



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

September 16, 2015

Mr. Thomas D. Gatlin, Vice President
Nuclear Operations
South Carolina Electric and Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88, Mail Code 800
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1 - 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. MF2338 AND MF1173)

Dear Mr. Gatlin:

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. ML13063A150), South Carolina Electric and Gas Company (SCE&G, the licensee) submitted its OIP for Virgil C. Summer Nuclear Station, Unit 1 (VCSNS) in response to Order EA-12-049. By letters dated August 28, 2013, February 27, 2014, August 28, 2014, February 27, 2015, and August 24, 2015 (ADAMS Accession Nos. ML13242A273, ML14063A203, ML14245A405, ML15062A007, and ML15239A750, respectively), SCE&G submitted its first five 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 VCSNS interim staff evaluation (ISE) on February 21, 2014 (ADAMS Accession No. ML14034A339), and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A099), the licensee submitted its OIP for VCSNS in response to Order EA-12-051. By letter dated July 29, 2013 (ADAMS Accession No. ML13203A180), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated August 28, 2013, August 28, 2013, February 27, 2014, August 28, 2014, February 27, 2015, and August 20, 2015 (ADAMS Accession Nos. ML13247A338, ML13242A272, ML14063A201, ML14245A404, ML15062A008, and ML15237A041, respectively), the licensee submitted its RAI responses and first five six-month

updates to the OIP. The NRC staff's review led to the issuance of the VCSNS ISE and RAI dated December 5, 2013 (ADAMS Accession No. ML13305A100). 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 audit process, to include the in-office and onsite portions, allows the staff to assess whether it has enough information to make a safety evaluation of the Integrated Plans. The audit allows 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 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 VCSNS from July 13-17, 2015, per the audit plan dated June 2, 2015 (ADAMS Accession No. ML15147A056). 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, review of staging and deployment of offsite equipment, and review of installation details for 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.

T. Gatlin

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If you have any questions, please contact me at 301-415-1924 or by e-mail at Tony.Brown@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'Tony Brown', with a large, stylized flourish at the end.

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

Docket No.: 50-395

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
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1
DOCKET NO. 50-395

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. ML13063A150), South Carolina Electric and Gas Company (SCE&G, the licensee) submitted its OIP for Virgil C. Summer Nuclear Station, Unit 1 (VCSNS, VC Summer) in response to Order EA-12-049. By letters dated August 28, 2013, February 27, 2014, August 28, 2014, February 27, 2015, and August 24, 2015 (ADAMS Accession Nos. ML13242A273, ML14063A203, ML14245A405, ML15062A007, and ML15239A750, respectively), SCE&G submitted its first five six-month updates to the OIP. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503),

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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 VCSNS interim staff evaluation (ISE) on February 21, 2014 (ADAMS Accession No. ML14034A339), and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A099), the licensee submitted its OIP for VCSNS in response to Order EA-12-051. By letter dated July 29, 2013 (ADAMS Accession No. ML13203A180), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated August 28, 2013, August 28, 2013, February 27, 2014, August 28, 2014, February 27, 2015, and August 20, 2015 (ADAMS Accession Nos. ML13247A338, ML13242A272, ML14063A201, ML14245A404, ML15062A008, and ML15237A041, respectively), the licensee submitted its RAI responses and first five six-month updates to the OIP. The NRC staff's review led to the issuance of the VCSNS ISE and RAI dated December 5, 2013 (ADAMS Accession No. ML13305A100). 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 audit process, to include the in-office and onsite portions, allows the staff to assess whether it has enough information to make a safety evaluation of the Integrated Plans. The audit allows 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 (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 VCSNS from July 13-17, 2015, per the audit plan dated June 2, 2015 (ADAMS Accession No. ML15147A056). 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, review of staging and deployment of offsite equipment, and review of installation details for 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 using the Nuclear Energy Institute (NEI) developed 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). For Order EA-12-051, the staff will make a safety determination using the NEI developed 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 for compliance, additional staff review will be required to evaluate the alternative strategy in reference to the applicable order.

AUDIT ACTIVITIES

The onsite audit was conducted at the VCSNS facility from July 13, 2015, through July 17, 2015. The NRC audit team staff was as follows:

Title	Team Member	Organization
Team Lead/Project Manager	Tony Brown	NRR/JLD
Technical Support – Balance of Plant	Brett Titus	NRR/JLD
Technical Support – Reactor Systems	Laura Okruhlik	NRR/JLD
Technical Support – Electrical	Prem Sahay	NRR/JLD
Technical Support – SFPI	Duc Nguyen	NRR/JLD

The NRC staff executed the onsite portion of the audit per the three part approach discussed in the June 2, 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 (July 13, 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 describing the site's strategies to meet the NRC orders. The licensee reviewed its strategy to maintain core cooling, containment, and SFP cooling in the event of an extended loss of alternating current power (ELAP), and the plant modifications being done in order to implement the strategies. Also reviewed was the design and location of the storage facilities for the FLEX equipment, the

interface with the National Strategic Alliance for FLEX Emergency Response SAFER Response Center (NSRC) including staging areas, the SFP level indication modification, the emergency communications equipment and capabilities, preventative maintenance plans for the FLEX equipment, procedural enhancements such as development of FLEX support guidelines (FSGs), and operator training.

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 identified in the plan. Results of these technical reviews and any additional review items needed from the licensee are documented in the audit item status table in Attachment 3, 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, the timing of the injection of borated water into the reactor coolant system (RCS), and the availability of borated water sources. The NRC staff reviewed the boration calculations and flow calculations, along with applicable procedures.

3.2 Electrical Technical Discussions and Walk-Downs

The NRC staff reviewed the licensee’s strategy for repowering the battery chargers. Additionally, the staff reviewed the summary of results and conclusion of the licensee’s calculations for extending battery life based on load shedding, if necessary, and walked down the battery rooms to evaluate strategies for hydrogen and temperature control. The NRC staff also walked down electrical panels used for load shedding to evaluate feasibility and timing.

The NRC staff walked down connection points and locations for FLEX diesel generators. The staff reviewed the summary of results and conclusion of the licensee’s load and sizing calculations for the FLEX generators and reviewed the procedures for connecting the Phase 2 and Phase 3 diesel generators. In addition, the NRC staff reviewed the electrical single line diagrams showing proposed electrical design and equipment qualification.

3.3 SFPI Technical Discussions and Walk-Downs

The NRC staff walked down instrument, transmitter, electronics, and display locations for the SFP level instrumentation, along with the associated cable runs. The NRC staff also reviewed the associated calibration, maintenance and test procedures for the SFP level instrumentation.

The NRC staff noted that portions of the backup channel of SFP level instrumentation are routed outside of the fuel handling building and not fully protected from all external

hazards. The licensee acknowledged this configuration as an alternative to the requirements of NEI 12-02 and plan to implement additional requirements as an alternative. The additional requirements include reducing the allowed out of service time for either channel to 30 days, maintaining a complete set of replacement parts for either channel, and providing procedural guidance to maintain SFP level to within the normal narrow range indication level during an ELAP. The narrow range indication is maintained available following an ELAP.

3.4 Other Technical Discussion Areas and Walk-Downs

a. The NRC staff met with licensee staff to discuss the required robust sources of water for the turbine-driven auxiliary feedwater (TDAFW) pump. The staff conducted a walkdown of the locations of the water sources to be used, as well as the connection points inside the protected plant buildings. The staff also reviewed the procedures for providing makeup to the steam generators (SGs), as well as alternate methods as needed. The staff noted that the Condensate Storage Tank (CST) is susceptible to damage from high winds and tornado missiles. As such, the licensee is developing an alternate emergency feedwater (EFW) strategy and the staff requested that the licensee make available details of the strategy for audit.

b. The NRC staff toured the buildings designated for storage of FLEX equipment and reviewed the building plans. The staff walked down equipment haul routes from the storage building to the designated deployment sites, and walked down haul routes from designated staging areas for equipment that will be delivered from the NSRC.

c. The NRC staff walked down the FLEX strategies for core cooling, RCS inventory, and SFP inventory functions. This included the locations of the FLEX pumps, hose routing and deployment connection points.

d. The NRC staff reviewed the strategy that will be implemented by the licensee to refuel the diesel-powered FLEX equipment. The NRC staff reviewed the instructions for refueling the equipment, as well as the equipment needed to perform the refueling.

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 staff interviewed plant personnel responsible for these areas, and observed lighting and communication needs during plant walkdowns.

f. The licensee's cooldown strategy relies on operation of the SG power operated relief valves (PORVs) and operation of the TDAFW pump. The licensee indicated that operator access to the TDAFW pump may be necessary to reset the pump and access to the PORVs may be necessary for manual operation. The staff observed these mechanisms during the plant walkdown and also reviewed the site procedures for operation of the PORVs. The staff reviewed the licensee's ventilation and habitability assessment for these areas, as well as the plans for communications with the control room.

4.0 Exit Meeting (July 17, 2015)

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 NRC staff also discussed the remaining open items with the licensee and information needed for closure. The open items are listed in Attachment 3 of this report.

CONCLUSION

The NRC staff completed all three parts of the June 2, 2015, onsite audit plan. The audit items identified in Part 2 of the plan were 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 compliance for this site, Attachment 3 provides 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 MS and SFP 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 OIP Open Items (OIs)
- d. Spent Fuel Pool Level Instrumentation (SFPLI) 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: MS/SFPI SE Audit Items currently under NRC staff review (licensee input needed as noted)

While this report notes the completion of the onsite portion of the audit per the audit plan dated June 2, 2015, 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 Attachment 3 provides a list of currently open items, the status and progress of the NRC staff's review may change based on licensee plan changes, resolution of generic

Enclosure

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. MS/SFPI Audit Items currently under NRC staff review

Onsite Audit Participants

NRC Staff:

Tony Brown	NRR/JLD/JOMB
Brett Titus	NRR/JLD/JCBB
Laura Okruhlik	NRR/JLD/JERB

Prem Sahay	NRR/JLD/JERB
Duc Nguyen	NRR/JLD/JERB

VC Summer Staff:

Shaun M. Zarandi	Nuclear Support Services A&G – General Manager
Matthew A. Torres	Operations – Shift Technical Advisor
Jeffrey Lackovic	Projects Maintenance – Program Manager
Jeremy Graham	Design Engineering - Engineer
Robert E. Williamson	Emergency Planning - Manager
Michael C. Kammer	Emergency Response Unit - Supervisor Emergency Services
Michael S. Moore	Nuclear Licensing - Supervisor
Tracey Stewart	Nuclear Licensing - Engineer
Marty Morgan	Design Engineering - Engineer
John Pfabe	Nuclear Licensing - Consultant
Chris Roberts	Emergency Response Unit - Supervisor
Rashien Ahrabli	Plant Support Engineering - Engineer
Robert Beckham	Operations - Control Room Supervisor
Harvey Brown	Nuclear Operations - Training
Pamela Fergen	Projects Maintenance Org - Contractor
Allen Fulmer	Nuclear Protection Services – Security Specialist
Maricela Orozco	Projects Maintenance - Admin
Jason Smithwick	Operations – Auxiliary Operator
Wayne Plemmons	Radio Networking - Manager

Documents Reviewed

- 2012 RC014, "Reactor Head Vent Calculation", Rev 10.1
- CR-13-00222
- CR-14-05730
- CR-15-03206
- AOP-304.4, "ARG-4, Loss of All ESF AC Power While on RHR Cooling," Rev. 3 Draft
- Areva Document No. 51-9202556-004, "Qualification Analysis of VEGAPULS 62 ER Through Air Radar," Rev. 4
- Areva Document No. 51-9225770-000, "Through Air Radar Spent Fuel Pool Level Instrument (SFPLI) Factory Acceptance Test (FAT) Report for V.C. Summer Unit 1," Rev. 0
- Areva Document No. 51-9237996-001, "Virgil C. Summer Nuclear Station SAFER Response Plan," Rev. 1
- Areva Document No. 51-9241803-000, "Through Air Radar Spent Fuel Pool Level Instrument (SFPLI) Site Acceptance Test (SAT) Report for V.C. Summer Unit 1," Rev. 0
- ARP-001, "Panel XCP-608 Annunciator Point 1-2," Rev. 7
- DC00020-238, "Room Heat-Up Calculation," Rev. 0
- DC00030-057, "Operator Dose as a Function of SFP Water Level – Response to INPO IER L1-11-4," Rev. 1
- DC07290-001, "Hydrogen Evolution Rates Intermediate Building Battery Rooms," Rev. 2
- DC00080-002, "Site Hazards Design Parameters for FLEX," Rev. 0
- DC00080-003, "FLEX Boration Requirements (Cycle 22)," Rev. 3
- DC00080-004, "Spent Fuel Pool Sloshing Evaluation for SFPLI Equipment," Rev. 0
- DC00080-007, "FX System Flow Model," Rev. 1
- DC00080-008, "Accumulator Volume Required for 350 Xe-Free Conditions," Rev. 0
- DC00080-009, "VCSNS FLEX Strategy Hydraulic Analysis," Rev. 0
- DC00080-010, "VCSNS ELAP Containment Response Due to RCS Inventory Loss," Rev. 1
- DC00080-011, "VCSNS Containment Response to ELAP in Mode 5 with FLEX Makeup," Rev. 1
- DC08260-001, "FLEX East Strategy Electrical Calculation," Rev. 0
- DC08260-002, "FLEX West Strategy Electrical Calculations Rev. 0
- DC08320-005, "ESF Battery Capacity," Rev. 11
- DC08320-019, "EOP-6/DMG Ultimate Battery Life," Rev. 1
- DC08340-002, "120V Class 1E Vital AC System Design Bases," Rev. 5
- DC08340-003, "120V Vital AC System Load Analysis," Rev. 5
- DC09660-008, "EOP setpoints O.01 to O.10", Rev. 0

- E-206-005, "Simplified Plant Electrical Distribution," Rev. 26
- ECR 51001A-8, "Sketch 5-55,"
- EMP-100.016, "Temporary Power from 80kW BDMG to XBC1A, XBC1B, or XBC1A/1B Swing Battery Chargers," Rev. 0
- EMRP-100.016, "FX RCS Makeup Pump Preventive Maintenance," Rev. 0 Draft
- EOP-6.0,"ECA-O.O, Loss of All ESF AC Power," Rev. 31 Draft
- ERMP-100.004, FX Portable Diesel Generator Data Sheet," Rev. 0
- ERP-0113, "ERU BDB Refueling Operations," Rev. 0 Draft
- E RTP-100.001, "FX Pump Test Procedure," Rev. 0 Draft
- FSP-1.0, "Long Term RCS Inventory Control," Rev. 0 Draft
- FSP-1.1, "Establishing RCS Makeup During Reflux Cooling," Rev. 0 Draft
- FSP-2.0, "Alternate EFW Suction Source," Rev. 0 Draft
- FSP-4, "ELAP DC Bus Load Shed/Management," Rev. 0 Draft
- FSP-4.1, "Recovering the Vital DC and Instrument Buses When a 480V Source is Available," Rev. 0 Draft
- FSP-5, "Initial Assessment and FLEX Equipment Staging," Rev. 0 Draft
- FSP-6, "Alternate CST Makeup," Rev. 0 Draft
- FSP-7, "Loss of Vital Instrumentation or Control Power," Rev. 0 Draft
- FSP-7.1, "Establishing Local Indication of Emergency Feed Flow," Rev. 0 Draft
- FSP-8, "Alternate RCS Boration," Rev. 0 Draft
- FSP-9, "Low Decay Heat Temperature Control," Rev. 0 Draft
- FSP-10.0, "Passive RCS Injection Isolation," Rev. 0 Draft
- FSP-11.0, "Alternate SFP Makeup and Cooling," Rev. 0 Draft
- FSP-12.0, "Alternate Reactor Building Cooling," Rev. 0 Draft
- FSP-13.0, "Transition From FLEX Equipment," Rev. 0 Draft
- FSP-14.0, "Shutdown RCS Makeup," Rev. 0 Draft
- FSP-20.0, "5KW Portable Emergency Generator Operation," Rev. 0 Draft
- FSP-20.1, "Vital Area Emergency Ventilation," Rev. 0 Draft
- FSP-20.3.1, "Staging the FX SG Feed Pump Using the East Strategy (East Pen FLEX Header)," Rev. 0 Draft
- FSP-20.3.2, "Staging the FX SG Feed Pump Using the West Strategy (AB Roll-Up Door)," Rev. 0 Draft
- FSP-20.3.3, "FX SG Feed Pump Operation," Rev. 0 Draft
- FSP-20.3.5, "Operation of the FX SG Feed Pump for RCS Makeup," Rev. 0 Draft
- FSP-20.4.1, "Staging the FX UHS Pumps," Rev. 0 Draft
- FSP-20.4.2, "FX UHS Pump Operation," Rev. 0 Draft
- FSP-20.5.1, "Staging the FX RCS MU Pump," Rev. 0 Draft
- FSP-20.5.2, "FX RCS MU Pump Operation," Rev. 0 Draft
- FSP-20.6.1, "Staging the FX BSTR/XFER Pump," Rev. 0 Draft
- FSP-20.6.2, "FX BSTR/XFER Pump Operation," Rev. 0 Draft

- FSP-20.7, "FLEX Combustion Turbine Generator Operation," Rev. 0 Draft
- FX003, "Analysis of Waveguide Level Indication System for the SFP," Rev. 5
- FXH5043, "Qualification of Sensor End Support for Spent Fuel Level Indication FXH5043 and FXH5045," Rev. 5
- ICP-390.012, "Spent Fuel Pool Level ILT09780 and ILT09781 Calibration," Rev. 0
- ERU BDB Equipment List, June 30, 2015
- Request for Preventive Maintenance, FX RCS Makeup Pump, 1/28/15
- PWROG-16064-P "Application of NOTRUMP Code Results for Westinghouse Design PWRs in Extended Loss of AC Power Circumstances," Rev. 0
- PWROG-14027-P, "No. 1 Seal Flow Rate for Westinghouse RCP Following Loss of All AC Power," Rev. 0
- "White Paper on the Response of the N-Seal Reactor Coolant Pump (RCP) to Extended Loss of All Power (ELAP)," Rev. A
- LTR-LIS-14-219 "Documentation for the Westinghouse 2 Loop, 3 Loop, and 4 Loop Analysis Input for Task 1 of PA-ASC-1271," May 1, 2014
- LRC TWR 822, "Decay Heat Comparison," July 2, 2014
- OGSV-15-0001, "Design Input to FLEX Containment Response," January 20, 2015
- DSP-667, "RCP Seal," Rev. 2
- SP-1003, "RCP Seal Assembly," Rev. 2
- NAI-1817-001, "VC Summer Decay Heat Load for Time to Boil", Rev. 0
- E-001-011/021 (Plant diagrams)
- FLEX Simplified Electrical Diagram, July 1, 2015
- EQ Data Base
- 1MS-94B-496, "RCP Vendor Manual"
- Instruction Manual TM-0406, "Three Stage N-9000 Seal Cartridge," Rev. A
- SAP-143, "Preventive Maintenance Program," Rev. 16
- SCE&G White Paper, "Strategy: Lighting," Rev. A
- SSP-002, "Planning and Scheduling of Outage Activities," Rev. 6, Change C
- SSP-004, "Outage Safety Review Guidelines," Rev. 4TR00080-003, "FLEX Equipment Ventilation and Habitability Assessment," Rev. 2
- SP-1015, "Procurement Specification, 7200V FLEX Generators XTG-0200 A & B," Rev. 1
- TR00080-001, "Guidance for Development of Specifications for FLEX Equipment," Rev. 3
- TR00080-006, "FLEX Time Constraints Basis," Rev. 0
- TR00080-007, "VCS Unit 1 FLEX Validation Document," Rev. 0 Draft
- TRP-044, "Fukushima (FLEX) Related Systems, Structures, and Components," Rev. 1
- WCAP 17601-P, "Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs," Rev. 1

Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:

Audit Items Currently Under NRC Staff Review, Requiring Licensee Input As Noted

Audit Item Reference	Item Description	Licensee Input Needed
ISE CI 3.2.1.2.A	Confirm the acceptability of the use of the non-Westinghouse RCP seals in the Westinghouse RCPs; provide justification for the RCP seal leakage rates for use in the ELAP analysis; and confirm the acceptability of O-ring performance under high temperature conditions expected during an ELAP event.	The NRC staff is reviewing the white paper from Flowserve regarding the use of Flowserve N-9000 RCP seals. No additional information from the licensee is requested at this time.
AQ #12	a. Provide the value of the maximum leak-off for each RCP seal in gpm assumed in the ELAP analysis.	The NRC staff is reviewing the white paper from Flowserve regarding the use of Flowserve N-9000 RCP seals. No additional information from the licensee is requested at this time.
SE #16	Alternate Emergency Feedwater (EFW) Strategy	Because the Condensate Storage Tank (CST) is susceptible to damage from high winds and missiles, the licensee is developing an Alternate EFW Strategy for loss of CST. The NRC staff requests that the licensee make available for audit the strategy for providing emergency feedwater to the steam generators in the event of a loss of the CST. Several facets of the strategy will have to be addressed including, but not limited to, hydraulic analysis, clogging considerations for the FLEX pump, timing of actions, and pre-staging of equipment.

T. Gatlin

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If you have any questions, please contact me at 301-415-1924 or by e-mail at Tony.Brown@nrc.gov.

Sincerely,

/RA by Jason Paige for/

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

Docket No.: 50-395

Enclosure:
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