UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

May 1, 2009

Mr. Preston D. Swafford
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT 05000327/2009002 AND 05000328/2009002, AND ANNUAL ASSESSMENT MEETING SUMMARY

Dear Mr. Swafford:

On March 31, 2009, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Sequoyah Nuclear Plant, Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on April 2 and 30, 2009, with Mr. Timothy Cleary and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents one NRC-identified and one self-revealing finding of very low safety significance (Green). One of these findings was determined to involve a violation of NRC requirements. However, because of the very low safety significance and because it is entered into your corrective action program, the NRC is treating this violation as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Sequoyah Nuclear Plant. In addition, if you disagree with the characterization of any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region II, and the NRC Resident Inspector at the Sequoyah Nuclear Plant. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publically Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Eugene F. Guthrie, Chief
Reactor Projects Branch 6
Division of Reactor Projects

Docket Nos.: 50-327, 50-328
License Nos.: DPR-77, DPR-79
Enclosure: Inspection Report 05000327/2009002 and 05000328/2009002
w/Attachment: Supplemental Information

cc: w/encl: (See page 3)

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Letter to Preston D. Swafford from Eugene F. Guthrie dated May 1, 2009

SUBJECT: SEQUOYAH NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT 05000327/2009002 AND 05000328/2009002, AND ANNUAL ASSESSMENT MEETING SUMMARY

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-327, 50-328
License Nos.:	DPR-77, DPR-79
Report Nos.:	05000327/2009002 and 05000328/2009002
Licensee:	Tennessee Valley Authority (TVA)
Facility:	Sequoyah Nuclear Plant, Units 1 and 2
Location:	Sequoyah Access Road Soddy-Daisy, TN 37379
Dates:	January 1, 2009 – March 31, 2009
Inspectors:	C. Young, Senior Resident Inspector M. Speck, Resident Inspector J. Baptist, Senior Project Engineer L. Garner, Senior Project Engineer H. Gepford, Senior Health Physicist (Sections 2PS1, 4OA1, and 4OA5.3) R. Hamilton, Senior Health Physicist (Sections 2PS1 and 2PS3) P. Higgins, Project Engineer A. Nielsen, Health Physicist (Section 2OS3) L. Suggs, Reactor Inspector (Section 4OA5.5)
Approved by:	Eugene F. Guthrie, Chief Reactor Projects Branch 6 Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000327/2009-002, 05000328/2009-002; 01/01/2009 – 03/31/2009; Sequoyah Nuclear Plant, Units 1 and 2; Post-Maintenance Testing, Other Activities

The report covered a three-month period of inspection by resident inspectors and announced inspections by regional inspectors. Two Green finding, one of which was a non-cited violation (NCV), was identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

Cornerstone: Initiating Events

Green. A Green self-revealing non-cited violation of Unit 2 Technical Specification 6.8.1 was identified for the licensee's failure to have an adequate procedure to ensure replacement of the pressurizer pressure master controller would not adversely impact plant stability. Specifically, on January 7, 2009, operators placed a pressurizer spray valve controller in automatic while the master controller was in manual with a large demand output signal present. This resulted in the spray valve fully opening and an associated reactor coolant system pressure transient. Operators immediately restored pressure to its normal value, and the finding was entered into the licensee's corrective action program as Problem Evaluation Report (PER) 160504.

The finding was greater than minor because it was associated with the procedure quality attribute of the initiating events cornerstone and affected the cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions. Using Manual Chapter 0609, "Significance Determination Process," Attachment 4, the finding was determined to have very low safety significance (Green) because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigating systems will not be available. The cause of this finding was determined to be in the cross-cutting area of human performance associated with work practices and the aspect of human error prevention, in that, during the pre-job brief, the operators discussed minimizing the master controller demand signal but failed to self and peer check to ensure that the procedural steps were consistent with the appropriate actions [H.4(a)] (Section 1R19).

Cornerstone: Barrier Integrity

Green. An NRC inspector identified a Green finding for the licensee's failure to implement a docketed commitment made to the NRC. Specifically, the licensee did not adequately revise procedures in accordance with a self-imposed standard to provide backup power to at least one train of hydrogen igniters in response to Generic Safety Issue – 189 "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident." The revised procedures failed to close the supply breaker to the hydrogen igniter. The licensee entered this issue into their corrective action program as Problem Evaluation Report 144301.

The finding is more than minor because it is associated with the Procedure Quality attribute of the Reactor Safety/Barrier Integrity Cornerstone. The inadequate procedure affects the cornerstone objective to provide reasonable assurance that physical design barriers, specifically maintaining the functionality of containment, protect the public from radio nuclide releases caused by accidents or events. For this finding, the accident sequences are associated with station blackouts. A Phase 3 Significance Determination Process evaluation was required to ascertain the safety significance. A regional senior reactor analyst performed a Phase 3 evaluation and determined that this performance deficiency was of very low safety significance (Green) (Section 4OA5.5).

REPORT DETAILS

Summary of Plant Status:

Unit 1 operated at or near 100 percent rated thermal power (RTP) until March 26, 2009, when Unit 1 was automatically tripped in response to a loss of power to two reactor coolant pumps. Following the trip, Unit 1 remained shut down for the remainder of the inspection period for a planned refueling outage.

Unit 2 operated at or near 100 percent RTP until March 26, 2009, when Unit 2 was automatically tripped in response to a loss of power to two reactor coolant pumps. Following the identification of the cause of the electrical fault that resulted in a loss of power to two unit boards (per unit), a normal offsite electrical power configuration was restored. Unit 2 achieved criticality on March 28, 2009, and reached 100 percent RTP on March 31, 2009.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection

.1 Tornado Watch

a. Inspection Scope

The inspectors observed the licensee's response to a tornado watch on February 11, 2009. The inspectors reviewed licensee Procedure AOP-N.02, Tornado Watch/Warning, Revision 22, for its effectiveness to limit the risk of tornado-related initiating events and to adequately protect mitigating systems from the effects of a tornado and verified licensee performance of required actions. In addition, the inspectors verified that no loose debris was in the 500kV and 161kV Switchyards which would serve as missile hazards during a tornado. This activity constituted one inspection sample.

b. Findings

No findings of significance were identified.

.2 Readiness to Cope With External Flooding

a. Inspection Scope

The inspectors reviewed the licensee’s readiness prior to the onset of adverse weather that poses a risk of flooding. Specifically, the inspectors reviewed problem evaluation report (PER) 162711 which identified that Tennessee Valley Authority River Operations methodology used to operate upstream reservoirs was not consistent with Updated Final Safety Analysis Report (UFSAR) assumptions and would result in probable maximum floods exceeding current licensing basis flood heights. The inspectors reviewed flood analysis and design documents including UFSAR Section 2.4, abnormal operating procedure (AOP)-N.03, Flooding, and the licensee's functional evaluation to evaluate the impact on plant structures, systems and components (SSCs).

The inspectors walked down flood protection barriers around the emergency diesel building and spent fuel cooling pumps, which would be affected by a probable maximum flood, to ensure that interim contingency actions could be accomplished. This review constituted one inspection sample. Documents reviewed are listed in the Attachment.

b. Findings

No findings of significance were identified.

1R04 Equipment Alignment

.1 Partial System Walkdowns

a. Inspection Scope

The inspectors performed a partial walkdown of the following four systems to verify the operability of redundant or diverse trains and components when safety equipment was inoperable. The inspectors focused on identification of discrepancies that could impact the function of the system and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, walked down control system components, and determined whether selected breakers, valves, and support equipment were in the correct position to support system operation. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the corrective action program (CAP). Documents reviewed are listed in the Attachment to this report.

- Unit 1 Emergency Core Cooling Systems (ECCS) Train A During Charging Pump 1B Component Outage
- Auxiliary Air Compressor Train A During Train B Component Outage
- Unit 1 ECCS Train B During Residual Heat Removal (RHR) Pump 1A Component Outage
- Unit 1 Containment Spray Train A Following Component Outage

b. Findings

No findings of significance were identified.

1R05 Fire Protection

Quarterly Fire Protection Inspection

a. Inspection Scope

The inspectors conducted a tour of the six areas listed below to assess the material condition and operational status of fire protection features. The inspectors evaluated whether: combustibles and ignition sources were controlled in accordance with the licensee's administrative procedures; fire detection and suppression equipment was available for use; passive fire barriers were maintained in good material condition; and compensatory measures for out-of-service, degraded, or inoperable fire protection

equipment were implemented in accordance with the licensee's fire plan. Documents reviewed are listed in the Attachment to this report.

- Control Building Elevation 706 (Cable Spreading Room)
- Auxiliary Building Elevation 690 (Corridor)
- Control Building Elevation 685 (Auxiliary Instrument Rooms)
- Control Building Elevation 732 (Mechanical Equipment Room and Relay Room)
- Control Building Elevation 669 (Mechanical Equipment Room, 250 VDC Battery and Battery Board Rooms)
- Auxiliary Building Elevation 734 6.9kV and 480V Shutdown Board Rooms

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures

a. Inspection Scope

The inspectors reviewed the flood mitigation plans to verify whether they were consistent with the Control Building Elevation 669 internal flood design requirements and risk analysis assumptions and that equipment essential for reactor shutdown was properly protected from a flood caused by pipe breaks in the building. Specifically, the inspectors reviewed the licensee's moderate energy line break flooding study to fully understand the licensee's flood mitigation strategy and then verified if the assumptions and results remained valid. The inspectors walked down the Control Building Elevation 669 to determine whether, during a flooding event, the condition of common area drainage and building compartmentalization would preclude the assumed flooding sources from adversely impacting reactor shutdown capabilities. The inspectors walked down the control room to ensure that if a pipe break occurred, procedures existed to identify and isolate the leak. Documents reviewed are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance

a. Inspection Scope

The inspectors observed and reviewed the results of thermal performance testing of the 1A1 and 1A2 Component Cooling System Heat Exchangers to determine whether the acceptance criteria and results appropriately considered differences between testing conditions and design conditions; whether test results were appropriately evaluated against pre-established acceptance criteria; whether the frequency of testing was sufficient to detect degradation prior to loss of heat removal capability below design basis values; and whether test results considered test instrument inaccuracies and differences. The inspectors also observed the inspection and cleaning of the 1A1 and 1A2 Component Cooling System Heat Exchangers. Documents reviewed are listed in the Attachment.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification Program

a. Inspection Scope

The inspectors performed one licensed operator requalification program review. The inspectors observed a simulator session on February 4, 2009. The training scenario involved loss of the condensate storage tank, locked rotor on a reactor coolant pump, partial loss of power, malfunction of the control rod system, a large break loss of coolant accident, a containment breach and a turbine driven auxiliary feedwater pump malfunction. The inspectors observed crew performance in terms of: communications; ability to take timely and proper actions; prioritizing, interpreting and verifying alarms; correct use and implementation of procedures, including the alarm response procedures; timely control board operation and manipulation, including high risk operator actions; oversight and direction provided by shift manager, including the ability to identify and implement appropriate Technical Specification (TS) action; and, group dynamics involved in crew performance. The inspectors also observed the evaluators' critique and reviewed simulator fidelity to verify that the simulator matched the actual control room physical configuration. Documents reviewed are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

The inspectors reviewed the two maintenance activities listed below to verify the effectiveness of the activities in terms of: appropriate work practices; identifying and addressing common cause failures; scoping in accordance with 10 CFR 50.65 (b); characterizing reliability issues for performance; trending key parameters for condition monitoring; charging unavailability for performance; classification in accordance with 10 CFR 50.65(a)(1) or (a)(2); appropriateness of performance criteria for SSCs and functions classified as (a)(2); and, appropriateness of goals and corrective actions for SSCs and functions classified as (a)(1). Documents reviewed are listed in the Attachment to this report.

- Essential Raw Cooling Water (ERCW) System Leaks and Pipe Wall Thinning
- Unit 2 Component Cooling System

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors reviewed the following three activities to determine whether appropriate risk assessments were performed prior to removing equipment from service for maintenance. The inspectors evaluated whether risk assessments were performed as required by 10 CFR 50.65 (a)(4), and were accurate and complete. When emergent work was performed, the inspectors reviewed whether plant risk was promptly reassessed and managed. The inspectors also assessed whether the licensee's risk assessment tool use and risk categories were in accordance with Standard Programs and Processes Procedure (SPP)-7.1, "On-Line Work Management," Revision 12, and Instruction 0-TI-DSM-000-007.1, "Risk Assessment Guidelines," Revision 8. Documents reviewed are listed in the Attachment to this report.

- Auxiliary Air Compressor Train-A Replacement Resulting in Multiple 72-Hr. Limiting Condition for Operation (LCO) on Both Units
- Motor-Driven Auxiliary Feedwater (MDAFW) Pump Component Outage
- Unit 1 Turbine-driven Auxiliary Feedwater Pump Unavailability

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations

a. Inspection Scope

For the eight operability evaluations described in the PERs listed below, the inspectors evaluated the technical adequacy of the evaluations to ensure that TS operability was properly justified and the subject component or system remained available, such that no unrecognized increase in risk occurred. The inspectors compared the operability evaluations to UFSAR descriptions to determine if the system or component's intended function(s) were adversely impacted. In addition, the inspectors reviewed compensatory measures implemented to determine whether the compensatory measures worked as stated and the measures were adequately controlled. The inspectors also reviewed a sampling of PERs to assess whether the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the Attachment to this report.

- PER 160262, Common Station Service Transformer (CSST) Oil Samples Did Not Meet Test Criteria for Dielectric Strength
- PER 151470, Centrifugal Charging Pump (CCP) Discharge Piping Void Operability
- PER 160211, Auxiliary Building Gas Treatment System (ABGTS) B-Train Power Supply Failure
- PER 160607, Auxiliary Feedwater Pump 1-AS Oil Sample Analysis Particle Count Exceeds Acceptance Criteria
- PER 161902, ERCW Screen Wash Pump Fails To Meet Minimum Differential Pressure Acceptance Criteria

- PER 160705, S/G #2 MDAFW Level Control Valve Fails To Stroke Closed Within Acceptable Range
- PER 164453, Pipe Chase Cooler Fan 1A-A Thermal Overloads Set on Automatic Vice Manual as Required By Design Criteria
- PER 164508, Unit 1 Safety Injection Containment Isolation Valve Stuck

b. Findings

No findings of significance were identified.

1R18 Plant Modifications

Temporary Modifications

a. Inspection Scope

The inspectors reviewed the temporary modification described in Temporary Alteration Control Form (TACF) 1-09-004-030, Unit 1 A-train 669 Penetration Room Cooler, Revision 0, and the associated 10 CFR 50.59 screening, and compared it against the UFSAR and TS to verify that the modification did not affect the operability or availability of any safety system. The inspectors walked down the TACF to ensure it was installed in accordance with the modification documents and reviewed post installation and removal testing to verify the actual impact on permanent systems was adequately verified by the tests. The inspectors also verified that permanent plant documents were updated to reflect the TACF to ensure that plant configuration control was maintained. Documents reviewed are listed in the Attachment.

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing

a. Inspection Scope

The inspectors reviewed the six post-maintenance tests associated with the Work Orders (WOs) listed below to assess whether procedures and test activities ensured system operability and functional capability. The inspectors reviewed the licensee's test procedure to evaluate whether: the procedure adequately tested the safety function(s) that may have been affected by the maintenance activity; the acceptance criteria in the procedure were consistent with information in the applicable licensing basis and/or design basis documents; and the procedure had been properly reviewed and approved. The inspectors also witnessed the test or reviewed the test data to determine whether test results adequately demonstrated restoration of the affected safety function(s). Documents reviewed are listed in the Attachment to this report.

- WO 09-770054, Unit 2 Pressurizer Pressure Master Controller Replacement
- WO 07-779510-000, Replace Motor Operator Valve (MOV) Spring Pack on Residual Heat Removal (RHR) Pump 1B-B Inlet Flow Control Valve, 1-FCV-74-21

- 1-SI-OPS-202-253.B, Functional Test of Loss of Voltage Relays on 6.9kV Shutdown Board 1B-B, Revision 12
- 1-SI-SXP-072-201.A, Containment Spray Pump 1A-A Performance Test, Revision 15
- WO 08-775760-000, 1B-B Pipe Chase Cooler Preventive Maintenance
- WO 09-772494-000, Packing Blown out 0-VLV-82-517-1A1

b. Findings

Introduction. A Green self-revealing non-cited (NCV) of Unit 2 Technical Specification 6.8.1 was identified for the licensee's failure to have an adequate procedure to ensure replacement of the pressurizer pressure master controller would not adversely impact plant stability. The procedure failed to instruct the operators to ensure that a master controller demand signal was not present prior to placing the pressurizer spray valve controller in automatic. This resulted in the spray valve fully opening and an associated reactor coolant system pressure transient.

Description. On January 7, 2009, maintenance technicians had replaced the Unit 2 pressurizer pressure master controller, 2-PIC-68-340A, as corrective maintenance. Control room personnel were restoring the related pressurizer spray valve controller, 2-PIC-68-340D, in automatic operation as directed by maintenance work order WO 09-770054-000. At the time, the master controller was in manual operation with a full-scale demand output signal present. When the spray valve controller was placed in automatic, the master controller demand signal caused the spray valve to fully open, resulting in a rapid drop in reactor coolant system (RCS) pressure. Operators placed the spray valve controller back in manual operation, energized pressurizer heaters, and restored RCS pressure to the proper control value of 2235 psig. During the transient, pressurizer pressure dropped to approximately 2200 psig, which was below the limit of 2220 psia specified by TS LCO 3.2.5 for DNB (departure from nucleate boiling) Parameters. TS LCO 3.2.5 required operators to restore pressure to greater than 2220 psia within two hours or reduce thermal power to less than 5% within the next four hours. This TS action applied for approximately 4 minutes.

The inspectors concluded that the WO did not contain adequate instructions to ensure that plant stability would be maintained during the restoration of the master and spray valve controllers to automatic operation. The instructions included a step to ensure that there was a near zero controller deviation on the master controller prior to placing the spray valve controller in automatic. However, the instructions failed to include a provision to ensure that the master controller demand output signal was similarly adjusted such that it would not result in a spray valve demand when the spray valve controller was placed in automatic.

Analysis. An operator placing the spray valve controller in automatic with a large demand signal from the master controller was a performance deficiency, which resulted in Unit 2 operating at an RCS pressure that was below the minimum value specified in TS for approximately 4 minutes. The finding was greater than minor because it was associated with the procedure quality attribute of the initiating events cornerstone and affected the cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions.

Using Manual Chapter 0609, “Significance Determination Process,” Attachment 4, the finding was determined to have very low safety significance (Green) because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigating systems will not be available.

The cause of this finding was determined to have a cross-cutting aspect in the area of human performance associated with work practices and the aspect of human error prevention. During the pre-job brief for this activity, the operators acknowledged the need to ensure that the master controller demand signal was minimized; however, it was not recognized that the procedure did not address this requirement, and during performance of the activity the operators failed to self and peer check to ensure that the procedure steps were consistent with the appropriate actions [H.4(a)].

Enforcement. Unit 2 TS 6.8.1.a required, in part, that written procedures be established, implemented, and maintained covering the activities specified in Appendix A, “Typical Procedures for Pressurized Water Reactors and Boiling Water Reactors,” of Regulatory Guide (RG) 1.33, “Quality Assurance Program Requirements (Operations),” dated February 1978. RG 1.33 Appendix A Section 9, “Procedures for Performing Maintenance,” required, in part, that maintenance be performed in accordance with documented instructions appropriate to the circumstances. Contrary to this, on January 7, 2009, maintenance was not performed in accordance with documented instructions appropriate to the circumstances, in that, WO 09-770054-000 and associated documents failed to ensure that placing the pressurizer spray valve controller 2-PIC-68-340D in automatic operation would not adversely affect plant stability. Because the finding was of very low safety significance and has been entered into the licensee’s CAP as PER 160504, this violation is being treated as an NCV, consistent with Section VI.A of the Enforcement Policy: NCV 05000328/2009002-01, “Pressurizer Pressure Transient due to Inadequate Maintenance Procedure.”

1R20 Refueling and Other Outage Activities

.1 Unit 2 Reactor Trip

a. Inspection Scope

Following the automatic trip of both Units on March 26, 2009, the licensee maintained Unit 2 in Mode 3 until conditions to support restart were established on March 28, 2009. The inspectors reviewed the licensee's mode change checklists to verify that appropriate prerequisites were met prior to changing TS modes. The inspectors observed portions of the plant startup including reactor criticality and power ascension.

b. Findings

No findings of significance were identified.

.2 Unit 1 Refueling Outage

a. Inspection Scope

Following the automatic trip of both Units on March 26, 2009, the licensee proceeded to Mode 5 and commenced a scheduled refueling outage on Unit 1.

The inspectors evaluated licensee activities to verify that the licensee considered risk in developing outage schedules, followed risk reduction methods developed to control plant configuration, developed mitigation strategies for the loss of key safety functions, and adhered to operating license and TS requirements that ensure defense-in-depth. The inspectors also walked down portions of Unit 1 not normally accessible during at-power operations to verify that safety-related and risk-significant SSCs were maintained in an operable condition. Specifically, between March 26, 2009, and March 31, 2009, the inspectors performed inspections and reviews of the following outage activities. Documents reviewed are listed in the Attachment.

- Outage Plan. The inspectors reviewed the outage safety plan and contingency plans to confirm that the licensee had appropriately considered risk, industry experience, and previous site-specific problems in developing and implementing a plan that assured maintenance of defense-in-depth.

- Reactor Shutdown. Following the automatic reactor trip from full power, the inspectors observed the operators' actions in the control room to maintain the unit in stable conditions in Mode 3. The inspectors also observed the cooldown of the reactor into Modes 4 and 5, including placing it on the RHR system for decay heat removal, to verify that TS cooldown restrictions were followed and stable conditions were established. The inspectors also toured the lower containment as soon as practicable after reactor shutdown to observe the general condition of the RCS and ECCS components and to look for indications of previously unidentified leakage inside the polar crane wall.

- Licensee Control of Outage Activities. On a daily basis, the inspectors attended the licensee outage turnover meeting, reviewed PERs, and reviewed the defense-in-depth status sheets to verify that status control was commensurate with the outage safety plan and in compliance with the applicable TS when taking equipment out of service. The inspectors further toured the main control room and areas of the plant daily to ensure that the following key safety functions were maintained in accordance with the outage safety plan and TS: electrical power, decay heat removal, spent fuel cooling, inventory control, reactivity control, and containment closure. To ensure that RCS level instrumentation was properly installed and configured to give accurate information, the inspectors reviewed the installation of the Mansell level monitoring system. Specifically, the inspectors discussed the system with engineering, walked it down to verify that it was installed in accordance with procedures and adequately protected from inadvertent damage, verified that Mansell indication properly overlapped with pressurizer level instruments during pressurizer draindown, verified that operators properly set level alarms to procedurally required setpoints, and verified that the system consistently tracked RCS level while lowering to reactor vessel head removal conditions.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing

a. Inspection Scope

For the five surveillance tests identified below, the inspectors assessed whether the SSCs involved in these tests satisfied the requirements described in the TS surveillance requirements, the UFSAR, applicable licensee procedures, and the tests demonstrated that the SSCs were capable of performing their intended safety functions. This was accomplished by witnessing testing and/or reviewing the test data. Documents reviewed are listed in the Attachment to the report.

Routine Surveillance Tests:

- Unit 1, 0-SI-OPS-085-011.0, Reactivity Control System Moveable Control Assemblies, Revision 28
- 1-SI-TDC-202-235.B, 6.9kV Shutdown Board Loss of Voltage and Degraded Voltage Relay Calibration rain B, Revision 14
- 1-TI-CEM-000-016.31, Primary Sampling – Reactor Coolant, Refueling Canal and Transfer Canal, Revision 6

In-Service Tests:

- 1-SI-SXP-070-201.A, Component Cooling System Pump 1A-A Performance Test, Revision 10
- 0-SI-SXP-067-201.P, Essential Raw Cooling Water Pump P-B Performance Test, Revision 19

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Cornerstones: Occupational Radiation Safety and Public Radiation Safety

2OS3 Radiation Monitoring Instrumentation and Protective Equipment

a. Inspection Scope

The following inspection was performed in April 2008, but through administrative error was not included in inspection report 05000327, 328/2008003.

Radiation Monitoring Instrumentation: During tours of the auxiliary building and spent fuel pool areas, the inspectors observed installed radiation detection equipment including the following instrument types: area radiation monitors (ARMs), continuous air monitors, personnel contamination monitors (PCMs), and components of the Post-Accident Sampling System (PASS). The inspectors observed the physical location of the components, noted the material condition, and compared sensitivity ranges with UFSAR requirements.

In addition to equipment walk-downs, the inspectors observed functional checks and alarm setpoint testing of various fixed and portable detection instruments.

These observations included: source checks of portable ion chambers and G-M survey meters using a Shepherd calibrator, source checks of PCMs and portal monitors at the Radiologically Controlled Area and Protected Area exits, and response checks for portable instruments being checked out for use. The most recent 10 CFR Part 61 analysis for dry active waste was reviewed to determine if calibration and check sources are representative of the plant source term.

The inspectors reviewed the last two calibration records for selected PCMs, portal monitors, ARMs, air monitors, and for the Unit 1 upper containment high-range ARMs. Calibration stickers on portable survey instruments were noted during inspection of storage areas for "ready-to-use" equipment. Records of quality assurance checks for the whole body counter were also reviewed.

Operability and reliability of selected radiation detection instruments were reviewed against details documented in the following: 10 CFR Part 20; NUREG-0737, Clarification of TMI Action Plan Requirements; Technical Specifications (TS) Section 3; UFSAR Chapter 12; and applicable licensee procedures. Documents reviewed are listed in the Attachment to the report.

Self-Contained Breathing Apparatus (SCBA) and Protective Equipment: Selected SCBA units staged for emergency use in the Control Room and other locations were inspected for material condition, air pressure, and number of units available. The inspectors also reviewed maintenance records for selected SCBA units for the past five years and certification records associated with supplied air quality.

Qualifications for individuals responsible for testing and repairing SCBA vital components were evaluated through review of training records. In addition, Control Room operators were interviewed to determine their knowledge of available SCBA equipment locations, including corrective lens inserts if needed, and their training on bottle change-out during a period of extended SCBA use. Respirator qualification records were reviewed for several Control Room operators and emergency responder personnel in the Maintenance Department.

Licensee activities associated with maintenance and use of respiratory protection equipment were reviewed against 10 CFR Part 20; Regulatory Guide (RG) 8.15, Acceptable Programs for Respiratory Protection; and applicable licensee procedures. Documents reviewed are listed in the Attachment to the report.

Problem Identification and Resolution: Select licensee PERs associated with instrumentation and protective equipment were reviewed and assessed. The inspectors evaluated the licensee's ability to identify, characterize, prioritize, and resolve the identified issues in accordance with procedure SPP-3.1, Corrective Action Program, Rev. 13. The inspectors also evaluated the scope of the licensee's internal audit program and reviewed recent assessment results. Documents reviewed are listed in the Attachment to the report.

The inspectors completed 9 of the 9 required line-item samples detailed in IP 71121.03.

b. Findings

No findings of significance were identified.

2PS1 Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems

The following inspection was performed in April 2008, but through administrative error was not included in inspection report 05000327, 328/2008003.

a. Inspection Scope

Effluent Monitoring and Radwaste Equipment: During inspector walk-downs, accessible sections of the Unit 1 (U1) and Unit 2 (U2) liquid and gaseous radioactive waste (radwaste) and effluent systems were assessed for material condition and conformance with the UFSAR. The inspection included the waste hold-up tanks, monitor tank, compressors, pumps, liquid radwaste piping and valves, Liquid Radwaste Effluent Monitor (0-RM-90-122), Essential Raw Cooling Water Discharge Monitors (0-RM-90-133,140), Condensate Demineralizer Liquid Monitor (0-RE-90-225), Steam Generator Blowdown Line Effluent Monitors (1-RM-90-120,121), Auxiliary Building Vent Monitors (0-RM-90-101), U1/U2 Shield Building Vent Monitors (1,2-R-90-400), U1 Condenser Vacuum Exhaust Monitors (1-RM-90-99,119), Waste Gas Disposal System Monitor (0-90-118), and associated airborne effluent sample lines. The inspectors interviewed chemistry and engineering staff regarding radwaste equipment configuration requirements for operation, representative sampling, and effluent monitor operation.

The inspectors reviewed performance records and calibration results for selected radiation monitors, flowmeters, and air filtration systems. For effluent monitors 0-R-90-119, 0-R-90-122, 1-R-90-225, 2-R-90-400, 2-R-90-255, and 2-R-90-256, the inspectors reviewed the last loop/isotopic calibration records. The most recent High Efficiency Particulate Air surveillances for the Auxiliary Building Gas Treatment System were also reviewed. The inspectors evaluated out-of-service effluent monitor events and reviewed select compensatory actions taken during the period of September 2006 to March 2008.

Installed configuration, material condition, operability, and reliability of selected effluent sampling and monitoring equipment were reviewed against details documented in the following: 10 CFR Part 20; RG 1.21, Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials In Liquid and Gaseous Effluents from Light-Water Cooled Nuclear Power Plants; ANSI N13.1 - 1969, Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities; TS Section 6; the Offsite Dose Calculation Manual (ODCM), Rev. 52; and UFSAR, Chapter 11. Documents reviewed are listed in the Attachment to the report.

Effluent Release Processing and Quality Control (QC) Activities: QC activities regarding gamma spectroscopy and beta-emitter detection were discussed with count room technicians and Chemistry supervision. The inspectors reviewed daily QC data logs for January 1, 2008 through April 9, 2008 for high purity germanium (HPGe) detectors 1, 2, 3, and 4, and the TriCarb liquid scintillation counter (LSC). The inspectors reviewed calibration records for HPGe No. 2 (select counting geometries) and the LSC (s/n 060450). In addition, quarterly results of the radiochemistry cross-check program for calendar years 2006 and 2007 were reviewed.

Selected portions of procedures for effluent sampling, processing, and release were evaluated for consistency with licensee actions. Two liquid and three gaseous release permits were reviewed against ODCM specifications for pre-release sampling and effluent monitor setpoints.

The inspectors discussed the performance of pre-release sampling and analysis, release permit generation, and radiation monitor setpoint adjustment with chemistry staff. The inspectors also directly observed pre-release liquid (cask decon collector tank) and gaseous (U1 vent) sampling, isotopic analysis of liquid and gaseous samples, and opening/closing of gaseous release permits by a chemistry technician. The inspectors reviewed the 2005 and 2006 annual effluent reports to evaluate reported doses to the public and ODCM changes. Public dose calculations were reviewed and discussed with cognizant licensee personnel. In addition, changes to the radwaste and effluent systems were discussed with engineering and chemistry personnel.

Observed task evolutions, count room activities, and offsite dose results were evaluated against details and guidance documented in the following: 10 CFR Part 20 and Appendix I to 10 CFR Part 50; ODCM; RG 1.21; RG 1.33, Quality Assurance Program Requirements (Operation); and TS Section 6. Documents reviewed are listed in the Attachment to the report.

Ground Water Protection/ Tritium Monitoring: The inspectors reviewed extensive documentation of the groundwater evaluations of the site. This documentation included vendor evaluations as well as documentation from the 10 CFR 50.75(g) file, which detailed various historical spills and actions taken to remediate. The inspectors toured the site and noted the positions of several sampling wells especially those that could provide useful monitoring of the historical spills. The inspectors discussed the ground water surveillance program with Chemistry Department supervision. This discussion included historical findings, sample results, ongoing initiatives, and planned changes to the groundwater surveillance program. The inspectors reviewed several corrective action documents related to the existing low level ground contamination with tritium and the groundwater monitoring program.

The inspectors noted that at two well sampling locations the tritium concentration approached the EPA drinking water limit; subsequent samples showed a sustained downward trend in activity. The locations were well within the protected area at a considerable distance from the site boundary.

Problem Identification and Resolution: Several PERs, an audit, and a self-assessment associated with effluent release activities, liquid/gaseous radwaste processing, and the groundwater monitoring program were reviewed. The inspectors evaluated the licensee's ability to identify, characterize, prioritize, and resolve selected issues in accordance with procedure SPP-3.1, Corrective Action Program, Rev. 13. Documents reviewed are listed in the Attachment to the report.

The inspectors completed 3 of the 3 required line-item samples for IP 71122.01.

b. Findings

No findings of significance were identified.

2PS3 Radiological Environmental Monitoring Program (REMP)

a. Inspection Scope

The following inspection was performed in April 2008, but through administrative error was not included in inspection report 05000327, 328/2008003.

REMP Implementation: The inspectors observed routine sample collection and surveillance activities as required by the licensee's REMP. The inspectors noted the material condition and operability of airborne particulate filter and iodine cartridge sample stations at two monitoring locations. Environmental thermoluminescent dosimeters (TLDs) at the same locations were checked for material condition and appropriate identification. Collection of a milk sample was observed at a farm near the plant. In addition, collection of a water sample at the Riverside substation in Chattanooga was observed. The inspectors determined the current location of selected air samplers, TLDs, water samples, and dairy farm using a hand held global positioning system unit. Land use census results, changes to the ODCM, and sample collection/processing activities were discussed with environmental technicians.

The inspectors reviewed the most recent calibration records for selected environmental air sampler gas meters. The inspectors also reviewed the 2005 and 2006 Radiological Environmental Operating Reports, results of the 2006 and 2007 interlaboratory cross-check program. Selected environmental measurements were reviewed for consistency with licensee effluent data, evaluated for radionuclide concentration trends, and compared with detection level sensitivity requirements.

Procedural guidance, program implementation, and environmental monitoring results were reviewed against: 10 CFR Part 20; Appendix I to 10 CFR Part 50; TS Section 5.0; ODCM; RG 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operation) - Effluent Streams and the Environment; and the Branch Technical Position, An Acceptable Radiological Environmental Monitoring Program - 1979. Documents reviewed are listed in the Attachment to the report.

Meteorological Monitoring Program: The inspectors observed the physical condition of the tower and discussed equipment operability and maintenance history with a technician. The inspectors compared locally generated meteorological data with information available to control room operators. For the 10, 46, and 91 meter meteorological measurements of wind speed, wind direction, and temperature, the inspectors reviewed calibration records for applicable tower instrumentation, maintenance records and measurement data recovery for 2007 and 2008. The inspectors reviewed weekly tower inspection checklists, numerous instrument exchanges and PERs. The inspectors interviewed the individuals responsible for maintaining the meteorological program to determine problems, resource issues, reliability issues and organizational support for program. The inspectors discussed the extensive maintenance and upgrades done to the meteorological tower at length.

Licensee procedures and activities related to meteorological monitoring were evaluated against: ODCM; FSAR Section 2.3; ANSI/ANS-2.5-1984, Standard for Determining Meteorological Information at Nuclear Power Sites; and Safety Guide 23, Onsite Meteorological Programs. Documents reviewed are listed in the Attachment to the report.

Unrestricted Release of Materials from the Radiologically Controlled Area (RCA): The inspectors observed surveys of material and personnel being released from the RCA using small article monitor (SAM), PCM, and portal monitor instruments. The inspectors also observed source checks of these instruments and discussed equipment sensitivity and release program guidance with licensee staff. To evaluate the appropriateness and accuracy of release survey instrumentation, radionuclides identified within recent waste stream analyses were compared with radionuclides used in current calibration sources and performance check sources. The inspectors also reviewed the last two calibration records for selected SAM, PCM and portal monitor instruments.

Licensee programs for monitoring materials and personnel released from the RCA were evaluated against 10 CFR Part 20 and IE Circular 81-07, Control of Radioactively Contaminated Material. Documents reviewed are listed in the Attachment to the report.

Problem Identification and Resolution: The inspectors reviewed work requests and PERs for the meteorological instruments and an audit in the areas of environmental monitoring, meteorological monitoring, and release of materials. The inspectors evaluated the licensee's ability to identify, characterize, prioritize, and resolve the identified issues in accordance with procedure SPP-3.1, Corrective Action Program, Rev. 13. Documents reviewed are listed in the Attachment to the report.

The inspectors completed 10 of the 10 required line-item samples for IP 71122.03.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification

a. Inspection Scope

The inspectors sampled licensee submittals for the five PIs listed below for the period from January 1, 2008, through December 31, 2008, for both Unit 1 and Unit 2. Definitions and guidance contained in Nuclear Energy Institute (NEI) 99-02, "Regulatory Assessment Indicator Guideline," Revision 5, were used to determine the basis in reporting for each data element.

Cornerstone: Barrier Integrity

- Reactor Coolant System Activity
- Reactor Coolant System Leakage

The inspectors reviewed portions of the operator and chemistry logs to verify that the licensee had accurately determined the RCS activity and leakage during the previous four quarters for both units. The inspectors also observed the performance of Procedure 0-SI-OPS-068-137.0, RCS Water Inventory, which determines the amount of RCS leakage. Documents reviewed are listed in the Attachment.

Cornerstone: Initiating Events

- Unplanned Scrams per 7000 Critical Hours
- Unplanned Scrams with Complications
- Unplanned Power Changes per 7000 Critical Hours

The inspectors reviewed selected Licensee Event Reports (LERs) and portions of operator logs to verify whether the licensee had accurately identified the number of scrams and unplanned power changes that occurred during the previous four quarters for both units. The inspectors also reviewed the accuracy of the number of critical hours reported and the licensee's basis for addressing the criteria for complications for each of the reported scrams. Documents reviewed are listed in the Attachment.

b. Findings

No findings of significance were identified.

The following inspection was performed in April 2008, but through administrative error was not included in inspection report 05000327, 328/2008003.

a. Inspection Scope

The inspectors sampled licensee data for the PI listed below. To verify the accuracy of the PI data reported during the period reviewed, PI definitions and guidance contained in NEI 99-02, "Regulatory Assessment Indicator Guideline," Rev. 5, were used to verify the basis for each data element.

Public Radiation Safety (PS) Cornerstone

To evaluate the Radiological Effluent Technical Specification/Offsite Dose Calculation Manual Radiological Effluent Occurrences PI the inspectors reviewed data for calendar year 2007. This included records, such as monthly effluent dose calculations, that are used by the licensee to identify occurrences of quarterly doses from liquid and gaseous effluents in excess of the values specified in NEI 99-02 guidance. The inspectors also interviewed licensee personnel responsible for collecting and reporting the PI data. In addition, licensee procedural guidance for classifying and reporting PI events was evaluated. Documents reviewed are listed in the Attachment to the report.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems

a. Inspection Scope

As required by Inspection Procedure 71152, Identification and Resolution of Problems, and in order to help identify repetitive equipment failures or specific human performance issues for followup, the inspectors performed a daily screening of items entered into the licensee's CAP. This was accomplished by reviewing the description of each new PER and attending daily management review committee meetings.

b. Findings and Observations

No findings of significance were identified.

4OA3 Event Followup

.1 (Closed) LER 05000328/2008-001-00, Manual Reactor Trip Following Partial Loss of Main Feedwater Flow to Loop 4 Steam Generator

On November 3, 2008, following a manual reactor trip of Unit 2 in response to decreasing water level in loop 4 steam generator, the inspectors evaluated plant status, mitigating actions, and the licensee's classification of the event, to enable the NRC to determine an appropriate NRC response. The event was reported to the NRC as event notification (EN) 44627 and documented in the licensee corrective action program as PER 156301.

Shortly following the trip, a reactor coolant system leak of approximately 2 gpm developed inside containment. The source was determined to be from a pressurizer instrument sensing line. The inspectors evaluated the actions taken by operators in response to the leak, and determined that the licensee's actions were appropriate and in accordance with plant procedures and TS. This was entered into the licensee's corrective action program as PER 156470.

The inspectors reviewed the LER and PERs 156301 and 156470 to verify that the causes of the reactor trip and RCS leakage were identified and that corrective actions were appropriate. The inability to maintain water level in the affected steam generator was due to the failure of the Loop 4 feedwater regulating valve (FRV) controller. The cause of the failure was determined to be the K1 relay associated with the main feedwater flow indicating controller, which developed a failing contact connection and allowed the FRV to drift closed. The inspectors concluded that the licensee's corrective actions to this event, including plans to permanently upgrade the feedwater control system in a future refueling outage, were appropriate. The inspectors also verified that timely notifications were made in accordance with 10 CFR 50.72, that licensee staff properly implemented the appropriate plant procedures, and that plant equipment performed as required. No findings of significance were identified. This LER is closed.

.2 (Closed) LER 05000328/2008-002-00, Indications of a Dropped Control Rod During Startup

On November 9, 2008, Unit 2 was manually tripped while in Mode 3 and withdrawing shutdown banks in preparation for entering Mode 2. The operators manually opened reactor trip breakers in accordance with plant procedures in response to indications that one of the shutdown bank control rods had dropped into the core. The event was reported to the NRC as event notification (EN) 44649 and documented in the licensee corrective action program as PER 156867.

The inspectors reviewed the LER and PERs 156867 to verify that the cause of the reactor trip was identified and that corrective actions were appropriate. The cause of the indicated dropped rod was determined to be a broken wire on the affected rod position indication coil stack.

The inspectors discussed the trip with operations, engineering, and licensee management personnel to gain an understanding of the event and assess followup actions. The inspectors reviewed operator actions taken in accordance with licensee procedures and TS, and reviewed unit and system indications to verify that actions and system responses were as expected. The inspectors verified that timely notifications were made in accordance with 10 CFR 50.72, that licensee staff properly implemented the appropriate plant procedures, and that plant equipment performed as required. No findings of significance were identified. This LER is closed.

.3 Automatic Reactor Trip of Units 1 and 2

a. Inspection Scope

On March 26, 2009, the inspectors responded to an automatic trip of both Units due to a loss of electrical power to two reactor coolant pumps on each unit when a fault that originated in a transformer bus duct caused power to be lost to two unit boards per unit. Unit boards supply power to reactor coolant pumps and circulating water pumps. Following the trip, the loss of two circulating water pumps on each unit resulted in the need to break condenser vacuum. The auxiliary feedwater systems and atmospheric steam reliefs operated as designed to remove decay heat.

The inspectors discussed the trip with operations, engineering, and licensee management personnel to gain an understanding of the event and assess followup actions. The inspectors reviewed operator actions taken in accordance with licensee procedures and TS, and reviewed unit and system indications to verify that actions and system responses were as expected. The inspectors also reviewed the initial licensee notifications to verify that they met the requirements specified in NUREG-1022, “Event Reporting Guidelines.” The events were reported to the NRC as event notifications (EN) 44934 and 44935, and documented in the licensee CAP as PER 166884.

b. Findings

No findings of significance were identified.

4OA5 Other Activities

.1 Quarterly Resident Inspector Observations of Security Personnel and Activities

a. Inspection Scope

During the inspection period, the inspectors conducted observations of security force personnel and activities to ensure that the activities were consistent with licensee security procedures and regulatory requirements relating to nuclear plant security. These observations took place during both normal and off-normal plant working hours.

These quarterly resident inspector observations of security force personnel and activities did not constitute any additional inspection samples. Rather, they were considered an integral part of the inspectors’ normal plant status review and inspection activities.

b. Findings

No findings of significance were identified.

.2 Institute of Nuclear Power Operations (INPO) Plant Evaluation Report Review

a. Inspection Scope

The inspectors reviewed the final report for the INPO plant evaluation of Sequoyah Nuclear Plant conducted in August 2008. The inspectors reviewed the report to ensure that issues identified were consistent with the NRC perspectives of licensee performance and to identify if any significant safety issues were identified that required further NRC follow-up.

b. Findings

No findings of significance were identified.

.3 Independent Spent Fuel Storage Installation (ISFSI) Radiological Controls

a. Inspection Scope

The following inspection was performed in April 2008, but through administrative error was not included in inspection report 05000327, 328/2008003.

The inspectors conducted independent gamma surveys of the ISFSI facility and compared the results to previous quarterly surveys. The inspectors also observed and evaluated implementation of radiological controls, including radiation work permits and postings, and discussed the controls with a health physics technician and Health Physics supervisory staff. In addition, the inspectors reviewed direct radiation monitoring results obtained using thermoluminescent dosimeters. Radiological controls for loading Hi-Storm ISFSI casks were also reviewed and discussed.

Radiological control activities for ISFSI areas were evaluated against 10 CFR Parts 20 and 50, NRC Certificate of Compliance No. 1014 and applicable licensee procedures. Documents reviewed are listed in Section 4OA5 of the report Attachment.

b. Findings

No findings of significance were identified.

.4 (Closed) Temporary Instruction (TI) 2515/176, EDG TS Surveillance Requirements Regarding Endurance and Margin Testing

Inspection activities for TI 2515/176 were previously completed and documented in inspection report 05000327, 328/2008005, and this TI is considered closed at Sequoyah; however, TI 2515/176 will not expire until August 31, 2009. The information gathered while completing this temporary instruction was forwarded to the Office of Nuclear Reactor Regulation for review and evaluation.

.5 (Closed) URI 05000327, 328/2008003-02; Procedure 0-MA-REM-000-001.0, Extended Station Blackout, Did Not Close Hydrogen Igniter Breakers

Introduction: An NRC inspector identified a Green finding for the licensee's failure to implement a docketed commitment made to the NRC. Specifically, the licensee did not adequately revise procedures in accordance with a self-imposed standard to provide backup power to at least one train of hydrogen igniters in response to Generic Safety Issue (GSI) – 189 "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident." Enforcement action does not apply because the performance deficiency did not involve a violation of a regulatory requirement.

Description: Per Temporary Instruction 2515/174 "Hydrogen Igniter Backup Power Verification," the NRC evaluated the potential for early failure of containment during very low probability events involving damage to the reactor core in NUREG/CR-6427, "Assessment of the Direct Containment Heat (DCH) Issue for Plants with Ice Condenser Containments." The report stated that the early containment failure probability of ice condenser containments was dominated by hydrogen combustion following core damage events. To further examine this issue, the NRC staff opened a generic safety issue, GSI-189, "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion during a Severe Accident."

These documents indicated that following a severe core damage event associated with station blackout (SBO) or other events affecting AC power distribution, the PWR ice condenser containment, such as those at Sequoyah Nuclear Plant, have the potential to fail as a result of large hydrogen detonations. A detonation of a large buildup of hydrogen has the potential to fail these containment types because of their low design pressure and low free internal volume. Plants with these containment designs use hydrogen igniters to control the buildup of hydrogen. The system is based on the concept of controlled ignition using thermal hydrogen igniters to induce periodic burns at moderate energy addition rates to mitigate the effects of hydrogen releases in the containment. The power source for the Sequoyah igniters was the plant's normal AC power distribution system. During a SBO event the igniters would be without power and incapable of preventing a large hydrogen detonation.

In a letter to the NRC dated March 6, 2007, the licensee included the following commitment to address the GSI-189 issue:

- Sequoyah and Watts Bar will revise the back-up generator procedure(s) to include supplying one train of containment hydrogen igniters per unit, and train personnel to the procedure revision, by December 31, 2007.

These commitments constituted a self-imposed standard.

To implement these commitments at Sequoyah, the licensee had procured two trailer-mounted diesel generator sets that could supply either train of hydrogen igniters on each unit. Furthermore, the licensee had also revised procedure 0-MA-REM-000-001.0, "Extended Station Blackout," revision 3, to support the additional function.

In May 2008, the inspector reviewed whether the licensee implemented the commitments of the March 6, 2007, letter, including the procedure revisions. The

inspector determined that procedure 0-MA-REM-000-001.0 was revised December 14, 2007, (Revision 3). This procedure provided guidance on restoring power to the 480V 'C' and 'A' Vent Boards, which energized the hydrogen igniters. The procedure called for all the individual load breakers (including the breakers for both trains of hydrogen igniters on both Units 1 and 2), to be placed in the OPEN position. Guidance for reclosing the hydrogen igniter breakers was omitted from the procedure, thereby rendering the Hydrogen Mitigation System incapable of operating following a SBO event. Upon identification of the performance deficiency, the licensee took immediate corrective action and issued a procedure change form to correct the omission in the procedure. The inspector confirmed this revision included the necessary guidance to re-close the hydrogen igniter load breakers.

The breaker closure step omission in procedure 0-MA-REM-000-001.0 resulted in the licensee not meeting their commitment to have revised procedures by December 31, 2007. The procedure revision was properly established on May 5, 2008. The licensee entered this issue into their corrective action program as Problem Evaluation Report (PER) 144301.

Analysis: The licensee's failure to properly implement a docketed commitment to revise procedures to supply one train of containment hydrogen igniters was a performance deficiency. The inspector concluded that the finding was more than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Disposition Screening," because it was associated with the Procedure Quality attribute of the Reactor Safety/Barrier Integrity Cornerstone. The inadequate procedure affected the cornerstone objective to provide reasonable assurance that physical design barriers, specifically maintaining the functionality of containment, protect the public from radio nuclide releases caused by accidents or events. For this finding, the applicable accident sequences were associated with SBO events.

The inspector assessed the performance deficiency using IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations" and determined that the hydrogen control function of the Barriers Cornerstone was degraded as a result of the performance deficiency. In accordance with Table 4a – "Characterization Worksheet for the Barrier Integrity Cornerstone", this performance deficiency was evaluated using IMC 0609, Appendix H, "Containment Integrity Significance Determination Process" because the finding involved an actual reduction in function of hydrogen igniters in the reactor containment. The deficiency was a Type B finding since it was related to a degraded condition that had potentially important implications for the integrity of the containment, without affecting the likelihood of core damage. Since the performance deficiency affected the igniters of a PWR with an ice condenser containment, Table 6.1 of IMC 0609, Appendix H, "Phase 1 Screening – Type B Findings at Full Power" indicated that a Phase 2 was warranted. A Phase 2 screening in accordance with Table 6.2 of IMC 0609, Appendix H, "Phase 2 Risk Significance – Type B Findings at Full Power" indicated that a failure of multiple igniters such that coverage is lost in two adjacent compartments for a PWR Ice Condenser containment with an exposure time of greater than 30 days, was greater than Green and warranted a Phase 3 evaluation.

A regional senior reactor analyst performed a Phase 3 Significance Determination Process evaluation and determined that this performance deficiency was characterized as of very low safety significance (Green).

The lack of procedural guidance to close the igniter breakers only affected igniter availability during a SBO when the SBO diesel was being utilized with procedure 0-MA-REM-000-001.0; other procedures did not leave the igniter breakers open. The dominant accident sequence in which the procedure would be used was loss of offsite power, emergency diesel generator failure, failure to recover offsite power or an emergency diesel generator and failure of the electrical buss cross-tie from the other unit. A human reliability analysis was performed to determine the likelihood of diagnosing and energizing the igniters without the procedure directing such actions. The evaluation determined that the diagnosis was obvious and recovery was likely due to the design of the circuit and the proximity of the control room, which contributed to the characterization of very low safety significance for the finding. No cross-cutting aspect was identified to be applicable to this finding.

Enforcement: Enforcement action does not apply because the performance deficiency did not involve a violation of a regulatory requirement. Because this finding does not involve a violation of regulatory requirements and has very low safety significance (Green), it is identified as FIN 05000327,328/2009002-02 “Procedure 0-MA-REM-000-001.0, Extended Station Blackout, Did Not Close Hydrogen Igniter Breakers.”

4OA6 Meetings, Including Exit

.1 Integrated Inspection Report Exit Meeting

On April 2 and 30, 2009, the resident inspectors presented the inspection results to Mr. Timothy Cleary and other members of his staff, who acknowledged the findings. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

.2 Annual Assessment Meeting Summary

On April 15, 2009, Dr. Heather Gepford, Acting Branch Chief, Region II, met with Mr. Timothy Cleary, Site Vice President, and other members of the licensee staff to discuss the NRC’s annual assessment of the Sequoyah Nuclear Plant's safety performance for the period of January 1 through December 31, 2008. The annual assessment results were previously provided to TVA via letter dated March 4, 2009.

On April 15, 2009, the NRC’s Acting Chief of Reactor Projects Branch 6, and the Resident Inspectors, held a Category 3 meeting for members of the public and local officials.

This Category 3 public meeting provided an open house public forum to fully engage the public in a discussion of the NRC’s Reactor Oversight Process and annual assessment of the Sequoyah Nuclear Plant's safety performance for the period January 1 through December 31, 2008. The members of the public expressed no concerns about the operation of the Sequoyah facility. The presentation material used for discussions and the list of attendees are attached to this report.

ATTACHMENTS:

1. Supplemental Information
2. Attendance List
3. Meeting Presentation

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel

D. Bodine, Chemistry/Environmental Manager
D. Boone, Radiation Protection Manager
S. Bowman, Licensing Engineer
C. Church, Plant Manager
T. Cleary, Site Vice President
D. Clift, Site Support Manager
L. Cross, Maintenance Manager
J. Dvorak, Outage and Site Scheduling Manager
N. Eggemeyer, Site Security Manager
K. Jones, Engineering Manager
M. Kerwin, Nuclear Assurance Manager
Z. Kitts, Licensing Engineer
T. Marshall, Maintenance and Modifications Manager
J. Proffitt, Licensing Engineer
P. Simmons, Operations Manager
N. Thomas, Licensing Engineer
R. Thompson, Emergency Preparedness Manager
B. Wetzel, Licensing and Industry Affairs Manager
J. Whitaker, Inspection Services
K. Wilkes, Operations Support Superintendent

NRC personnel:

R. Bernhard, Region II, Senior Reactor Analyst
T. Orf, Project Manager, Office of Nuclear Reactor Regulation

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000328/2009002-01	NCV	Pressurizer Pressure Transient due to Inadequate Maintenance Procedure (Section 1R19)
05000327,328/2009002-02	FIN	Procedure 0-MA-REM-000-001.0, Extended Station Blackout, Did Not Close Hydrogen Igniter Breakers (Section 4OA5.5)

Closed

05000328/2008-001-00	LER	Manual Reactor Trip Following Partial Loss of Main Feedwater to Loop 4 Steam Generator (Section 4OA3.1)

05000328/2008-002-00	LER	Indications of a Dropped Control Rod During Startup (Section 4OA3.2)
2515/176	TI	EDG TS Surveillance Requirement Regarding Endurance and Margin Testing (Section 4OA5.4)
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0-MI-EMV-317-113.0, Corrective Maintenance Instruction for Limitorque Model SB/SMB-0 Thru SB/SMB-4 Actuators, Revision 11
0-MI-EMV-317-144.0, Procedure for Testing Motor Operated Valves Using MOVATS Signature Analysis System, Revision 29
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0-TI-PDM-000-057.6, Lubrication, Revision 26

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PER 126208, Wrong quality level part installed in rad monitor 0-RE-90-126-B, 6/13/07
PER 134904, Should perform functional evaluation of Post Accident Sampling to address issues raised during NA audit SSA0702, 12/7/07
PER 138674, Wrong SCBA units used for EP drill, 2/21/08

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Calibration of monitor 2-R-90-255, 0-SI-ICC-090-255.0 (7/18/05, 1/16/07)
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Drawing 12-47W610-90-1, Mechanical Dcontrol Diagram Radiation Monitoring System
Drawing: Waste Disposal Vent Header System 77, 3/22/90
Drawing: Hydrogen Headerin Aux Bldg to VCTs, elevation 690, 9/13/04
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PER 105745, Rad monitors not returned to service as scheduled, 6/23/06
PER 113783, ERCW rad monitors OOS for more than 30 days, 10/30/06
PER 113446, Improvement needed in primary to secondary leak rate determination, 10/24/06
PER 116016, Chemistry wrote WO to raise setpoint on ERCW rad monitors (0-RM-90-134/141) but setpoint was already higher than WO instructed, 12/6/06
PER 119693,
PER 130331, 2B purge charcoal failed lab test, 9/13/07
PER 130519, Pre-release effluent permit prepared using incorrect gas data file, 9/18/07
PER 131630, ERCW computer point lost during tagout, 10/9/07
PER 133047, SQN continues to exceed industry norms for liquid and gaseous radwaste releases, 10/31/07
PER 137167, WGDT release to wrong unit shield building exhaust, 1/28/08
PER 141189, Chemistry 2nd quarter ITR review, 3/31/08
PER 141273, Radwaste release post release time incorrect, 4/1/08
PER 104669, The tritium concentration in Well-31 (on-site ground water monitoring well) has increased approximately 5000 pCi/L to 17068 pCi/L after installation of the temporary radwaste discharge line.
PER 126529, Procedure 0-TI-CEM-000-016.4, "Sampling Methods Secondary System Samples," does not contain steps or precautions which prevent spilling or purging CST sample water onto the ground during sampling activities.
PER 127353, Unit 1 RWST moat overflowed into the gravel outside the tank on 7/11/07 through the drain pipe designed to protect the level instrumentation following a rainfall event.
PER 128127, U-1 RWST moat overflowed onto ground early Saturday morning July 28 following short but heavy rainfall. Quantity was estimated @ ~5.5 gallons with ECL (effluent concentration limit) of 0.516. This is repetitive problem, last experienced on 07/11/07.
PER 132948, On Friday Sept. 14, 2007 it was discovered that the automatic RWST moat sump pump was not working properly. This determination was based on the fact that moat level was above the float switch that should have started the pump.

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0-PI-CEM-000-010.2, Land Use Surveys, Rev. 0
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0-TI-CEM-000-005.0, Well Sampling, Rev. 2
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EPFS-6, Calibration of Environmental Data Station Data Logger and Sonic Channels, Rev. 13
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G-03, Gamma Analysis by Germanium Spectroscopy , Rev. 6
QC-01, Germanium Spectroscopy System Energy Calibration and Count Reproducibility Check, Rev. 5
QC-03, Germanium Detector Photopeak Resolution Check, Rev. 4
QC-04, Gamma Efficiency Calibration of Germanium Detectors, Rev. 8
QC-10. Alpha and Beta Background and Count Reproducibility Checks, Rev. 6

QC-12, Beta-Gamma Coincidence System Energy Calibration, Count Reproducibility, and Background Checks, Rev.6
QC- 18, Liquid Scintillation Background and Count Reproducibility Check, Rev.5
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Gamma Spectroscopy System Control Charts for 2007, Instruments 141, 143, 148, 149, and 154, Jan-Dec 2007
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Corrective Action Program Documents
Self Assessment CPR-TPR-06-003, REMIC (Meteorological Monitoring-Configuration, Environmental Monitoring), July 17-28, 2006
PER 113454, Guidance for release of material from the RCA is spread throughout many different procedures, 10/24/06
PER 106684, Individual observed processing through a PCM-2 without monitoring hand-carried items in a SAM, 7/12/06
PER 136607, RCA exit point near refuel floor was taken out of service, 1/16/08
PER 100577, The total sample volume was not adequate for the SQN REMP air filter and charcoal cartridge samples schedule for collection from location LM-2 on 4/3/2006. The main electrical circuit breaker for air sampler was tripped.
PER 104716, During the last REMP TLD exchange, dosimeters were missing from BFN station BFNW-1, Poplar Creek and SQN station SQW-3, which is concurrent with SQ PM-3.
PER 109891, The REMP air filter and charcoal cartridge samples scheduled for collection from SQN location LM-3 on August 30, 2006, did not have an adequate sample volume due to problems with the sampling system.
PER 116916, REMP TLDs were unavailable for collection from a SQN environmental monitoring station during the last retrieval period. The affected station was SQWSW-2 (Thrasher Lane). No obvious cause for the TLDs to be missing was noted.
PER 121722, The guy wire tension on the SQN meteorological tower from the recent inspection exceeds the tolerance range specified in EPFS-7, Revision 4, “Radio and Meteorological Tower Inspection”
PER 122076, The REMP air filter and charcoal cartridge samples scheduled for collection on 3/19/07 from SQN monitoring location RM-3 were not collected due to low total sample volume.
PER 123410, The total sample volume was not adequate for REMP air filter and charcoal cartridge samples scheduled for collection on 4/10/2007 from SQN location PM-2 due to problems with the sampling system.
PER 125004, The ground water sample scheduled for collection on May 15, 2007, from SQN

REMP monitoring well #6 could not be collected due a loss of power for the sampling pump.
PER 127011, All meteorological tower and river data was lost due to suspected lightening strike at the Met tower.
PER 127318, The SQN REMP air sampler at location RM-4 was not operating at the time of the normal weekly sample collection visit on 7/2/07.
PER 131020, The Sr-89&90 results reported by the ERM&I lab for the second quarter 2007 environmental milk cross checks were not within the agreement limits. The results reported were too high by a factor of two. A calculation error occurred.
PER 131322, Nuclear Assurance found a blue hose contained in a plastic bag labeled as Radioactive Material in an AUO equipment locker on the 690 foot level of the AUX Building. AUO equipment lockers are not approved Radioactive Material storage areas.
PER 133937, The sampling pump at SQN REMP air monitoring location LM-4 was not running at time of the weekly sample collection scheduled for 11/12/07. The drive belt between the motor and the sampling pump was broken.
PER 113454, Guidance for release of material from the RCA is spread throughout many different procedures, 10/24/06
PER 106684, Individual observed processing through a PCM-2 without monitoring hand-carried items in a SAM, 7/12/06
PER 136607, RCA exit point near refuel floor was taken out of service, 1/16/08

Section 4OA1: Performance Indicator Verification

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EPIP-1, Emergency Plan Classification Matrix, Revision 40
PER 156867, U2 Manual Trip due to E-11 Rod Indication
PER 156870, AOP-C.01
AOP-C.01, Control Rod System Malfunctions, Revision 18
NRC IN 2008-13, “Main Feedwater System Issues and Related Reactor Trip Data”
PER 156301, Rx Manual Trip Due To Unit 2 Loop 4 FRV Failure
PER 1156470, Unit 2 RCS Leakage
PER 156399, Unit 2 PZR RCS Leak Due To Damaged Instrument Flex Tube
1,2-15E500-1, Key Diagram Station Aux Power System, Revision 27
1,2-45N761-4, Wiring Diagrams 6900V Common Aux Power DC Schematic Diagrams, Revision 17
PER 166884, Dual Unit Trip

Section 4OA5: Independent Spent Fuel Storage Installation

Procedures and Guidance Documents
O-SI-DCS-079-001.0 HI-Trac Average Surface Dose Rates, Rev. 3
O-SI-DCS-079-002.0 HI-Trac Contamination Surveys, Rev. 3
O-SI-DCS-079-003.0 HI-Storm Average Surface Dose Rates, Rev. 3
0-SI-DCS-079.007.0, HI-Storm Surface Dose Rates, Rev. 1

Records and Data
ISFSI Pad Survey (030908-7)
ISFSI Boundary Surveys (100507-20, 101207-16, 101907-16, 102607-14, 110207-4, 110907-5, 111607-3, 120707-5, 121507-3, 122107-6, 011108-4, 011808-9, 012508-9, 020808-12, 021508- 9, 022208-10)
SQN QA Form 1.22, Area TLD Posting Data Sheets, 1st Quarter 2007 through 4th Quarter 2007

SEQUOYAH END OF CYCLE
PUBLIC MEETING

Soddy Daisy, TN

April 15, 2009

Attendees

Name (Print)	Title and Organization
Ken Nearhoof	Public
Sabrina Novak	Hamilton Co. Health Dept - Env. Scientist
Robert DeBoe	Env. Health Inspector - Hamilton Co Health Dept.
Bill Tittle	Chief Emergency Mgmt. Hamilton County
Bern Wetzel	TVA, Sequoyah Licensing Mngr.
Kay Whitenburg	TVA, Communications
Russell Thompson	TVA, Sequoyah Emerg Prep Mgr.
Tim Cleary	TVA Sequoyah SVP
Chris R. Church	TVA Sequoyah Plant Manager
Kevin Jones	TVA Sequoyah Engineering Mgr.
Gale Young	NRC Senior Resident Inspector
Mark Speck	NRC RI
Heather Gepford	NRC BC
Joey Ledford	NRC RII PAO
Evan Davidson	NRC HQ/NRR

Attachment 2

NRC Strategic Plan

Strategic Goals

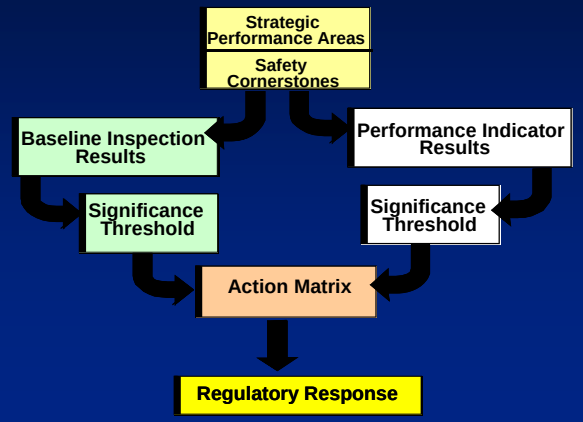
- Safety: Ensure adequate protection of public health and safety and the environment.
- Security: Ensure adequate protection in the secure use and management of radioactive materials.

Strategic Objectives

- Openness: The NRC appropriately informs and involves stakeholders in the regulatory process.
- Effectiveness: NRC actions are high quality, efficient, timely, and realistic, to enable the safe and beneficial use of radioactive materials.
- Operational Excellence: NRC operations use effective business methods and solutions to achieve excellence in accomplishing the agency's mission.

Plant Performance

Reactor Oversight Process

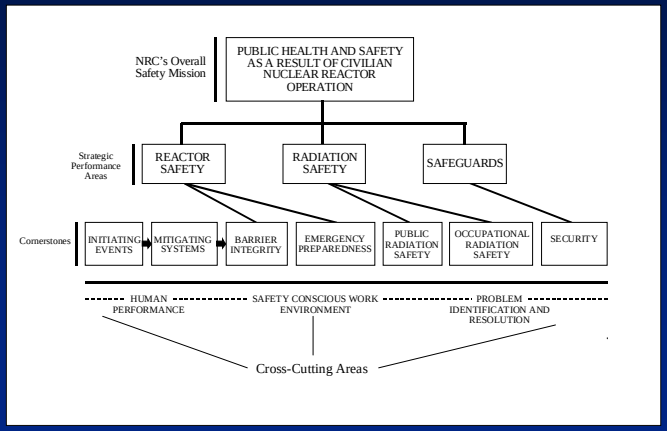


Action Matrix Concept

Licensee Response	Regulatory Response	Degraded Cornerstone	Multiple/Rep. Degraded Cornerstone	Unacceptable Performance

- Increasing Safety Significance
- Increasing NRC Inspection Efforts
- Increasing NRC/Licensee Management Involvement
- Increasing Regulatory Actions

Regulatory Framework



Action Matrix

	Licensee Response Column	Regulatory Response Column	Degraded Cornerstone Column	Multiple/ Repetitive Degraded Cornerstone Column	Unacceptable Performance Column	IMC 0350 Process[1]
	All Assessment Inputs (Performance Indicators (PIs) and Inspection Findings) Green; Cornerstone Objectives Fully Met	One or Two White Inputs (in different cornerstones) in a Strategic Performance Area; Cornerstone Objectives Fully Met	One Degraded Cornerstone (2 White Inputs or 1 Yellow Input) or any 3 White Inputs in a Strategic Performance Area; Cornerstone Objectives Met with Moderate Degradation in Safety Performance	Repetitive Degraded Cornerstone, Multiple Degraded Cornerstones, Multiple Yellow Inputs, or 1 Red Input; Cornerstone Objectives Met with Longstanding Issues or Significant Degradation in Safety Performance	Overall Unacceptable Performance; Plants Not Permitted to Operate Within this Band, Unacceptable Margin to Safety	Plants in a shutdown condition with performance problems placed under the IMC 0350 process
Regulatory Performance Meeting	None	Branch Chief (BC) or Division Director (DD) Meet with Licensee	Regional Administrator (RA) (or Designee) Meet with Senior Licensee Management.	EDO/DEDO (or Designee) meet with Senior Licensee Management	EDO/DEDO (or Designee) Meet with Senior Licensee Management	RA/EDO (or Designee) Meet with Senior Licensee Management
Licensee Action	Licensee Corrective Action	Licensee Root cause Evaluation and corrective action with NRC Oversight	Licensee cumulative root cause evaluation with NRC Oversight	Licensee Performance Improvement Plan with NRC Oversight		Licensee Performance Improvement Plan / Restart Plan with NRC Oversight
NRC Inspection	Risk-Informed Baseline Inspection Program	Baseline and supplemental inspection procedure 95001	Baseline and supplemental inspection procedure 95002	Baseline and supplemental inspection procedure 95003		Baseline and Supplemental as Practicable, Plus Special Inspections per Restart Checklist.
Regulatory Actions[2]	None	Supplemental inspection only	Supplemental inspection only Plant Discussed at AARM if Conditions Met	-10 CFR 2.204 DFI -10 CFR 50.54(f) Letter - CAL/Order Plant Discussed at AARM	Order to Modify, Suspend, or Revoke Licensed Activities Plant Discussed at AARM	CAL/Order Requiring NRC Approval for Restart. Plant Discussed at AARM
Assessment Letters	BC or DD review/sign assessment report (w/ inspection plan)	DD review/sign assessment report (w/ inspection plan)	RA review/sign assessment report (w/ inspection plan)	RA review/sign assessment report (w/ inspection plan)		N/A. RA (or 0350 Panel Chairman) Review/ Sign 0350-Related Correspondence
Annual Involvement of Public Stakeholders	SRI or BC Meet with Licensee	BC or DD Meet with Licensee	RA (or Designee) Discuss Performance with Senior Licensee Management	EDO/DEDO (or Designee) Discuss Performance with Senior Licensee Management		N/A. 0350 Panel Chairman Conduct Public Status Meetings Periodically
Commission Involvement	None	None	Possible Commission Meeting if Licensee Remains for 3 yrs	Commission Meeting with Senior Licensee Management Within 6 mo.	Commission Meeting with Senior Licensee Management	Commission Meetings as Requested, Restart Approval in Some Cases.

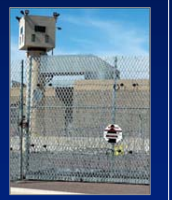
INCREASING SAFETY SIGNIFICANCE ---------->

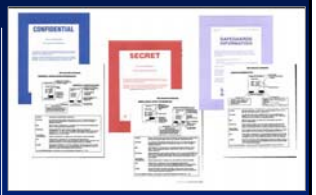
U.S.NRC

Nuclear Security & Safeguards

Physical Protection

- Security Inspections
- Force-on-Force Exercises
- Interagency Cooperation
- Intrusion Detection & Assessment
- Response &Offsite Assistance
- Threat Assessment





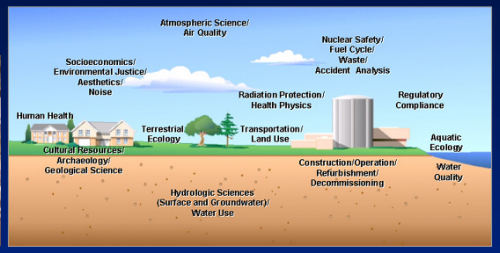
Information Security

Preventing Unauthorized Disclosure

License Renewal

- Safety Review of Aging Management

- Review of Environmental Impacts



- Opportunities for Public Participation

Spent Nuclear Fuel

Safe and Secure Storage & Transport

Assured By

- Comprehensive Regulations
- Detailed NRC Review
- Robust Cask & Package Designs
- Significant Experience Base
- Continued Oversight