



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

May 3, 2011

Mr. Michael J. Pacilio
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer (CNO), Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNITS 1 AND 2, INTEGRATED INSPECTION
REPORT 05000454/2011-002; 05000455/2011-002

Dear Mr. Pacilio:

This refers to the inspection completed on March 31, 2011 at your Byron Station, Units 1 and 2. The enclosed report presents the results of this inspection which were discussed on April 15, 2011, with Mr. T. Tulon, and other members of your staff.

During this inspection, the Nuclear Regulatory Commission (NRC) staff 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. Within these areas, the inspection consisted of a selected examination of procedures and representative records, observations of activities, and interviews with personnel.

Based on the results of this inspection, the NRC has identified five issues that were evaluated under the risk significance determination process as having very low safety significance (Green). The NRC has determined that five violations are associated with these issues. However, because of their very low safety significance, and because these issues were entered into your corrective action program, these violations are being treated as Non-Cited Violations (NCVs), consistent with Section 2.3.2 of the Enforcement Policy. These NCVs are described in the subject inspection report. Additionally, licensee-identified violations which were determined to be of very low safety significance are listed in Section 4OA7 of this report.

If you contest the subject or severity of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Byron Station. In addition, if you disagree with the cross-cutting aspect assigned to 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 III, and the NRC Resident Inspector at Byron Station.

M. Pacilio

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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 Publicly Available Records System (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/

Eric R. Duncan, Chief
Branch 3
Division of Reactor Projects

Docket Nos. 50-454; 50-455
License Nos. NPF-37; NPF-66

Enclosure: Inspection Report 05000454/2011-002; 05000455/2011-002
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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 05000454; 05000455
License Nos: NPF-37; NPF-66

Report No: 05000454/2011002; 05000455/2011002

Licensee: Exelon Generation Company, LLC

Facility: Byron Station, Units 1 and 2

Location: Byron, IL

Dates: January 01, 2011, through March 31, 2011

Inspectors: B. Bartlett, Senior Resident Inspector
J. Robbins, Resident Inspector
R. Ng, Project Engineer
J. Cassidy, Senior Health Physicist
J. Gilliam, Reactor Engineer
M. Jones, Reactor Engineer
J. Whitman, Office of Research
W. Lyon, Senior Reactor Engineer, NRR
J. Miller, General Engineer (Observer), NRR
C. Tilton, Senior Reactor Engineer

C. Thompson, Resident Inspector, Illinois Department of
Emergency Management

Approved by: E. Duncan, Chief
Branch 3
Division of Reactor Projects

Enclosure

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SUMMARY OF FINDINGS

IR 05000454/2011002, 05000455/2011002; 01/01/11 – 03/31/11; Byron Station, Units 1 & 2; Routine Integrated Inspection Report; Annual Heat Sink Performance; Surveillance Testing; In-Plant Airborne Radioactivity Control and Mitigation.

This report covers a 3-month period of inspection by resident inspectors and announced baseline inspections by regional inspectors. Five Green findings were identified by the inspectors, one of which was self-revealing. The findings were considered non-cited violations (NCVs) of NRC regulations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Assigned cross-cutting aspects were determined using IMC 0310, "Components Within the Cross-Cutting Areas." 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.

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

Green. An NRC-identified finding of very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified by the inspectors when licensee personnel failed to install the Unit 1 Train B auxiliary feedwater pump lube oil heat exchanger end bell in accordance with design drawings. The finding was determined to be more than minor because the finding was associated with the Mitigating Systems Cornerstone attribute of Configuration Control and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the as-found orientation of the heat exchanger end bell was not consistent with design drawings and adversely affected the performance of the auxiliary feedwater pump lube oil heat exchanger.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of Findings," Table 4a, for the Mitigating Systems Cornerstone. The inspectors determined that the finding was a design or qualification deficiency confirmed not to result in a loss of operability or functionality. This conclusion was reached after reviewing an analysis performed by the licensee that concluded the auxiliary feedwater system would perform its safety-related function with the lube oil heat exchanger end bell in the as-found and as-installed configuration. The licensee subsequently restored the configuration, consistent with design drawings. Due to the age of this issue, it was not determined to be reflective of current licensee performance and therefore a cross-cutting aspect was not assigned to this finding. (Section 1R07)

Green. An NRC-identified finding of very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified by the inspectors when licensee personnel failed to establish instructions for measuring pipe voids detected during surveillances of the emergency core cooling systems for gas accumulation. Specifically, instructions to

measure the size of gas voids detected during venting at each safety injection and residual heat removal system vent location were not provided so that the effect of the void on system operability could be evaluated. The licensee entered this issue into their corrective action program and initiated procedure revisions to provide additional guidance for recording data to size voids identified during venting operations.

The performance deficiency was determined to be more than minor because if left uncorrected it would have the potential to lead to a more significant safety concern. The finding screened as having very low safety significance because it did not result in a loss of operability or functionality. Specifically, a qualitative assessment of the voids detected by venting since the implementation of the licensee's resolution of Generic Letter 2008-01 established reasonable assurance that these voids did not result in a loss of operability. The inspectors did not identify a cross-cutting aspect that represented the underlying cause of this performance deficiency. Therefore, no cross-cutting aspect was assigned to this finding. (Section 4OA5)

Cornerstone: Barrier Integrity

- Green. A self-revealed finding of very low safety significance was identified on January 21, 2011, when licensee personnel failed to ensure that surveillance procedures for measuring essential service water flow through reactor containment fan coolers was adequate. As a result, during routine surveillance testing, measured essential service water flow through the reactor containment fan coolers was less than technical specification requirements.

The inspectors concluded that the finding was more than minor because it was associated with the Configuration Control attribute of the Barrier Integrity Cornerstone and affected the cornerstone objective of providing reasonable assurance that physical barriers, including the containment, protect the public from radionuclide releases caused by accidents and events. Specifically, the finding was determined to adversely impact the required technical specification required flow rate of essential service water through the reactor containment fan coolers. The inspectors evaluated the finding using IMC 0609.04, "Phase 1 – Initial Screening and Characterization of Findings," and based on a "No" answer to all of the questions in the Barrier Integrity column of Table 4a, determined the finding to be of very low safety significance. This finding had a cross-cutting aspect in the area of Human Performance, Resources (H.2(c)) because the licensee had repeatedly modified the surveillance procedure without ensuring adequate operational margin to the technical specification limit. The licensee entered this issue into the corrective action program and initiated actions to revise the surveillance procedure to raise the as-left essential service water system flow rate. (Section 1R22)

- Green. An NRC-identified finding of very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified by the inspectors when licensee personnel failed to evaluate the effects of dynamic loads at the containment spray discharge piping. The inspectors were concerned because portions of the containment spray discharge piping were normally voided by design and neither the structural design nor operation of the system addressed the dynamic loads that would result when the voided piping was rapidly filled following system initiation. The licensee entered this issue into the corrective action program

and, at the time of the inspection, planned to include an evaluation of dynamic loads into the design basis of containment spray.

The performance deficiency was determined to be more than minor because it was associated with the Structures, Systems, Components, and Barrier Performance attribute of the Barrier Integrity Cornerstone and adversely affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. The finding screened as having very low safety significance because it did not affect either core damage frequency or large early release frequency. The inspectors determined that this finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Operating Experience, because the licensee did not thoroughly evaluate external operating experience. (P.2(a)) (Section 4OA5)

Cornerstone: Occupational Radiation Safety

- Green. An NRC-identified finding of very low safety significance and an associated NCV of TS 5.4.1 was identified by the inspectors when out of date respirator cartridges were found available for use. Radiation protection procedures that cover respiratory protection program did not require cartridges to be replaced after the manufacturer specified shelf-life had expired. The manufacturer of the respirator canister recognized that it was possible that chemical cartridges, which were more than a year old, might lose some of their efficiency in their ability to absorb contaminants. The manufacturer prescribed an expiration date of 3 years from the date of the canister manufacture and this date was stamped on to the canister label.

The regulatory authority for respiratory protection is the Occupational Safety and Health Administration (OSHA). The regulations are defined in 29 CFR 1910.134 titled "Respiratory Protection." Title 29 CFR 1910.134(d)(3)(iii) provides requirements for the protection against gases and vapors. These requirements include that air purifying respirators be equipped with an End-of-Service Life Indicator (ESLI) or the employer implements a change schedule for canisters and cartridges that is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. The employer shall describe in the respirator program the information and data relied upon and the basis for the canister and cartridge change schedule and the basis for reliance on the data.

The inspectors reviewed the guidance in IMC 0612, Appendix E, Examples of Minor Issues, but did not identify any examples similar to the performance deficiency. However, in accordance with IMC 0612, the inspectors determined that the finding was more than minor because if left uncorrected the performance deficiency would have the potential to lead to a more significant safety concern. Specifically, cartridges that were beyond the recommended shelf-life could lose some of their efficiency in their ability to absorb contaminants and result in additional radiation doses to the users. The finding was assessed using the Occupational Radiation SDP and was determined to be of very low safety significance because these problems were not as-low-as-is-reasonably-achievable (ALARA) planning issues, there were no overexposures, nor substantial potential for overexposures and the licensee's ability to assess dose was not compromised. Corrective actions planned by the licensee included replacing the expired cartridges and adding guidance to

procedures for checking expiration dates during routine inventories. The inspectors determined that the cause of this incident involved a cross-cutting component in the human performance area for inadequate resources. Specifically, the licensee did not have complete, accurate and up-to-date procedures. (H.2(c)) (Section 2RS3.3)

B. Licensee-Identified Violations

Violations of very low safety significance that were identified by the licensee have been reviewed by the inspectors. Corrective actions planned or taken by the licensee have been entered into the licensee's corrective action program. These violations and corrective action tracking numbers are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Unit 1 operated at or near full power during most of the inspection period. On March 13, 2011, Unit 1 was shut down for planned Refueling Outage 17 (B1R17). At the end of the inspection report period, the unit remained shutdown.

Unit 2 operated at or near full power during the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R04 Equipment Alignment (71111.04)

.1 Quarterly Partial System Walkdowns

a. Inspection Scope

The inspectors performed partial system walkdowns of the following risk-significant systems:

- Unit 1 Train B Safety Injection Pump while Unit 1 Train A Safety Injection Pump was Out-of-Service for Maintenance; and
- Unit 2 Train B Charging Pump while Unit 2 Train A Charging Pump was Out-of-Service for Maintenance.

The inspectors selected these systems based on their risk significance relative to the Reactor Safety Cornerstones at the time they were inspected. The inspectors attempted to identify any discrepancies that could impact the function of the system, and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, system diagrams, Updated Final Safety Analysis Report (UFSAR), Technical Specification (TS) requirements, outstanding work orders (WOs), condition reports, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have rendered the systems incapable of performing their intended functions. The inspectors also walked down accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no obvious deficiencies. 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) with the appropriate significance characterization. Documents reviewed are listed in the Attachment.

These activities constituted two partial system walkdown samples as defined in Inspection Procedure (IP) 71111.04-05.

b. Findings

No findings of significance were identified.

.2 Semi-Annual Complete System Walkdown

a. Inspection Scope

On March 8, 2011, the inspectors performed a complete system alignment inspection of the Component Cooling Water system for both units following operability questions identified by the licensee to verify the functional capability of the system. This system was also selected because it was considered both safety-significant and risk-significant in the licensee's probabilistic risk assessment. The inspectors walked down the system to review mechanical and electrical equipment line-ups, electrical power availability, system pressure and temperature indications, component labeling, component lubrication, component and equipment cooling, hangers and supports, and the operability of support systems, and to ensure that ancillary equipment or debris did not interfere with equipment operation. A review of a sample of past and outstanding WOs was performed to determine whether any deficiencies significantly affected the system function. In addition, the inspectors reviewed the CAP database to ensure that system equipment alignment problems were being identified and appropriately resolved. Documents reviewed are listed in the Attachment.

These activities constituted one complete system walkdown sample as defined in IP 71111.04-05.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05)

.1 Routine Resident Inspector Tours (71111.05Q)

a. Inspection Scope

The inspectors conducted fire protection walkdowns which were focused on availability, accessibility, and the condition of firefighting equipment in the following risk-significant plant areas:

- Unit 1 Division 11 Cable Penetration Area 414' Elevation (Fire Zone 11.5A-1, 11.5B-1);
- Auxiliary Building General Area 346' Elevation (Fire Zone 11.2-0);
- Unit Common Auxiliary Building HVAC [Heating, Ventilation, and Air Conditioning] Exhaust Complex (Fire Zone 11.7-0);
- Auxiliary Building Laundry Room (Fire Zone 11.6C-0); and
- Unit 1 Division 11 Switchgear Room (Fire Zone 5.2-1).

The inspectors reviewed areas to assess if the licensee had implemented a fire protection program that adequately controlled combustibles and ignition sources within the plant, effectively maintained fire detection and suppression capability, maintained

passive fire protection features in good material condition, and implemented adequate compensatory measures for out-of-service, degraded or inoperable fire protection equipment, systems, or features in accordance with the licensee's fire plan. The inspectors selected fire areas based on their overall contribution to internal fire risk as documented in the plant's Individual Plant Examination of External Events with later additional insights, their potential to impact equipment which could initiate or mitigate a plant transient, or their impact on the plant's ability to respond to a security event. Using the documents listed in the Attachment, the inspectors verified that fire hoses and extinguishers were in their designated locations and available for immediate use; that fire detectors and sprinklers were unobstructed; that transient material loading was within the analyzed limits; and fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors also verified that issues identified during the inspection were entered into the licensee's CAP.

These activities constituted five quarterly fire protection inspection samples as defined in IP 71111.05-05.

b. Findings

No findings of significance were identified.

1R07 Annual Heat Sink Performance (71111.07)

.1 Heat Sink Performance

a. Inspection Scope

The inspectors reviewed the licensee's testing of Unit 1 Train B Auxiliary Feedwater Pump Lube Oil Heat Exchanger to verify that potential deficiencies did not mask the licensee's ability to detect degraded performance, to identify any common cause issues that had the potential to increase risk, and to ensure that the licensee was adequately addressing problems that could result in initiating events that would cause an increase in risk. The inspectors reviewed the licensee's observations as compared against acceptance criteria, the correlation of scheduled testing and the frequency of testing, and the impact of instrument inaccuracies on test results. Inspectors also verified that test acceptance criteria considered differences between test conditions, design conditions, and testing conditions. Documents reviewed are listed in the Attachment.

This annual heat sink performance inspection constituted one sample as defined in IP 71111.07-05.

b. Findings

(1) Auxiliary Feedwater Pump Heat Exchanger Configured Incorrectly

Introduction: A finding of very low safety significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified by the inspectors when licensee personnel failed to install the auxiliary feedwater pump lube oil heat exchanger end bell in accordance with original construction design drawings.

Description: While performing a routine inspection of the Unit 1 Train B auxiliary feedwater system on December 7, 2010, the inspectors identified that the essential service water connections to the lube oil heat exchanger for the auxiliary feedwater pump were different than those of similar equipment located in the room.

The end bell of the heat exchanger was mounted such that the essential service water connections were at the 10 o'clock and 2 o'clock positions. Many of the similarly sized heat exchangers in the room had connections at the 9 o'clock and 12 o'clock positions. The inspectors performed walkdowns of the remaining auxiliary feedwater system trains and determined that the Unit 1 Train B configuration was unique. The inspectors engaged licensee personnel to gain additional insights into this equipment configuration issue. Following these discussions, and after additional review, the licensee determined that the as-found configuration was incorrect, and that the performance of the heat exchanger was potentially adversely impacted.

By design, the essential service water piping should have been mounted to the end bell at the 9 o'clock and 12 o'clock position. The end bell of the auxiliary feedwater lube oil heat exchanger was rotated such that the essential service water piping connections were on the same elevation rather than different elevations as specified in drawing "Unit 1 Essential Service Water," M-2544, Sheet 77, Revision 4. Initially, the licensee's review focused on whether maintenance activities caused the error (i.e., had the licensee modified the system in the past). The licensee was not able to identify any previous maintenance activity that involved the removal of the previously installed piping and/or welding of new piping to the end bell. The licensee was able to locate photographs from previous work activities that supported the conclusion that the piping arrangement had not been changed, and this incorrect configuration originated from original construction. The inspectors concluded that the as-installed configuration of the Unit 1 Train B auxiliary feedwater lube oil heat exchanger end bell was not consistent with design drawings.

The licensee subsequently performed an analysis to support an operability determination for the auxiliary feedwater pump. This analysis determined that the orientation of the end bell affected auxiliary feedwater lube oil heat exchanger performance. Specifically, the heat exchanger was designed as a 4-pass heat exchanger with 7 tubes per pass. The mis-orientation of the end bell as a result of the installation error adversely impacted this performance. The licensee's initial analysis assumed the performance had been degraded to that of a 2-pass heat exchanger with 6 tubes per pass.

The licensee disassembled the auxiliary feedwater lube oil heat exchanger on March 23, 2011. Upon disassembly, the lube oil heat exchanger was found to be fouled, with some tubes plugged with dirt or debris. Heat exchanger performance was judged to be similar to that of a 2-pass heat exchanger utilizing 5 tubes per pass. A subsequent licensee analysis concluded that in the as-found degraded condition, the auxiliary feedwater pump remained capable of performing its safety-related function.

Analysis: The inspectors determined that the failure to install the Unit 1 Train B auxiliary feedwater lube oil heat exchanger end bell in accordance with original construction drawings was a performance deficiency.

The finding was determined to be more than minor because the finding was associated with the Mitigating Systems Cornerstone attribute of Configuration Control and affected

the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the mis-orientation of the auxiliary feedwater lube oil heat exchanger end bell affected the performance of the heat exchanger.

The inspectors determined the finding could be evaluated using the SDP in accordance with Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of Findings," Table 4a, for the Mitigating Systems Cornerstone. The inspectors determined that the finding was a design or qualification deficiency confirmed not to result in loss of operability or functionality. This conclusion was reached after reviewing a licensee analysis that concluded the auxiliary feedwater system was able to perform its safety-related function with the heat exchanger end bell in the as-found and as-installed configuration. Therefore, the inspectors concluded the finding was of very low safety significance (Green). The licensee subsequently restored the configuration, consistent with design drawings.

Due to the age of this issue, it was not determined to be reflective of current licensee performance and therefore a cross-cutting aspect was not assigned to this finding.

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings.

Drawing M-2544, Sheet 77, "Unit 1 Essential Service Water," Revision 4, prescribed that the essential service water piping be mounted to the end bell of the Unit 1 Train B auxiliary feedwater pump lube oil cooler at the 9 o'clock and 12 o'clock position.

Contrary to the above, during initial construction and subsequent maintenance activities until March 28, 2011, the licensee failed to install the Unit 1 Train B auxiliary feedwater lube oil heat exchanger end bell in accordance with instructions, procedures, or drawings. Specifically, the Unit 1 Train B auxiliary feedwater lube oil heat exchanger end bell was rotated such that the essential service water piping connections were on the same elevation rather than the 9 o'clock and 12 o'clock position as specified in drawing M-2544, Sheet 77, "Unit 1 Essential Service Water," Revision 4. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as IR 1149417, this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy.

(NCV 05000454/2011002-01; Auxiliary Feedwater Pump Lube Oil Heat Exchanger Configured Incorrectly)

1R11 Licensed Operator Requalification Program (71111.11)

.1 Resident Inspector Quarterly Review (71111.11Q)

a. Inspection Scope

On March 1, 2011, the inspectors observed a crew of licensed operators in the plant's simulator during licensed operator requalification examinations to verify that operator

performance was adequate, evaluators were identifying and documenting crew performance problems, and training was being conducted in accordance with licensee procedures. The inspectors evaluated the following areas:

- licensed operator performance;
- crew's clarity and formality of communications;
- ability to take timely actions in the conservative direction;
- prioritization, interpretation, and verification of annunciator alarms;
- correct use and implementation of abnormal and emergency procedures;
- control board manipulations;
- oversight and direction from supervisors; and
- ability to identify and implement appropriate TS actions and Emergency Plan actions and notifications.

The crew's performance in these areas was compared to pre-established operator action expectations and successful critical task completion requirements. Documents reviewed are listed in the Attachment.

This inspection constituted one quarterly licensed operator requalification program sample as defined in IP 71111.11.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Routine Quarterly Evaluations (71111.12Q)

a. Inspection Scope

The inspectors evaluated degraded performance issues involving the following risk-significant systems:

- Essential Service Water Cooling Tower Structural Maintenance;
- DC [Direct Current] Battery 112 Non-Qualified Parts Installed on Safety-Related Component; and
- Failure of Unit 2 Train A Diesel Generator Lube Oil Heat Exchanger Flange During Surveillance.

The inspectors reviewed events such as where ineffective equipment maintenance had resulted in valid or invalid automatic actuations of engineered safeguards systems and independently verified the licensee's actions to address system performance or condition problems in terms of the following:

- implementing appropriate work practices;
- identifying and addressing common cause failures;
- scoping of systems in accordance with 10 CFR 50.65(b) of the maintenance rule;
- characterizing system reliability issues for performance;
- charging unavailability for performance;

- trending key parameters for condition monitoring;
- ensuring 10 CFR 50.65(a)(1) or (a)(2) classification or re-classification; and
- verifying appropriate performance criteria for structures, systems, and components (SSCs)/functions classified as (a)(2) or appropriate and adequate goals and corrective actions for systems classified as (a)(1).

The inspectors assessed performance issues with respect to the reliability, availability, and condition monitoring of the system. In addition, the inspectors verified maintenance effectiveness issues were entered into the CAP with the appropriate significance characterization. Documents reviewed are listed in the Attachment.

This inspection constituted three quarterly maintenance effectiveness samples as defined in IP 71111.12-05.

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)

.1 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors reviewed the licensee's evaluation and management of plant risk for the maintenance and emergent work activities affecting risk-significant and safety-related equipment listed below to verify that the appropriate risk assessments were performed prior to removing equipment for work:

- Work During the Week of February 7, 2011, with Unit 2 Train A Charging Pump Out-of-Service, Train A Control Room Ventilation and Train A Essential Service Water Makeup Pump Out-of-Service;
- Component Coolant Water System following Operational and Maintenance Issues; and
- Bus 132X Out of Service for Maintenance during Week of March 28, 2011.

These activities were selected based on their potential risk significance relative to the Reactor Safety Cornerstones. As applicable for each activity, the inspectors verified that 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 verified that the plant risk was promptly reassessed and managed. The inspectors reviewed the scope of maintenance work, discussed the results of the assessment with the licensee's probabilistic risk analyst or shift technical advisor, and verified plant conditions were consistent with the risk assessment. The inspectors also reviewed TS requirements and walked down portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

These maintenance risk assessments and emergent work control activities constituted three samples as defined in IP 71111.13-05.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

.1 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the following issues:

- Essential Service Water Cooling Tower due to Reported Leak;
- Component Coolant Water System on Both Units Following Issuance of New Standing Orders;
- Component Coolant Water System Configuration/Design Control Issues; and
- Auxiliary Feedwater System Operability due to Small Voids Located in Essential Service Water to Auxiliary Feedwater Suction Piping, Unit 2 Trains A and B.

The inspectors selected these potential operability issues based on the risk significance of the associated components and systems. 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 and design criteria in the appropriate sections of the TS and UFSAR to the licensee's evaluations to determine whether the components or systems were operable. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. The inspectors determined, where appropriate, compliance with bounding limitations associated with the evaluations. Additionally, the inspectors reviewed a sample of corrective action documents to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the Attachment.

These operability evaluation inspections constituted four samples as defined in IP 71111.15-05.

b. Findings

No findings of significance were identified.

1R18 Plant Modifications (71111.18)

.1 Plant Modifications

a. Inspection Scope

The inspectors reviewed the following modifications:

- Unit 1 Auxiliary Feedwater Suction Valve Control Scheme Change (Permanent);
- Unit 1 Train A Filling of Empty Pipe between AF006 and AF017 Valves and Altering Vent Valve Operation (Permanent); and
- Unit Common Component Coolant Water System Procedure Modifications to Address UFSAR Discrepancies (Temporary).

The inspectors reviewed the configuration changes and associated 10 CFR 50.59 safety evaluation screening against the design basis, the UFSAR, and the TS, as applicable, to verify that the modification did not affect the operability or availability of the affected system(s). The inspectors, as applicable, observed ongoing and completed work activities to ensure that the modifications were installed as directed and consistent with the design control documents; the modifications operated as expected; post-modification testing adequately demonstrated continued system operability, availability, and reliability; and that operation of the modifications did not impact the operability of any interfacing systems. As applicable, the inspectors verified that relevant procedure, design, and licensing documents were properly updated. Lastly, the inspectors discussed the plant modification with operations, engineering, and training personnel to ensure that the individuals were aware of how the operation with the plant modification in place could impact overall plant performance. Documents reviewed are listed in the Attachment.

This inspection constituted one temporary modification sample and two permanent plant modification samples as defined in IP 71111.18-05.

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing (71111.19)

.1 Post-Maintenance Testing

a. Inspection Scope

The inspectors reviewed the following post-maintenance activities to verify that procedures and test activities were adequate to ensure system operability and functional capability:

- Unit 1 Stroke Time and Position Indication Test on Valve 1SI8813 Following Maintenance;
- Unit 1 Train A Essential Service Water Test Following Pump and Motor Replacement; and
- Unit 1 Auxiliary Feedwater Suction Valve Actuator Test Following Rebuild.

These activities were selected based upon the structure, system, or component's ability to impact risk. The inspectors evaluated these activities for the following (as applicable): the effect of testing on the plant had been adequately addressed; testing was adequate for the maintenance performed; acceptance criteria were clear and demonstrated operational readiness; test instrumentation was appropriate; tests were performed as written in accordance with properly reviewed and approved procedures; equipment was returned to its operational status following testing (temporary modifications or jumpers

required for test performance were properly removed after test completion); and test documentation was properly evaluated. The inspectors evaluated the activities against TS, the UFSAR, 10 CFR Part 50 requirements, licensee procedures, and various NRC generic communications to ensure that the test results adequately ensured that the equipment met the licensing basis and design requirements. In addition, the inspectors reviewed corrective action documents associated with post-maintenance tests to determine whether the licensee was identifying problems and entering them in the CAP and that the problems were being corrected commensurate with their importance to safety. Documents reviewed are listed in the Attachment.

This inspection constituted three post-maintenance testing samples as defined in IP 71111.19-05.

b. Findings

No findings of significance were identified.

1R20 Outage Activities (71111.20)

.1 Refueling Outage Activities

a. Inspection Scope

The inspectors reviewed the Outage Safety Plan (OSP) and contingency plans for the Unit 1 refueling outage (RFO), which started March 13, 2011, 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. During the RFO, the inspectors observed portions of the shutdown and cooldown processes and monitored licensee controls over the outage activities listed below. Documents reviewed are listed in the Attachment.

- Licensee configuration management, including maintenance of defense-in-depth commensurate with the OSP for key safety functions and compliance with the applicable TS when taking equipment out of service.
- Implementation of clearance activities and confirmation that tags were properly hung and equipment appropriately configured to safely support the work or testing.
- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication, accounting for instrument error.
- Controls over the status and configuration of electrical systems to ensure that TS and OSP requirements were met, and controls over switchyard activities.
- Monitoring of decay heat removal processes, systems, and components.
- Controls to ensure that outage work was not impacting the ability of the operators to operate the spent fuel pool cooling system.
- Reactor water inventory controls including flow paths, configurations, and alternative means for inventory addition, and controls to prevent inventory loss.
- Controls over activities that could affect reactivity.
- Maintenance of secondary containment as required by TS.
- Refueling activities, including fuel handling and sipping to detect fuel assembly leakage.

- Startup and ascension to full power operation, tracking of startup prerequisites, walkdown of the drywell (primary containment) to verify that debris had not been left which could block emergency core cooling system suction strainers, and reactor physics testing.
- Licensee identification and resolution of problems related to RFO activities.

This inspection constituted a partial Outage Activity sample as defined in IP 71111.20-05.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22)

.1 Surveillance Testing

a. Inspection Scope

The inspectors reviewed the test results for the following activities to determine whether risk-significant systems and equipment were capable of performing their intended safety function and to verify testing was conducted in accordance with applicable procedural and TS requirements:

- Unit 2 Train B Safety Injection Pump ASME (IST) Surveillance;
- Unit 2 Train A Diesel Generator Monthly Surveillance;
- Unit 2 Train B Auxiliary Feedwater Pump Monthly Surveillance; and
- Unit 2 Reactor Containment Fan Cooler Monthly Surveillance.

The inspectors observed in-plant activities and reviewed procedures and associated records to determine the following:

- did preconditioning occur;
- were the effects of the testing adequately addressed by control room personnel or engineers prior to the commencement of the testing;
- were acceptance criteria clearly stated, demonstrated operational readiness, and consistent with the system design basis;
- plant equipment calibration was correct, accurate, and properly documented;
- as-left setpoints were within required ranges; and the calibration frequency were in accordance with TSs, the USAR, procedures, and applicable commitments;
- measuring and test equipment calibration was current;
- test equipment was used within the required range and accuracy; applicable prerequisites described in the test procedures were satisfied;
- test frequencies met TS requirements to demonstrate operability and reliability; tests were performed in accordance with the test procedures and other applicable procedures; jumpers and lifted leads were controlled and restored where used;
- test data and results were accurate, complete, within limits, and valid;
- test equipment was removed after testing;

- where applicable for inservice testing activities, testing was performed in accordance with the applicable version of Section XI, American Society of Mechanical Engineers (ASME) code, and reference values were consistent with the system design basis;
- where applicable, test results not meeting acceptance criteria were addressed with an adequate operability evaluation or the system or component was declared inoperable;
- where applicable for safety-related instrument control surveillance tests, reference setting data were accurately incorporated in the test procedure;
- where applicable, actual conditions encountering high resistance electrical contacts were such that the intended safety function could still be accomplished;
- prior procedure changes had not provided an opportunity to identify problems encountered during the performance of the surveillance or calibration test;
- equipment was returned to a position or status required to support the performance of its safety functions; and
- all problems identified during the testing were appropriately documented and dispositioned in the CAP.

Documents reviewed are listed in the Attachment.

This inspection constituted three routine surveillance testing samples, and one inservice testing sample, as defined in IP 71111.22, Sections -02 and -05.

b. Findings

Introduction: A self-revealed finding of very low safety significance (Green) was identified on January 21, 2011, when licensee personnel failed to ensure that surveillance procedures for measuring essential service water (SX) flow through reactor containment fan coolers (RCFCs) was adequate. As a result, during routine surveillance testing, measured SX flow through the RCFCs was less than technical specification requirements.

Description: On January 21, 2011, routine surveillance 2BOSR 6.6.2-1, "Unit 2 Reactor Containment Fan Cooler Monthly Surveillance," was performed. This test verified that the TS 3.6.6.3 surveillance minimum required flow rate of 2,660 gallons per minute (gpm) of SX through each of the RCFCs were met. The as-found data indicated that the SX flow through all four RCFCs was below the nominal 2,800 gpm and that two were below the TS minimum. The Unit 2 Train B flow rate was 2,604 gpm and the Unit 2 Train D flow rate was 2,587 gpm.

To correct the flow deficiency, one additional SX cooling tower riser valve was opened, which reduced SX system back pressure and consequently increased SX system flow through the RCFCs to greater than the TS minimum required value. In addition, local manual valves were adjusted to increase the SX flow to each of the four RCFCs to near or above the nominal flow of 2,800 gpm.

The inspectors subsequently identified that during a similar surveillance on November 18, 2010, SX flow through the RCFCs was less than the nominal 2,800 gpm, but greater than the 2,660 gpm minimum TS-required flow. Following this surveillance, the decision was made to not adjust SX flow to greater than the nominal 2,800 gpm due

to other conflicting work activities. The inspectors also identified that on June 25, 2010, SX flow to the Unit 2 Train D RCFC was 2605 gpm, which was below the TS-required flow of 2,660 gpm. Essential service water flow to two other RCFCs was also found less than the nominal 2,800 gpm. Essential service water flow was adjusted and the TS Limiting Condition for Operation was exited. The corrective action for the June 25, 2010, event was to revise the surveillance procedure to raise the as-left SX flow rate and increase the margin to the minimum TS requirement.

Following a postulated Loss of Coolant Accident (LOCA), operators were required by Emergency Operating Procedures (EOPs) to promptly open all SX cooling tower riser valves. Therefore, the safety significance of this issue was mitigated.

Analysis: The inspectors determined that the failure to establish adequate instructions in the surveillance procedure used to measure and establish SX flow through the RCFCs was a performance deficiency warranting a significance determination.

The inspectors concluded that the finding was more than minor in accordance with Appendix B, "Issue Screening," of IMC 0612, "Power Reactor Inspection Reports," dated January 1, 2010, because the finding was associated with the Configuration Control attribute of the Barrier Integrity Cornerstone and affected the cornerstone objective of providing reasonable assurance that physical design barriers, including the containment, protect the public from radionuclide releases caused by accidents and events. Specifically, the finding was determined to impact the TS-required SX flow to the RCFCs.

The inspectors completed a significance determination of this issue using IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At Power Situations," dated January 10, 2008, Phase 1 Screening. The inspectors determined that because the finding did not represent a degradation of the radiological barrier function, did not represent a degradation of the barrier function of the control room, did not represent an actual open pathway in the physical integrity of reactor containment, and did not involve an actuation reduction in function of hydrogen igniters in the reactor containment, the issue was of very low safety significance (Green).

This finding had a cross-cutting aspect in the area of Human Performance, Resources, (H.2(c)) because the licensee had repeatedly modified the surveillance procedure without ensuring adequate operational margin to the TS limit.

Enforcement: Technical Specification 5.4.1 required, in part, that written procedures be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide 1.33, "Quality Assurance Program Requirements," Revision 2, dated February 1978.

Section 8.b of Regulatory Guide 1.33, Revision 2, Appendix A, dated February 1978, required specific procedures for each surveillance test listed in the TSs. Technical Specification Surveillance Requirement 3.6.6.3 required that the cooling water flow rate for each reactor containment cooling train be greater than or equal to 2,660 gpm.

Licensee surveillance procedure 2BOSR 6.6.2-1, Revision 25, "Unit Two Reactor Containment Fan Cooler Monthly Surveillance," was written to satisfy Section 8.b of Regulatory Guide 1.33, Revision 2, Appendix A, dated February 1978 and ensure that

the cooling water flow rate to each reactor containment cooling train be greater than or equal to 2,660 gpm.

Contrary to the above, on January 21, 2011, during the performance of 2BOSR 6.6.2-1, it was self-revealed that SX flow to the 2B and 2D RCFCs was 2,604 gpm and 2,587 gpm, respectively which was less than the TS required value of 2,660 gpm. Because this finding was of very low safety significance, and because it was entered into the licensee's corrective action program as IR 1165434, this violation is being treated as a NCV consistent with Section VI.A of the Enforcement Policy.

(NCV 05000455/2011002-02; Self-Revealed Low Flow to Reactor Containment Fan Cooler)

2. RADIATION SAFETY

Cornerstones: Occupational Radiation Safety

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01)

This inspection constituted a partial sample as defined in IP 71124.01-05.

.1 Radiological Hazard Assessment (02.02)

a. Inspection Scope

The inspectors determined if there have been changes to plant operations since the last inspection that may result in a significant new radiological hazard for onsite workers or members of the public. The inspectors evaluated whether the licensee assessed the potential impact of these changes and has implemented periodic monitoring, as appropriate, to detect and quantify the radiological hazard.

The inspectors reviewed the last two radiological surveys from selected plant areas and evaluated whether the thoroughness and frequency of the surveys were appropriate for the given radiological hazard.

The inspectors conducted walkdowns of the facility, including radioactive waste processing, storage, and handling areas to evaluate material conditions and performed independent radiation measurements to verify conditions.

The inspectors selected the following radiologically risk-significant work activities that involved exposure to radiation.

- 1B Reactor Coolant Pump Repair Work – All Activities – Flange and Above;
- UI-1C Loop Stop Isolation Valve Repair Work: All Activities;
- Mechanical Stress Improvement Program: Process / External Measurements/Testing; and
- B1R17 Radiography and All Associated Activities.

For these work activities, the inspectors assessed whether the pre-work surveys performed were appropriate to identify and quantify the radiological hazard and to

establish adequate protective measures. The inspectors evaluated the radiological survey program to determine if hazards were properly identified, including the following:

- identification of hot particles;
- the presence of alpha emitters;
- the potential for airborne radioactive materials, including the potential presence of transuranics and/or other hard-to-detect radioactive materials (This evaluation may include licensee planned entry into non-routinely entered areas subject to previous contamination from failed fuel.);
- the hazards associated with work activities that could suddenly and severely increase radiological conditions and that the licensee has established a means to inform workers of changes that could significantly impact their occupational dose; and
- severe radiation field dose gradients that can result in non-uniform exposures of the body.

The inspectors observed work in potential airborne areas and evaluated whether the air samples were representative of the breathing air zone. The inspectors evaluated whether continuous air monitors were located in areas with low background to minimize false alarms and were representative of actual work areas. The inspectors evaluated the licensee's program for monitoring levels of loose surface contamination in areas of the plant with the potential for the contamination to become airborne.

b. Findings

No findings of significance were identified.

.2 Instructions to Workers (02.03)

a. Inspection Scope

The inspectors selected various containers holding non-exempt licensed radioactive materials that may cause unplanned or inadvertent exposure of workers, and assessed whether the containers were labeled and controlled in accordance with 10 CFR 20.1904, "Labeling Containers," or met the requirements of 10 CFR 20.1905(g), "Exemptions To Labeling Requirements."

The inspectors reviewed the following radiation work permits used to access high radiation areas and evaluated the specified work control instructions or control barriers.

- 1B Reactor Coolant Pump Repair Work – All Activities – Flange and Above;
- UI-1C Loop Stop Isolation Valve Repair Work: All Activities;
- Mechanical Stress Improvement Project Process/External Measurements/Testing; and
- B1R17 Radiography and All Associated Activities.

For these radiation work permits, the inspectors assessed whether allowable stay times or permissible dose (including from the intake of radioactive material) for radiologically significant work under each radiation work permit were clearly identified. The inspectors evaluated whether electronic personal dosimeter alarm set-points were in conformance with survey indications and plant policy.

For work activities that could suddenly and severely increase radiological conditions, the inspectors assessed the licensee's means to inform workers of changes that could significantly impact their occupational dose.

b. Findings

No findings of significance were identified.

.3 Contamination and Radioactive Material Control (02.04)

a. Inspection Scope

The inspectors observed locations where the licensee monitors potentially contaminated material leaving the radiological control area and inspected the methods used for control, survey, and release from these areas. The inspectors observed the performance of personnel surveying and releasing material for unrestricted use and evaluated whether the work was performed in accordance with plant procedures and whether the procedures were sufficient to control the spread of contamination and prevent unintended release of radioactive materials from the site. The inspectors assessed whether the radiation monitoring instrumentation had appropriate sensitivity for the type(s) of radiation present.

The inspectors reviewed the licensee's criteria for the survey and release of potentially contaminated material. The inspectors evaluated whether there was guidance on how to respond to an alarm that indicates the presence of licensed radioactive material.

The inspectors reviewed the licensee's procedures and records to verify that the radiation detection instrumentation was used at its typical sensitivity level based on appropriate counting parameters. The inspectors assessed whether or not the licensee has established a de facto "release limit" by altering the instrument's typical sensitivity through such methods as raising the energy discriminator level or locating the instrument in a high-radiation background area.

The inspectors selected several sealed sources from the licensee's inventory records and assessed whether the sources were accounted for and verified to be intact.

The inspectors evaluated whether any transactions, since the last inspection, involving nationally tracked sources were reported in accordance with 10 CFR 20.2207.

b. Findings

No findings of significance were identified.

.4 Radiological Hazards Control and Work Coverage (02.05)

a. Inspection Scope

The inspectors evaluated ambient radiological conditions (e.g., radiation levels or potential radiation levels) during tours of the facility. The inspectors assessed whether the conditions were consistent with applicable posted surveys, radiation work permits, and worker briefings.

The inspectors evaluated the adequacy of radiological controls, such as required surveys, radiation protection job coverage (including audio and visual surveillance for remote job coverage), and contamination controls. The inspectors evaluated the licensee's use of electronic personal dosimeters in high noise areas as high radiation area monitoring devices.

The inspectors assessed whether radiation monitoring devices were placed on the individual's body consistent with licensee procedures. The inspectors assessed whether the dosimeter was placed in the location of highest expected dose or that the licensee properly employed an NRC-approved method of determining effective dose equivalent.

The inspectors reviewed the application of dosimetry to effectively monitor exposure to personnel in high-radiation work areas with significant dose rate gradients.

The inspectors reviewed the following radiation work permits for work within airborne radioactivity areas with the potential for individual worker internal exposures.

- 1B Reactor Coolant Pump Repair Work – All Activities – Flange and Above;
- UI-1C Loop Stop Isolation Valve Repair Work: All Activities; and
- Mechanical Stress Improvement Project Process/External Measurements/Testing.

For these radiation work permits, the inspectors evaluated airborne radioactive controls and monitoring, including potential for significant airborne levels (e.g., grinding, grit blasting, system breaches, entry into tanks, cubicles, and reactor cavities). The inspectors assessed barrier (e.g., tent or glove box) integrity and temporary high-efficiency particulate air ventilation system operation.

b. Findings

No findings of significance were identified.

.5 Radiation Worker Performance (02.07)

a. Inspection Scope

The inspectors observed radiation worker performance with respect to stated radiation protection work requirements. The inspectors assessed whether workers were aware of the radiological conditions in their workplace and the radiation work permit controls/limits in place, and whether their performance reflected the level of radiological hazards present.

b. Findings

No findings of significance were identified.

.6 Radiation Protection Technician Proficiency (02.08)

a. Inspection Scope

The inspectors observed the performance of the radiation protection technicians with respect to all radiation protection work requirements. The inspectors evaluated whether technicians were aware of the radiological conditions in their workplace and the radiation work permit controls/limits, and whether their performance was consistent with their

b. Findings

No findings of significance were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03)

This inspection constituted a partial sample as defined in IP 71124.03-05.

.1 Inspection Planning (02.01)

a. Inspection Scope

The inspectors reviewed the plant USFAR to identify areas of the plant designed as potential airborne radiation areas and any associated ventilation systems or airborne monitoring instrumentation. Instrumentation review included continuous air monitors (continuous air monitors and particulate-iodine-noble-gas-type instruments) used to identify changing airborne radiological conditions such that actions to prevent an overexposure may be taken. The review included an overview of the respiratory protection program and a description of the types of devices used. The inspectors reviewed USFAR, TS, and emergency planning documents to identify location and quantity of respiratory protection devices stored for emergency use.

Inspectors reviewed the licensee's procedures for maintenance, inspection, and use of respiratory protection equipment including self-contained breathing apparatus as well as procedures for air quality maintenance.

The inspectors reviewed reported performance indicators to identify any related to unintended dose resulting from intakes of radioactive material.

b. Findings

No findings of significance were identified.

.2 Engineering Controls (02.02)

a. Inspection Scope

The inspectors assessed whether the licensee had established trigger points (e.g., the Electric Power Research Institute's "Alpha Monitoring Guidelines for Operating Nuclear Power Stations") for evaluating levels of airborne beta-emitting (e.g., plutonium-241) and alpha-emitting radionuclides.

b. Findings

No findings of significance were identified.

.3 Use of Respiratory Protection Devices (02.03)

a. Inspection Scope

The inspectors assessed whether respiratory protection devices used to limit the intake of radioactive materials were certified by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration or have been approved by the NRC per 10 CFR 20.1703(b).

The inspectors reviewed records of air testing for supplied-air devices and self-contained breathing apparatus bottles to assess whether the air used in these devices meets or exceeds Grade D quality. The inspectors reviewed plant breathing air supply systems to determine whether they meet the minimum pressure and airflow requirements for the devices in use.

The inspectors selected several individuals qualified to use respiratory protection devices, and assessed whether they have been deemed fit to use the devices by a physician.

The inspectors selected several individuals assigned to wear a respiratory protection device and observed them donning, doffing, and functionally checking the device as appropriate. Due to limited in-field observations, the inspectors reviewed training curricula for users of respiratory protection devices.

The inspectors chose multiple respiratory protection devices staged and ready for use in the plant or stocked for issuance for use. The inspectors assessed the physical condition of the device components (mask or hood, harnesses, air lines, regulators, air bottles, etc.) and reviewed records of routine inspection for each. The inspectors selected several of the devices and reviewed records of maintenance on the vital components (e.g., pressure regulators, inhalation/exhalation valves, hose couplings).

b. Findings

Introduction: A finding of very low safety significance and an associated NCV of TS 5.4.1 was identified by the inspectors when out of date/expired respirator cartridges were found available for use. Radiation protection procedures that cover respiratory protection program did not require cartridges to be replaced after the manufacturer specified shelf-life had expired.

Description: On January 11, 2011, the inspectors observed full face respirator cartridges bagged and available for use in the Operations Support Center (OSC), an area designated in the site emergency plan. The inspectors noted that the date of manufacture was in calendar year 1998 for the majority of cartridges observed.

The cartridge is the part of a respirator that removes contaminants from the air before it is inhaled by the user. The cartridges observed by the inspectors were combination filters that include a particulate filter and a layer of activated charcoal to minimize exposure to gaseous radioactive iodine.

The regulatory authority for respiratory protection is the Occupational Safety and Health Administration (OSHA). The regulations are defined in 29 CFR 1910.134 titled "Respiratory Protection." Title 29 CFR 1910.134(d)(3)(iii) provides requirements for the protection against gases and vapors. These requirements include that air purifying respirators be equipped with an End of Service Life Indicator (ESLI) or the employer implements a change schedule for canisters and cartridges that is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. The employer shall describe in the respirator program the information and data relied upon and the basis for the canister and cartridge change schedule and the basis for reliance on the data.

The cartridges used by the licensee did not have an ESLI and the licensee had not defined a change schedule for the identified cartridges.

The respirator cartridge manufacturer recognized that it was possible that chemical cartridges, which are more than a year old, may lose some of their efficiency in their ability to absorb contaminants. The manufacturer prescribed an expiration date of three years from the date of the canister manufacture and this date was stamped on to the canister label.

This issue was entered in the licensee's corrective action program as Inspection Report (IR) 1161410. The licensee planned to replace the expired cartridges and add guidance to procedures for checking expiration dates during routine inventories.

Analysis: The inspectors determined that the issue of concern was a performance deficiency because the respiratory protection program, as implemented, did not ensure that cartridges are changed before the end of their service life. Additionally, the licensee's respiratory protection program did not contain a basis for not implementing a cartridge change schedule. The inspectors determined that the cause of the performance deficiency was reasonably within the licensee's ability to foresee and correct and should have been prevented.

The finding was not subject to traditional enforcement since the incidents did not have a significant safety consequence, did not impact the NRC's ability to perform its regulatory function, and were not willful.

The inspectors reviewed the guidance in IMC 0612, Appendix E, Examples of Minor Issues, but did not identify any examples similar to the performance deficiency. However, in accordance with IMC 0612, the inspectors determined that the finding was more than minor because if left uncorrected the performance deficiency would have the potential to lead to a more significant safety concern. Specifically, cartridges that were

beyond the recommended shelf-life could lose some of their efficiency in their ability to absorb contaminants and result in additional radiation doses to the users. The finding was assessed using the Occupational Radiation Safety Significance Determination Process (SDP) and was determined to be of very low safety significance because these problems were not ALARA planning issues, there were no overexposures, nor substantial potential for overexposures and the licensee's ability to assess dose was not compromised.

As described above, the out-of-date respirator cartridges were available for use because the licensee's respiratory protection program did not include a cartridge change schedule. Additionally, this condition was not identified by the licensee during the in-plant airborne controls and mitigation self-assessment completed December 10, 2010. Consequently, the inspectors determined that the cause of this incident involved a cross-cutting component in the human performance area for inadequate resources. Specifically, the licensee did not have complete, accurate and up-to-date, procedures. (H.2(c))

Enforcement: Technical Specification 5.4.1 states, in part, written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978. Regulatory Guide 1.33, Revision 2, Appendix A, Section 7.e.7 recommends procedures for respiratory protection. Contrary to the above, on January 11, 2011, out-of-date/expired respirator cartridges were found available for use. Since the failure to comply with the Technical Specification was of very low safety significance and has been entered in the licensee's corrective action program as IR 1161410, this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000454/2011002-02; 05000455/2011002-03; Out of Date/Expired Respirator Cartridges)**

.4 Self-Contained Breathing Apparatus for Emergency Use (02.04)

a. Inspection Scope

Based on the UFSAR, TS, and emergency operating procedure requirements, the inspectors reviewed the status and surveillance records of self-contained breathing apparatuses staged in-plant for use during emergencies. The inspectors reviewed the licensee's capability for refilling and transporting self-contained breathing apparatus air bottles to and from the control room and operations support center during emergency conditions.

The inspectors selected several individuals on control room shift crews and from designated departments currently assigned emergency duties (e.g., onsite search and rescue duties) to assess whether control room operators and other emergency response and radiation protection personnel (assigned in-plant search and rescue duties or as required by emergency operating procedures or the emergency plan) were trained and qualified in the use of self-contained breathing apparatuses (including personal bottle changeout). The inspectors evaluated whether personnel assigned to refill bottles were trained and qualified for that task.

The inspectors determined whether appropriate mask sizes and types were available for use (i.e., in-field mask size and type match what was used in fit-testing). The inspectors

determined whether on-shift operators had no facial hair that would interfere with the sealing of the mask to the face and whether vision correction (e.g., glasses inserts or corrected lenses) was available as appropriate.

The inspectors reviewed the past 2 years of maintenance records for selected self-contained breathing apparatus units used to support operator activities during accident conditions and designated as “ready for service” to assess whether any maintenance or repairs on any self-contained breathing apparatus unit’s vital components were performed by an individual, or individuals, certified by the manufacturer of the device to perform the work. The vital components typically are the pressure-demand air regulator and the low-pressure alarm. The inspectors reviewed the onsite maintenance procedures governing vital component work to determine any inconsistencies with the self-contained breathing apparatus manufacturer’s recommended practices. For those self-contained breathing apparatuses designated as “ready for service,” the inspectors determined whether the required, periodic air cylinder hydrostatic testing was documented and up to date, and the retest air cylinder markings required by the U. S. Department of Transportation were in place.

b. Findings

No findings of significance were identified.

.5 Problem Identification and Resolution (02.05)

a. Inspection Scope

The inspectors evaluated whether problems associated with the control and mitigation of in-plant airborne radioactivity were being identified by the licensee at an appropriate threshold and were properly addressed for resolution in the licensee corrective action program. The inspectors assessed whether the corrective actions were appropriate for a selected sample of problems involving airborne radioactivity and were appropriately documented by the licensee.

b. Findings

No findings of significance were identified.

2RS4 Occupational Dose Assessment (71124.04)

This inspection constituted a partial sample as defined in IP 71124.04-05.

.1 Inspection Planning (02.01)

a. Inspection Scope

The inspectors reviewed the results of radiation protection program audits related to internal and external dosimetry (e.g., licensee’s quality assurance audits, self-assessments, or other independent audits) to gain insights into overall licensee performance in the area of dose assessment and focus the inspection activities consistent with the principle of “smart sampling.”

The inspectors reviewed the most recent National Voluntary Laboratory Accreditation Program accreditation report on the vendor's most recent results to determine the status of the contractor's accreditation.

A review was conducted of the licensee procedures associated with dosimetry operations, including issuance/use of external dosimetry (routine, multibadging, extremity, neutron, etc.), assessment of internal dose (operation of whole body counter, assignment of dose based on derived air concentration-hours, urinalysis, etc.), and evaluation of and dose assessment for radiological incidents (distributed contamination, hot particles, loss of dosimetry, etc.).

The inspectors evaluated whether the licensee had established procedural requirements for determining when external and internal dosimetry is required.

b. Findings

No findings of significance were identified.

.2 External Dosimetry (02.02)

a. Inspection Scope

The inspectors evaluated the onsite storage of dosimeters before their issuance, during use, and before processing/reading. The inspectors also reviewed the guidance provided to rad-workers with respect to care and storage of dosimeters.

The inspectors assessed whether non-National Voluntary Laboratory Accreditation Program accredited passive dosimeters (e.g., direct ion storage sight read dosimeters) were used according to licensee procedures that provide for periodic calibration, application of calibration factors, usage, reading (dose assessment) and zeroing.

The inspectors assessed the use of active dosimeters (electronic personal dosimeters) to determine if the licensee uses a "correction factor" to address the response of the electronic personal dosimeter as compared to the passive dosimeter for situations when the electronic personal dosimeter must be used to assign dose and whether the correction factor is based on sound technical principles.

The inspectors reviewed dosimetry occurrence reports or corrective action program documents for adverse trends related to electronic personal dosimeters, such as interference from electromagnetic frequency, dropping or bumping, failure to hear alarms, etc. The inspectors assessed whether the licensee had identified any trends and implemented appropriate corrective actions.

b. Findings

No findings of significance were identified.

.3 Internal Dosimetry (02.03)

(1) Routine Bioassay (In Vivo)

a. Inspection Scope

The inspectors reviewed procedures used to assess the dose from internally deposited nuclides using whole body counting equipment. The inspectors evaluated whether the procedures addressed methods for differentiating between internal and external contamination, the release of contaminated individuals, the route of intake and the assignment of dose.

The inspectors reviewed the whole body count process to determine if the frequency of measurements was consistent with the biological half-life of the nuclides available for intake.

The inspectors reviewed the licensee's evaluation for use of its portal radiation monitors as a passive monitoring system to determine if instrument minimum detectable activities were adequate to determine the potential for internally deposited radionuclides sufficient to prompt additional investigation.

The inspectors selected several whole body counts and evaluated whether the counting system used had sufficient counting time/low background to ensure appropriate sensitivity for the potential radionuclides of interest. The inspectors reviewed the radionuclide library used for the count system to determine its appropriateness. The inspectors evaluated whether any anomalous count peaks/nuclides indicated in each output spectra received appropriate disposition. The inspectors reviewed the licensee's 10 CFR Part 61 data analyses to determine whether the nuclide libraries included appropriate gamma-emitting nuclides. The inspectors evaluated how the licensee accounts for hard-to-detect nuclides in the dose assessment.

b. Findings

No findings of significance were identified.

(2) Special Bioassay (In Vitro)

Inspection Scope

There were no internal dose assessments obtained using in vitro monitoring for the inspectors to review. The inspectors reviewed and assessed the adequacy of the licensee's program for in vitro monitoring (i.e., urinalysis and fecal analysis) of radionuclides (tritium, fission products, and activation products), including collection and storage of samples.

The inspectors reviewed the vendor laboratory quality assurance program and assessed whether the laboratory participated in an industry recognized cross-check program including whether out-of-tolerance results were resolved appropriately.

b. Findings

No findings of significance were identified.

(3) Internal Dose Assessment – Airborne Monitoring

a. Inspection Scope

The inspectors reviewed the licensee's program for airborne radioactivity assessment and dose assessment, as applicable, based on airborne monitoring and calculations of derived air concentration. The inspectors determined whether flow rates and collection times for air sampling equipment were adequate to allow lower limits of detection to be obtained. The inspectors also reviewed the adequacy of procedural guidance to assess internal dose if respiratory protection was used. The licensee had not performed dose assessments using airborne/derived air concentration monitoring since the last inspection.

b. Findings

No findings of significance were identified.

(4) Internal Dose Assessment – Whole Body Count Analyses

a. Inspection Scope

The inspectors reviewed several dose assessments performed by the licensee using the results of whole body count analyses. The inspectors determined whether affected personnel were properly monitored with calibrated equipment and that internal exposures were assessed consistent with the licensee's procedures.

b. Findings

No findings of significance were identified.

.4 Special Dosimetric Situations (02.04)

(1) Declared Pregnant Workers

a. Inspection Scope

The inspectors assessed whether the licensee informs workers, as appropriate, of the risks of radiation exposure to the embryo/fetus, the regulatory aspects of declaring a pregnancy, and the specific process to be used for (voluntarily) declaring a pregnancy.

The inspectors selected individuals who had declared pregnancy during the current assessment period and evaluated whether the licensee's radiological monitoring program (internal and external) for declared pregnant workers is technically adequate to assess the dose to the embryo/fetus. The inspectors reviewed exposure results and monitoring controls employed by the licensee and with respect to the requirements of 10 CFR Part 20.

b. Findings

No findings of significance were identified.

(2) Dosimeter Placement and Assessment of Effective Dose Equivalent for External Exposures

a. Inspection Scope

The inspectors reviewed the licensee's methodology for monitoring external dose in non-uniform radiation fields or where large dose gradients exist. The inspectors evaluated the licensee's criteria for determining when alternate monitoring, such as use of multi-badging, was to be implemented.

The inspectors reviewed dose assessments performed using multibadging to evaluate whether the assessment was performed consistently with licensee procedures and dosimetric standards.

b. Findings

No findings of significance were identified.

(3) Shallow Dose Equivalent

a. Inspection Scope

The inspectors reviewed shallow dose equivalent dose assessments for adequacy. The inspectors evaluated the licensee's method (e.g., VARSKIN or similar code) for calculating shallow dose equivalent from distributed skin contamination or discrete radioactive particles.

b. Findings

No findings of significance were identified.

(4) Neutron Dose Assessment

a. Inspection Scope

The inspectors evaluated the licensee's neutron dosimetry program, including dosimeter types and/or survey instrumentation.

The inspectors reviewed neutron exposure situations (e.g., independent spent fuel storage installation operations or at-power containment entries) and assessed whether: (a) dosimetry and/or instrumentation was appropriate for the expected neutron spectra; (b) there was sufficient sensitivity for low dose and/or dose rate measurement; and (c) neutron dosimetry was properly calibrated. The inspectors also assessed whether interference by gamma radiation had been accounted for in the calibration and whether time and motion evaluations were representative of actual neutron exposure events, as applicable.

b. Findings

No findings of significance were identified.

(5) Assigning Dose of Record

a. Inspection Scope

For the special dosimetric situations reviewed in this section, the inspectors assessed how the licensee assigns dose of record for total effective dose equivalent, shallow dose equivalent, and lens dose equivalent. This included an assessment of external and internal monitoring results, supplementary information on Individual exposures (e.g., radiation incident investigation reports and skin contamination reports), and radiation surveys and/or air monitoring results when dosimetry was based on these techniques.

b. Findings

No findings of significance were identified.

.5 Problem Identification and Resolution (02.05)

a. Inspection Scope

The inspectors assessed whether problems associated with occupational dose assessment are being identified by the licensee at an appropriate threshold and are properly addressed for resolution in the licensee corrective action program. The inspectors assessed the appropriateness of the corrective actions for a selected sample of problems documented by the licensee involving occupational dose assessment.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

CORNERSTONES: INITIATING EVENTS, MITIGATING SYSTEMS, BARRIER INTEGRITY, AND EMERGENCY PREPAREDNESS

4OA1 Performance Indicator Verification (71151)

.1 Unplanned Scrams Per 7000 Critical Hours

a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Scrams Per 7000 Critical Hours Performance Indicator (PI) for both Unit 1 and Unit 2 for the period from March 2010 through February 2011. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in Nuclear Energy Institute (NEI) 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6, dated October 2009, were used. The inspectors reviewed the licensee's operator narrative logs, issue reports, event reports and NRC Inspection Reports for the period of

January 2010 through December 2010 to validate the accuracy of the submittals. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the PI data collected or transmitted for this indicator. Documents reviewed are listed in the Attachment.

This inspection constituted two Unplanned Scrams Per 7000 Critical Hours PI review samples as defined in IP 71151-05.

b. Findings

No findings of significance were identified.

.2 Unplanned Scrams with Complications

a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Scrams with Complications PI for both Unit 1 and Unit 2 for the period from March 2010 through February 2011. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6, dated October 2009, were used. The inspectors reviewed the licensee's operator narrative logs, issue reports, event reports and NRC Integrated Inspection Reports for the period of January 2010 through December 2010 to validate the accuracy of the submittals. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the PI data collected or transmitted for this indicator. Documents reviewed are listed in the Attachment.

This inspection constituted two Unplanned Scrams with Complications PI review samples as defined in IP 71151-05.

b. Findings

No findings of significance were identified.

.3 Mitigating Systems Performance Index - Emergency Alternating Current Power System

a. Inspection Scope

The inspectors sampled licensee submittals for the Mitigating Systems Performance Index (MSPI) - Emergency Alternating Current (AC) Power System PI for both Unit 1 and Unit 2 for the period from the first quarter 2010 through the fourth quarter of 2010. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6, dated October 2009, were used. The inspectors reviewed the licensee's operator narrative logs, MSPI derivation reports, issue reports, event reports and NRC Integrated IRs for the period of January 2010 through December 2010 to validate the accuracy of the submittals. The inspectors reviewed the MSPI component risk coefficient to determine if it had changed by more than 25 percent in value since the previous inspection, and if so, determined whether the change was in accordance with applicable NEI guidance. The inspectors also reviewed the licensee's issue report

database to determine if any problems had been identified with the PI data collected or transmitted for this indicator. Documents reviewed are listed in the Attachment.

This inspection constituted two MSPI Emergency AC Power System PI review samples as defined in IP 71151-05.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems (71152)

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness, Public Radiation Safety, Occupational Radiation Safety, and Physical Protection

.1 Routine Review of Items Entered into the Corrective Action Program

a. Inspection Scope

As part of the various baseline inspection procedures discussed in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that they were being entered into the licensee's CAP at an appropriate threshold, that adequate attention was being given to timely corrective actions, and that adverse trends were identified and addressed. Attributes reviewed included: the complete and accurate identification of the problem; that timeliness was commensurate with the safety significance; that evaluation and disposition of performance issues, generic implications, common causes, contributing factors, root causes, extent-of-condition reviews, and previous occurrences reviews were proper and adequate; and that the classification, prioritization, focus, and timeliness of corrective actions were commensurate with safety and sufficient to prevent recurrence of the issue. Issues entered into the licensee's CAP as a result of the inspectors' observations are included in the attached List of Documents Reviewed.

These routine reviews for the identification and resolution of problems did not constitute any additional inspection samples. Instead, by procedure they were considered an integral part of the inspections performed during the quarter and documented in Section 1 of this report.

b. Findings

No findings of significance were identified.

.2 Daily Corrective Action Program Reviews

a. Inspection Scope

In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's CAP. This review was accomplished through inspection of the station's daily condition report packages.

These daily reviews were performed by procedure as part of the inspectors' daily plant status monitoring activities and, as such, did not constitute any separate inspection samples.

b. Findings

No findings of significance were identified.

.3 Semi-Annual Trend Review

a. Inspection Scope

The inspectors performed a review of the licensee's CAP and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review was focused on repetitive equipment issues, but also considered the results of daily inspector CAP item screening discussed in Section 40A2.2 above, licensee trending efforts, and licensee human performance results. The inspectors' review nominally considered the 6 month period of June 2010 through December 2010, although some examples expanded beyond those dates where the scope of the trend warranted.

The review also included issues documented outside the normal CAP in major equipment problem lists, repetitive and/or reworks maintenance lists, departmental problem/challenges lists, system health reports, quality assurance audit/surveillance reports, self assessment reports, and Maintenance Rule assessments. The inspectors compared and contrasted their results with the results contained in the licensee's CAP trending reports. Corrective actions associated with a sample of the issues identified in the licensee's trending reports were reviewed for adequacy.

The inspectors focused on the communications between the Engineering and Operations departments. Specifically, the inspectors focused on documents that discussed three issues: Auxiliary Feedwater Voided Piping, Steam Generator Margin to Overfill, and Possible Voiding of Residual Heat Removal System Piping. The inspectors concluded that in each of these cases there were opportunities for Engineering personnel to engage Operations personnel that were missed. The inspectors did not conclude that these missed opportunities for communication were of significant regulatory concern.

This review constituted a single semi-annual trend inspection sample as defined in IP 71152-05.

b. Findings

No findings of significance were identified.

.4 Selected Issue Follow-Up Inspection: Containment Drain Leak Detector Indicates Flow Intermittently

a. Inspection Scope

During a review of items entered in the licensee's CAP, the inspectors recognized a corrective action item documenting Containment Drain Leak Detector Indicates Flow Intermittently as a recurring issue. The inspectors selected this CAP item for an in-depth review.

The inspectors reviewed the licensee's corrective actions for the issues identified to determine whether: (1) the problems were accurately identified; (2) the causes were adequately ascertained; (3) extent of condition and generic implications were appropriately addressed; (4) previous occurrences were considered; and (5) corrective actions proposed and/or implemented were appropriately focused to address the problems and were commensurate with the safety significance of the issues. Documents reviewed are listed in the Attachment.

This review constituted one in-depth problem identification and resolution sample as defined in IP 71152-05.

b. Findings

No findings of significance were identified.

40A3 Follow-Up of Events and Notices of Enforcement Discretion (71153)

.1 (Open) Licensee Event Report 05000454/2010-001-00: Technical Specification Allowed Outage Time Extension for Component Cooling System Contained Inaccurate Design Information that Significantly Impacted the Technical Justification

The licensee determined that a license amendment request that was sent to the NRC on September 27, 1987, apparently contained some accidental discrepancies. The licensee reviewed the discrepancies and implemented appropriate compensatory measures pending final analysis and any necessary plant modifications.

This Licensee Event Report (LER) will remain open until the licensee has completed their analysis and chosen their necessary corrective actions.

This event follow-up review constituted one sample as defined in IP 71153-05.

.2 (Closed) Licensee Event Report 05000454/2011-001-00: Potential Loss of Residual Heat Removal System Safety Function in Mode 4 When Aligned for Shutdown Cooling Due to Potential for Flashing or Voiding of Coolant during a Shutdown Loss of Coolant Accident

In November 2009, Westinghouse issued Nuclear Safety Advisory letter (NSAL) 09-8, "Presence of Vapor in Emergency Core Cooling System/Residual Heat Removal (RH) System in Modes 3/4 Loss of Coolant Conditions." This letter was issued to ensure that the licensee considered the significantly reduced elevation head present when the residual heat removal system supply is transferred from the refueling water storage tank

to the recirculation sump. The licensee subsequently confirmed that the temperature limit applied to the residual heat removal system for alignment for emergency core cooling system (ECCS) injection was sufficient when aligned to the refueling water storage tank, but could result in flashing of liquid in the hot leg suction lines when the residual heat removal system was transferred to the ECCS recirculation sump. The licensee revised the associated operating and emergency procedures and TS Bases to reflect the more restrictive temperature limits.

The inspectors reviewed this issue as part of inspection activities associated with Temporary Instruction 2525/177, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," the results of which are documented in Section 4OA5.1.b and Section 4OA7 of this inspection report. The inspectors reviewed the LER and concluded it was completed in accordance with 10 CFR 50.73. Therefore, this LER is closed.

This event follow-up review constituted one sample as defined in IP 71153-05.

4OA5 Other Activities

.1 (Open) NRC Temporary Instruction 2515/177: Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems (NRC Generic Letter 2008-01)

a. Inspection Scope

The inspectors verified that the onsite documentation, system hardware, and licensee actions were consistent with the information provided in the licensee's response to NRC Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems." Specifically, the inspectors verified that the licensee has implemented or was in the process of implementing the commitments, modifications, and programmatically controlled actions described in the licensee's response to GL 2008-01. The inspection was conducted in accordance with Temporary Instruction (TI) 2515/177, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems (NRC Generic Letter 2008-01)," and considered the site-specific supplemental information provided by the Office of Nuclear Reactor Regulations (NRR) to the inspectors. In addition, two members of the NRR staff participated in this inspection.

b. Inspection Documentation

The selected TI areas of inspection were licensing basis, design, testing, and corrective actions. The documentation of the inspection effort and any resulting observations are below.

Licensing Basis: The inspectors reviewed selected portions of licensing basis documents to verify that they were consistent with the NRR assessment report and that they were processed by the licensee. The licensing basis verification included the verification of selected portions of TS, TS basis and UFSAR.

The inspectors also verified that selected applicable documents that described the plant and plant operation, such as calculations, piping and instrumentation diagrams (P&IDs),

procedures, and CAP documents, addressed the areas of concern and were changed if needed following plant changes. The inspectors noted one example where the onsite documentation was not consistent with the information provided in the licensee's response to GL 2008-01. Specifically, in the 9-month response to GL 2008-01, the licensee stated the Containment Spray piping was designed for the dynamic loads created when it fills with water. However, the inspectors noted Section CL2-3.5.3.6, "Flow transient analysis," of the design specification for Containment Spray, Document No. 01-10-52, "Commonwealth Edison Company, Byron/Braidwood Stations, Units 1 and 2, Piping Design Specifications," stated that, "No dynamic loads due to flow transient forces are considered in the analysis of the Containment Spray system." After discussion with the NRR, the inspectors confirmed that the inaccurate information provided by the licensee was not material because it would likely not have caused NRR to reconsider a regulatory position or undertake a substantial further inquiry such as a formal request for additional information. The licensee captured this issue in their CAP as IR 1150198. The licensee's recommended corrective action at the time of the inspection was to revise the applicable calculation.

The inspectors confirmed that the frequency of selected surveillance procedures was at least as frequent as required by TSs or that frequencies were established based on monitoring results and consideration for conditions such as outages to ensure the systems are filled following potential draining. The licensee will: (1) evaluate resolution of TS issues with respect to the elements contained in the Technical Specification Task Force (TSTF) traveler; and (2) submit a license amendment request, if deemed necessary based on this evaluation, within 180 days following NRC approval of the TSTF.

Design: The inspectors reviewed selected design documents, performed system walkdowns, and interviewed plant personnel to verify that the design and operating characteristics were addressed by the licensee. Specifically:

- The inspectors assessed the licensee's efforts for identifying the gas intrusion mechanisms that applied to the plant and identified the following two examples where the licensee recognized gas intrusion mechanisms associated with the residual RH and Containment Spray systems:
 1. The licensee identified a failure to ensure that the ECCS mode of operation of RH would be capable of performing its mitigating function at Mode 4 following RH realignment from its decay heat removal mode of operation. The operability requirements of RH in Mode 4 defined by TS 3.5.3 were not translated into applicable procedures or specifications of the system in that neither the procedures nor design prevented the conditions that would lead to steam void formation during a Loss of Coolant Accident that initiated at this Mode resulting in steam binding of the system pumps and/or an adverse waterhammer. The licensee entered this concern in its CAP as IR 1147124 and, as an interim measure, implemented a standing order to establish controls to ensure that at least one RH train would be protected for its ECCS mode of operation in Mode 4. In addition, at the time of this inspection, the licensee planned to implement permanent procedural changes to ensure the operability of at least one RH train while in Mode 4. This issue, considered to be a performance deficiency identified

by the licensee, was determined to be of more than minor significance and it is discussed in Section 4OA7 of this report.

2. The licensee identified a failure to account for vortexing when determining the maximum available time to secure the containment spray additive tank. The applicable calculation assumed that nitrogen would intrude the system when the tank was completely drained. The licensee entered this concern in its CAP as IR 1148711 to track the completion of a vortexing calculation. The licensee also performed preliminary calculations that determined there was margin between the time they reached the low level setpoint and the time the tank outlet valves were isolated. In addition, alarm and emergency procedures directed the operators to close the isolation valves which would prevent gas intrusion. The licensee failed to identify that the calculation that determined the maximum available time to secure the CS additive tank did not account for vortexing. This issue, considered to be a performance deficiency identified by the licensee, was determined to be of more than minor significance and is discussed in Section 4OA7 of this report.
- The inspectors verified that the licensee's void acceptance criteria were consistent with NRR's void acceptance criteria. The inspectors also confirmed that: (1) the licensee addressed the effect of pressure changes during system startup and operation since such changes could significantly affect the void fraction from the initial value; and (2) the range of flow conditions evaluated by the licensee was consistent with the full range of design basis and expected flow rates for various break sizes and locations.

However, the inspectors noted that the licensee also relied on the use of the computer code GOTHIC to evaluate the acceptability of voids. This computer code factored in void transport behavior into the analysis by performing two-phase and two-component analysis of gas movement to predict such behavior as how a void volume in piping was translated into a transient void fraction at the entrance of a pump following pump start. The inspectors noted instances where the basis of this void assessment analysis tool was questionable. Specifically, the licensee used WCAP-16631-NP, "Testing and evaluation of gas transport to the suction of ECCS pumps," to show that GOTHIC can acceptably predict quantitative void transport behavior. WCAP-16631-NP documented tests that were conducted by Westinghouse to study the transport of a gas void through a piping system. The inspectors noted that test configuration and conditions differed from actual plant configuration and conditions, and questioned if the application of some of the test results was acceptable. For example:

1. The difference between test and plant pressures was not considered in assessing void decrease in the vertical test section. The pressure range used during the test was significantly lower than the typical range in nuclear power plants. This effect would be insignificant in a nuclear power plant due to the higher pressures. Therefore, the inspectors questioned if the void fraction change observed during testing would be analogous in a nuclear power plant.
2. Two phase fluid flow test data typically exhibited significant scatter. This was addressed by running many duplicate tests and carefully examining the test

results. However, NRR stated in ML090150637, "Forthcoming Meeting With The NEI To Discuss NRC GL 2008-01," that this effort was not fully successful and some of the conclusions were not adequately supported by the test data due to data scatter. For example, this effort did not address allowance for uncertainty and the effect of actual plant pressures in contrast to test pressures.

3. The inspectors questioned if the test report adequately considered a "water fall" effect (also known as "hydraulic jump") when the upper part of the vertical pipe was voided. Specifically, the inspectors questioned if the pipe length used for the test was representative of the limiting conditions of a plant. The inspectors were concerned if such an effect could propel air further down in the pipe than would be predicted using a single dimensional Froude number and would be of concern if the vertical pipe length was significantly less than the pipe used for the test.
4. The use of an average of pipe slopes to determine an equivalent pipe length associated with an elbow with a void reduction of 20 percent was debatable. For example, the average slope of -0.055 was obtained from slopes of -0.333, -0.15, and -0.0883. In addition, as discussed above, the 20 percent factor does not consider the pressures that will be encountered in nuclear power plants.

The inspectors discussed these observations with NRR. It was determined that these observations required further evaluation by NRR to (1) better understand the acceptability of the application of the test results contained in WCAP-16631-NP to void assessment analysis and (2) assess potential generic implications. Therefore, this Temporary Instruction will remain open until this issue is resolved.

- The inspectors selectively reviewed applicable documents, including calculations and engineering evaluations, with respect to gas accumulation in Containment Spray and Safety Injection systems. Specifically, the inspectors verified that these documents addressed venting requirements, keep-full systems, aspects where pipes are normally voided such as some CS piping inside containment, and void control during system realignments.

The inspectors identified one example where the licensee had not properly evaluated the effects of gas accumulation with respect to dynamic loads. Specifically, portions of the Containment Spray discharge piping are normally voided by design. However, neither the design nor operation of the system addressed the dynamic loads that would result when the voided piping is rapidly filled following system initiation. The details and enforcement of this issue are discussed in Section 4OA5.1.c of this report.

In addition, the inspectors noted that the licensee intended to change their UFSAR to include the piping location near the SI8811 and CS009A valves as acceptable unventable locations. The licensee accepted the potential void sizes at these piping locations of Safety Injection and Containment Spray using GOTHIC. Although the basis of this void assessment tool was questionable, the inspectors noted that the licensee used significant conservatism when assessing the void sizes at these locations. Consequently, it was determined, with assistance from NRR, that there is reasonable assurance that these unventable locations do not represent an adverse

condition pending further assessment of GOTHIC. This TI will remain open pending the resolution of this issue.

- The inspectors conducted a walkdown of selected regions of the Containment Spray, RH, and Safety Injection systems in sufficient detail to assess the licensee's walkdowns. The inspectors also verified that the information obtained during the licensee's walkdown was consistent with the items identified during the inspector's independent walkdown.
- In addition, the inspectors verified that the licensee had P&IDs and isometric drawings that describe the Containment Spray, RH, and Safety Injection system configurations and had confirmed the accuracy of the drawings. The inspectors' review of the selected portions of isometric drawings considered the following:
 1. Selected high point vents were identified.
 2. Selected high points that do not have vents were recognizable.
 3. Other areas where gas could accumulate and potentially impact subject system operability, such as at orifices in horizontal pipes, isolated branch lines, heat exchangers, improperly sloped piping, and under closed valves, were described in the drawings or in referenced documentation.
 4. Horizontal pipe centerline elevation deviations and pipe slopes in nominally horizontal lines that exceed specified criteria were identified.
 5. All pipes and fittings were clearly shown.
 6. The drawings were up-to-date with respect to recent hardware changes and that any discrepancies between as-built configurations and the drawings were documented and entered into the CAP for resolution.

The inspectors also conducted a similar walkdown of selected portions of the inaccessible Unit 1 RH system in an earlier inspection period. This additional activity counted towards the completion of this TI and was documented in Inspection Report 05000454/2009004; 05000455/2009004.

- The inspectors verified that licensee's walkdowns have been completed. In addition, the inspectors selectively verified that information obtained during the licensee's walkdowns were addressed in procedures, the CAP, and training documents.

Testing: The inspectors reviewed selected surveillance and post-maintenance procedures and results to verify that the licensee had approved and was using procedures that were adequate to address the issue of gas accumulation and/or intrusion in the selected systems. This review included the verification of procedures used for conducting surveillances and determination of void volumes to ensure that the void criteria was satisfied and would be reasonably ensured to be satisfied until the next scheduled void surveillance. The inspectors noted that the licensee had not established instructions for measuring pipe voids detected during surveillances of the ECCS performed using the venting method. The details and enforcement of this issue are

discussed in Section 4OA5.1.c of this report. Also, the inspectors reviewed procedures used for filling and venting following conditions, which might introduced voids into the subject systems, to verify that the procedures addressed testing for such voids and provided processes for their reduction or elimination.

Corrective Actions: The inspectors reviewed selected licensee's assessment reports, CAP documents, and trending data to assess the effectiveness of the licensee's CAP when addressing the issues associated with GL 2008-01. In addition, the inspectors verified that selected corrective actions identified in the licensee's 9-month and supplemental reports were documented. The inspectors also verified that commitments were included in the CAP. The inspectors noticed there was a planned modification to install a vent valve near the SI8811 valve. The SI8811 valve had a gas void which could not be vented. The licensee evaluated this condition through an operability evaluation which would remain open until the next refueling outage when they could install the vent.

The inspectors concluded that this TI must remain open for Byron Station and additional inspection will be necessary using this TI. Specifically, at the conclusion of this inspection period, questions remains unresolved regarding the use of GOTHIC to justify the acceptability of design basis changes associated with the subject of gas accumulation.

c. Findings

(1) Inadequate Instructions For Measuring ECCS Voids

Introduction: A finding of very low safety significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," was identified by the inspectors for the licensee's failure to establish instructions for measuring pipe voids detected during surveillances of the ECCS for gas accumulation. Specifically, instructions to measure the size of gas voids detected during venting at each Safety Injection, Chemical and Volume Control (CV) and RH system vent location were not provided so that the effect of the void on system operability could be evaluated.

Description: On November 24, 2010, the inspectors identified that the licensee failed to establish adequate instructions in surveillance procedures used to monitor ECCS for gas accumulation.

In response to GL 2008-01, the licensee committed to revise the periodic venting procedures for the GL 2008-01 subject systems to include enhanced acceptance criteria and requirements to perform UT examinations on a graded approach as part of venting verifications of accessible high points.

In Section F of procedures 1BOSR 3.5.2.2-1, "Unit One ECCS Venting and Valve Alignment Monthly Surveillance," and 2BOSR 3.5.2.2-1, "Unit Two ECCS Venting and Valve Alignment Monthly Surveillance," the licensee established instructions to vent the Safety Injection system, CV system, RH pumps, and associated piping to satisfy TS Surveillance Requirements. A note in this section states: "If UT [Ultrasonic Testing] exam cannot be performed due to extenuating circumstances (safe access, radiological concerns, etc.) at a location with an installed vent valve, then NOTIFY the Shift Manager to manually vent the location. An IR shall be generated to document the inability to perform the UT exam." Section 4, following the note referenced above states: "If UT is

not to be performed at a location, then vent the location using the generic guidance show on Attachment A.” Attachment A, “Generic Venting Procedure,” allows venting ECCS pipe locations without recording any data to estimate the size of a gas void, if present. The licensee had applied these provisions to vent in lieu of a UT examination since inception of these procedures. As an example, Attachment D3 of the BOSR 5.2.2-1 lists eight locations which the licensee identified as not being able to be examined by UT and must be vented.

Step 4.8.1 of procedures ER-AA-2009, “Managing Gas Accumulation,” states: “Monitoring of susceptible locations is performed in such a manner that ensures the potential gas accumulation can be quantified before it is lost. Ultrasonic Testing measurements must be made prior to venting of any gas accumulation or capture of gas during venting if post-venting volume measurements are made.” This information is necessary to ensure the licensee could estimate the size of gas voids identified during venting of ECCS piping. However, specific instructions was not provided for measuring or capturing potential voids at other RH, CV, and SI vent valve locations that could be opened to detect the presence of gas voids. The inspectors also noted that these procedures did not specify how to time the duration of the venting operation (e.g., record duration of gas flow using a stopwatch).

As a corrective action, the licensee initiated IR 1144576 to document this concern. The licensee stated that they intended to continue to brief staff on their expectations for performing these surveillance procedures until procedure revisions were issued to provide additional guidance for recording data to size ECCS voids identified during venting operations.

Analysis: The inspectors determined that the licensee’s failure to provide instructions for measuring pipe voids during ECCS venting was contrary to the requirements of 10 CFR Part 50, Appendix B, Criterion V, and was a performance deficiency. The performance deficiency was determined to be more than minor because if left uncorrected it would have the potential to lead to a more significant safety concern. Specifically, since the licensee’s procedures do not contained instructions to properly document the void size when venting, the potential exists for an unacceptable void to go undetected affecting ECCS operability. Inoperable ECCS trains would place the plant at increased risk for core damage, which would affect the safety of an operating reactor.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, “Significance Determination Process,” Attachment 0609.04, “Phase 1 - Initial Screening and Characterization of findings,” Table 4a for the mitigating system cornerstone. The finding screened as of very low safety significance (Green) because the finding was a qualification deficiency confirmed not to result in loss of operability or functionality. Specifically, the licensee performed a history review of their CAP documents since the implementation of their resolution of GL 2008-01 and did not find any examples where a void was detected by venting activities.

The inspectors did not find an applicable cross-cutting aspect which represented the underlying cause of this performance deficiency; therefore, no cross-cutting aspect was assigned.

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” required, in part, that activities affecting quality shall be prescribed by

documented instructions, procedures, or drawings, of a type appropriate to the circumstances.

Contrary to the above, as of November 24, 2010, the licensee did not establish ECCS surveillance procedures appropriate to the circumstances. Specifically, instructions were not provided to measure the size of gas voids detected by venting surveillances at each CV, SI, and RH system vent location so that the effect of a void on system operability could be evaluated. Because this violation was of very low safety significance and it was entered into the licensee's CAP as IR 1144576, this violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the NRC Enforcement Policy.

(NCV 05000454/2011002-04; 05000455/2011002-04; Inadequate Instructions for Measuring ECCS Voids)

(2) Failure To Evaluate The Effects Of Dynamic Loads At The CS Discharge Piping

Introduction: A finding of very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified by the inspectors for the licensee's failure to evaluate the effects of dynamic loads at the CS discharge piping. Specifically, neither the structural design nor operation of the CS system addressed the dynamic loads that would result when normally voided discharge piping rapidly fill following system initiation.

Description: On December 1, 2010, the inspectors identified that the licensee had not evaluated the potential effects of dynamic loads on the discharge piping of CS resulting from flow transients. The inspectors were concerned because portions of the CS discharge piping are normally voided by design and neither the structural design nor operation of the system addressed the dynamic loads that would result when the voided piping is rapidly filled following system initiation.

The CS system is designed to remove fission products, primarily iodine, from the containment atmosphere for the purpose of minimizing the offsite radiological consequences following the design-basis LOCA. At the same time, the spray water serves to nominally reduce containment temperature and pressure. In addition, the CS additive tank provide a sufficient quantity of 30 percent to 36 percent NaOH solution to the containment to form an 8.0-10.5 pH solution when combined with the spilled RCS water, the Safety Injection accumulator inventory, and the RWST inventory. This range of pH values bounds the evaluation of pH effects on equipment qualification and hydrogen generation described in the UFSAR.

The licensee incorporated ASME Section III into the design basis for the safety related portion of CS. American Society of Mechanical Engineer's Section III, 74-S75, NC-3112.3, "Design Mechanical Loads," stated that "Impact forces caused by either external or internal conditions shall be considered." Dynamic loads induced by flow transients are impact forces caused by an internal condition. However, the Piping System Specific Design Specification for CS, Document No. 01-10-52, "Commonwealth Edison Company, Byron/Braidwood Stations, Units 1 and 2, Piping Design Specifications," Section CL2-3.5.3.6, "Flow transient analysis," stated that "No dynamic loads due to flow transient forces are considered in the analysis of the CS system." Since the structural design of CS did not consider dynamic loads, the inspectors questioned if the system was operated in a manner that would ensure that the resulting dynamic loads would be negligible when the system fills with water following system

initiation. The licensee confirmed that the operation of the system had not been evaluated to determine whether or not the resulting dynamic loads were negligible. Specifically, the system was initiated via automatic action and the design of the automatic initiation did not consider dynamic loads induced by flow transients.

The resulting dynamic loads from a voided system are discussed in GL 2008-01. For instance, GL 2008-01 stated that additional work might be necessary to develop realistic criteria to determine the amount of gas that could impact operability including allowable limits for the pump discharge piping to alleviate water cannon effects on the piping. In addition, GL 2008-01 discusses operating experiences related to dynamic loads resulting from gas accumulation/intrusion issues.

The inspectors confirmed the piping at the containment penetration was always filled with water. Thus, no dynamic load would be induced on the penetration as the line was filled. Specifically, the CS containment isolation valves were cycled (i.e., opened and closed) once a quarter allowing the water level in the CS piping in containment to equalize with the water level in the RWST. The elevation of the minimum water level required by TS is greater than the elevation of the containment penetrations. Therefore, the inspectors were not concerned with the integrity of the containment structure. However, an adverse dynamic load at the CS system discharge piping inside containment could render the system incapable of meeting its design basis functions.

As a result of the inspectors concerns, the licensee performed an evaluation that establish reasonable assurance that the resulting dynamic loads following system initiation would not exceed ASME operability allowables. The inspectors did not have further concerns. The licensee captured the inspectors concerns in their CAP as IR 1148874. The licensee's recommended corrective action at the time of the inspection was to include an evaluation of dynamic loads into the design basis of CS.

Analysis: The inspectors determined that the failure to evaluate the effects of dynamic loads at the CS discharge piping was contrary to ASME Section III, 74-S75, NC-3112.3 and was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Containment Barrier Cornerstone attribute of the Systems, Structures, and Components (SSC) and barrier performance and affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the inspectors had reasonable doubt on the operability of the CS system and the integrity of the reactor containment because the effects of flow transient induced dynamic loads in the CS discharge piping were not analyzed.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Appendix H, "Containment Integrity Significance Determination Process," Table 6.1, "Phase 1 Screening-Type B Findings at Full Power." The finding screened as Green because it did not affect either core damage frequency (CDF) or large early release frequency (LERF). Specifically, this containment spray issue impacted late containment failure and source terms, but not CDF or LERF.

The inspectors determined that this finding had a cross-cutting aspect in the area of problem identification and resolution because the licensee did not thoroughly evaluate external operating experience. Specifically, the licensee did not address potential water

cannon effects at the CS discharge piping when evaluating the subject of gas accumulation/intrusion as requested by GL 2008-01. (P.2(a))

Enforcement: 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. American Society of Mechanical Engineer's Section III, 74-S75, NC-3112.3 was included in the design bases for the safety related portion of the CS system.

Contrary to the above, until December 1, 2010, the design control measures failed to translate applicable design basis into specifications. Specifically, neither the structural nor automatic initiation design of the CS system considered flow transient induced dynamic loads as required by ASME Section III, 74-S75, NC-3112.3. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as IR1148874, this violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000454/2011002-05; 05000455/2011002-05).

40A6 Management Meetings

.1 Exit Meeting Summary

On April 15, 2011, the inspectors presented the inspection results to Mr. T. Tulon and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

.2 Interim Exit Meetings

Interim exits were conducted for:

- The results of Occupational Dose Assessment and In-Plant Airborne Radioactivity Control and Mitigation inspection with the Site Vice President, Mr. D. Enright, on January 14, 2011, and Mr. T. Tulon on March 25, 2011.
- The results of TI 2515/177: Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems (NRC GL 2008-01) inspection with Mr. E. Hernandez, on March 15, 2011.

The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

40A7 Licensee-Identified Violations

The following violations of very low safety significance (Green) were identified by the licensee and are violations of NRC requirements which meet the criteria of Section 2.3.2 of the NRC Enforcement Policy for being dispositioned as an NCV.

- A finding of very low safety significance (Green) and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified by

the licensee for the failure to ensure that the ECCS mode of operation of residual heat removal would be capable of performing its mitigating function in Mode 4 following residual heat removal system realignment from its decay heat removal mode of operation. Specifically, the operability requirements of RH in Mode 4 defined by TS 3.5.3 were not translated into applicable procedures or specifications of the system in that neither the procedures nor design prevented the conditions that would lead to steam void formation during a LOCA that initiates at this Mode resulting in steam binding of the system pumps and/or an adverse water-hammer. The performance deficiency was determined to be more than minor because it was associated with the Mitigating Systems cornerstone attribute of Equipment Performance and adversely affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. An SDP Phase II evaluation concluded that the finding screened as having very low safety significance. The licensee entered this concern in their corrective action program as IR 1147124 and, as an interim measure, implemented a standing order for the residual heat removal system to establish controls to ensure that at least one residual heat removal train would be protected in its ECCS mode of operation in Mode 4. In addition, at the time of this inspection, the licensee planned to implement permanent procedural changes to ensure the operability of at least one residual heat removal train while in Mode 4.

- A finding of very low safety significance (Green) and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified by the licensee for the failure to account for vortexing when determining the maximum available time to isolate flow from the containment spray additive tank. Specifically, the applicable calculation assumed that nitrogen would enter the system when the tank was completely drained. The performance deficiency was determined to be more than minor because it was associated with the Barrier Integrity cornerstone attribute of Structures, Systems, Components, and Barrier Performance and adversely affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. The finding screened as having very low safety significance because it was a design deficiency of the physical integrity of the reactor containment that did not: (1) affect the barrier function of the control room against smoke or a toxic atmosphere; (2) represent an actual open pathway in the physical integrity of reactor containment; and (3) involve an actual reduction in function of hydrogen igniters in the reactor containment. The licensee entered this concern in their corrective action program as IR 1148711 to track the completion of a vortexing calculation. The licensee also performed preliminary calculations that determined there was margin between the time the low level setpoint was reached and the time the tank outlet valves were isolated. In addition, alarm and emergency procedures directed the operators to close isolation valves to prevent gas intrusion.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

T. Tulon, Site Vice President
B. Adams, Plant Manager
D. Gudger, Regulatory Assurance Manager
T. Leaf, Operations Senior License Holder
B. Barton, Radiation Protection Manager
E. Hernandez, Engineering Director
J. Pitman, Mechanical Maintenance Superintendent
S. Swanson, Nuclear Oversight Manager
R. Gayheart, Training Director
P. Dempsey, Communications Manager
B. Askren, Security Director
J. Feimster, Design Engineering Manager

Nuclear Regulatory Commission

E. Duncan, Chief, Reactor Projects Branch 3
B. Bartlett, Senior Resident Inspector
J. Robbins, Resident Inspector

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000454/2010001-00	LER	Technical Specifications Allowed Outage Time Extension Request for Component Cooling System Contained Inaccurate Design Information That Significantly Impacted the Technical Specification
05000454/2011002-01	NCV	Auxiliary Feedwater Pump Heat Exchanger Configured Incorrectly (Section 1R07)
05000455/2011002-02	NCV	Self-Revealed Low Flow to Reactor Containment Fan Cooler (Section 1R22)
05000454/2011002-03; 05000455/2011002-03	NCV	Out of Date/Expired Respirator Cartridges (Section 2RS3.3)
05000454/2011002-04 05000455/2011002-04	NCV	Inadequate Instructions for Measuring ECCS Voids (Section 4OA5.1.c(1))
05000454/2011-002-05 05000455/2011-002-05	NCV	Failure to Evaluate the Effects of Dynamic Loads at the CS Discharge Piping (Section 4OA5.1.c(2))

Closed

05000454/2011002-01	NCV	Auxiliary Feedwater Pump Heat Exchanger Configured Incorrectly (Section 1R07)
05000455/2011002-02	NCV	Self-Revealed Low Flow to Reactor Containment Fan Cooler (Section 1R22)
05000454/2011002-03; 05000455/2011002-03	NCV	Out of Date/Expired Respirator Cartridges (Section 2RS3.3)
05000454/2011002-04 05000455/2011002-04	NCV	Inadequate Instructions for Measuring ECCS Voids (Section 4OA5.1.c(1))
05000454/2011002-05 05000455/2011002-05	NCV	Failure to Evaluate the Effects of Dynamic Loads at the CS Discharge Piping (Section 4OA5.1.c(2))

Discussed

None

LIST OF DOCUMENTS REVIEWED

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspector reviewed the documents in their entirety, but rather that selected sections or portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

Section 1R04: Equipment Alignment (Quarterly)

- Critical Control Room Drawing; Diagram M-61 of Safety Injection, Sheet Number 1A
- BOP SI-E1B; Unit 1, Train B Electrical Lineup, Revision 4
- BOP SI-M1B; Train B Safety Injection System Valve Lineup, Revision 3
- BOP CV-19, Revision 17; Switching Charging Pumps
- BOP CV-1B, Revision 23; Unit 2 Startup of the CV System
- BOP CV-27, Revision 0; Operation of the Reactor Makeup System in the Emergency Mode
- BOP CV-6, Revision 25; Operation of the Reactor Makeup System in the Borate Mode
- BOP CV-E2, Revision 5; Chemical and Volume Control Electrical Lineup, Unit 2
- BOP CV-E2B, Revision 1; Chemical and Volume Control Train B Electrical Lineup
- BOP CV-M2, Revision 27; Unit 2 Chemical and Volume Control System Valve Lineup
- Drawing M-138, Sheet 3A, Diagram of Chemical and Volume Control and Boron Thermal Regeneration, Revision AV
- BOP CC-14, Revision 9; Post LOCA Alignment of the CC System
- BOP CC-15, Revision 6; Switching Operating and Standby Component Cooling System Pumps
- BOP CC-8, Revision 9; Isolation of CC Between Units 1 and 2
- BOP CC-E1, Revision 5; Component Cooling System Electrical Lineup (Unit 1)
- BOP CC-E1A, Revision 1; Component Cooling System Train A Electrical Lineup
- BOP CC-E1B, Revision 1; Component Cooling System Train B Electrical Lineup
- BOP CC-M1, Revision 25; Component Cooling System Valve Lineup
- BOP CC-M1A, Revision 4; Train A Component Cooling System Valve Lineup (Train A Safety Loop and Seal Water HX)
- BOP CC-M1B, Revision 6; Train B Component Cooling System Valve Lineup (Train B Safety Loop and Seal Water HX)
- BOP CC-M1C, Revision 2; Train C Component Cooling System Valve Lineup
- BOP CC-T2, Revision 10; Component Cooling Throttle Valve Position List
- Drawing M-66, Sheet 1A, Diagram of Component Cooling, Revision AV
- Drawing M-66, Sheet 1B; Diagram of Component Cooling, Revision AJ
- Drawing M-66, Sheet 2; Diagram of Component Cooling, Revision AJ
- Drawing M-66, Sheet 3A; Diagram of Component Cooling, Revision AT
- Drawing M-66, Sheet 3B; Diagram of Component Cooling, Revision AN
- Drawing M-66, Sheet 4A; Diagram of Component Cooling, Revision AV
- Drawing M-66, Sheet 4B; Diagram of Component Cooling, Revision BB
- Drawing M-66, Sheet 4C; Diagram of Component Cooling, Revision AO
- Drawing M-66, Sheet 4D; Diagram of Component Cooling, Revision AQ
- BEP-0, Revision 201; Reactor Trip on Safety Injection Unit 1
- 1BEP-1, Revision 201; Loss of Reactor on Secondary Coolant Unit 1
- 1BEP ES-1.3, Revision 201; Transfer to Cold Leg Recirculation Unit 1
- 1BOA Pri-6, Revision 106; Component Cooling Malfunction Unit 1

Section 1R05: Fire Protection (Quarterly)

- Byron Pre-Fire Plan, Aux. Bldg. 426'-0 Elev., Division 11 ESF Switchgear Room (Zone 5.2-1)
- Byron Pre-Fire Plan, Aux. Bldg. 426'-0 Elev., Laundry Room (Zone 11.6C-0)
- Byron Pre-Fire Plan, Aux. Bldg. 346'-0 Elev., General Area – Southwest (Zone 11.2-0 Southwest)
- Byron Pre-Fire Plan, Aux. Bldg. 346'-0 Elev., General Area – West (Zone 11.2-0 West)
- Byron Pre-Fire Plan, Aux. Bldg. 346'-0 Elev., General Area – North (Zone 11.2-0 North)
- Byron Pre-Fire Plan, Aux. Bldg. 346'-0 Elev., General Area – South (Zone 11.2-0 South)
- Byron Pre-Fire Plan, Aux. Bldg. 346'-0 Elev., General Area – Northwest (Zone 11.2-0 Northwest)
- Byron Pre-Fire Plan, Aux. Bldg. 414'-0 Elev., Unit 1 Electrical Penetration Area (Zone 11.5A-1, 11.5B-1)
- Byron Pre-Fire Plan, Aux. Bldg. 451'-0 Elev., HVAC Exhaust Complex (Zone 11.7-0 South)
- TCP 11-006; Transient Combustible Permit, dated March 1, 2011
- OP-AA-201-009; Control of Transient Combustible Material, Rev. 11
- W/O 1197473, TRM Fire Damper 18-mth Visual Inspection, June 18, 2010

Section 1R07A: Heat Sink Performance (Annual)

- M-2544A-77/M-43-3; Unit 1 Essential Service Water Drawing, Rev. C/K
- EC 382473; 1B AF Pump Lube Oil Cooler Piping Wrong, Rev. 0
- EC 383794; Evaluation of 1AF01AB (AF Lube Oil Heat Exchanger), March 23, 2011
- WO 1394193; Inconsistent SX Piping Configuration for 1B AF PP Lube Oil Heat Exchanger, March 28, 2011

Section 1R12: Maintenance Effectiveness (Quarterly)

- EC 382958; Evaluation of DC Battery 112 Jumper Cable
- IR 116509; Jumper Cable Material Appears to be Wrong, January 21, 2011
- EC 157172; Need Eval On this Lug for Making-Up Jumpers for Changing Out Safety-Related Batteries (125 VDC), September 15, 1999
- WO 990069106; Misc Elect Battery and DC Distribution System, April 6, 2000
- EC 398100; Verify that NDIT BYR-2001-009, Rev. 0 Can Be Utilized To Meet The Limitation Listed In Step 3.2.4 of MA-MW-726-605 for Jumpering Out Cell 42 of Battery 112, December 1, 2010
- MA-BY-721-061; 125 Volt Battery Bank Quarterly Surveillance, Rev. 12
- WO 99070876; Jumper Out Degraded Battery Cell – Batt 112 (Contingency), December 2, 2010
- ACI 201.1R-92; Guide for Making a Condition Survey of Concrete in Service
- ACI 349.3R-96; Evaluation of Existing Nuclear Safety-Related Concrete Structures
- CHRON 114001; Inspection of River Screen House and Essential Service Water Cooling Tower Structures, September 23, 1991
- CHRON 204695; Results of 1993 Concrete Inspection of Essential Service Water Cooling Towers and River Screen House at Byron Station, October 18, 1993

Section 1R13: Maintenance Risk Assessments and Emergent Work Control (Quarterly)

- OU-AA-103; B1R17; BUS 132X Outage – Yellow, March 26 – 27, 2011
- OU-AA-103; B1R17; BUS 132X Outage – Yellow, March 28 – 29, 2011
- OU-AP-104; Shutdown Safety Management Program Byron/Braidwood Annex, Revision 15

- OU-AP-104; No Fuel in RX Vessel, Revision 15
- Issue 1194743; Lessons Learned - B1R17 Impact to OLR Profile to Unit 2, March 30, 2011

Section 1R15: Operability Evaluations (Quarterly)

- IR 1172646; Discrepancies Noted from Closed PM Service Request, February 08, 2011
- IR 1172938; Voided SX to AF Suction Piping, January 31, 2011
- OpEval 011-003; Voided Section of SX to AF Piping – AF Pump Suction, Revision 000
- IR 1172938; Voided Essential Service Water to Auxiliary Feedwater Suction Piping, January 31, 2011
- IR 1194324; Preliminary Results – Auxiliary Feedwater Void Calculations, March 29, 2011
- IR 1197017; Missed Opportunity for Earlier ID of AF Issue, April 3, 2011
- 1BOSR 0.5-3.AF.1-1; Unit One ASME Surveillance Requirements for the A Train Auxiliary Feedwater SX Supply Valves, Rev. 9
- AF-31; Auxiliary Feedwater Isometric, Rev. 8
- Test Data for 1AF006A and 1AF017A for previous 18 Months
- Test Data for 1AF006B and 1AF017B for previous 18 Months
- Test Data for 2AF006A and 2AF017A for previous 18 Months
- Test Data for 2AF006B and 2AF017B for previous 18 Months
- EC 379027; SER 02-05 Evaluation for Voids in AF System, Rev. 0

Section 1R18: Plant Modifications (Quarterly)

- EC 372807; Modify the MOV Closure Control Schemes of 1AF017A and 1AF017B, Revision 0
- EC 383229; Fill Empty Pipe Between 1AF006A and 1AF017A, Close Drain Valve 1AF018A, and Throttle Open Vent Valve 1AF030A, February 14, 2011
- WO 1278688-01; Revise Control Logic of 1AF017A Per EC 372807, March 21, 2011
- WO 1278688-07; Installer Test 1AF017A Per EC 372807, March 23, 2011
- WO 1421515-01; Unit 1 Auxiliary Feedwater Valves Train A Indication Test, March 24, 2011

Section 1R19: Post-Maintenance Testing (Quarterly)

- WO 11266980 01; MOV PM, Actuator Inspection, Diagnostic Testing, October 29, 2010
- WO 01273140 01; STT/PIT for 1SI8813, February 18, 2011
- 1BOSR 0.5-2.SI.5; Unit 1 1SI8813 Stroke Time and Position Indication Test, Revision 5
- IR 1185564, 1MS016A Lifted Outside 2.5 Percent Acceptance Criteria, March 9, 2011
- WO 1272177-01, Main Steam Safety Valves Operability Test, March 10, 2011
- WO 127, 1MS016A IST Trevitest, March 11, 2011
- WO 1267883-06, OPS PMT: 1AF006A – Perform PIT and STT, March 24, 2011
- WO 1263306-02, OPS PMT: 1SX01PA – Leak Check and Proper Oil Level/Pressure, March 23, 2011
- WO 794862-02, OPS PMT: 1SX01PA – Verify Normal Oil Pressure/Temp with PP Run, March 23, 2011
- WO 1119412-02, SEE PMT – 1SX01PA VT-2 (Need 1A SX PP Running), March 23, 2011
- WO 1119412-28, OPS 1SX01PA – Complete Fill Oil Res. After Initial Pump Start, March 23, 2011
- 1BOSR 0.5-3.AF.1-1, Unit 1 ASME Surveillance Requirements for the A Train Auxiliary Feedwater SX Supply Valves
- 1BOSR 5.5.8.SX.5-2c; Unit 1 Comprehensive Inservice Testing (IST) Requirements for the Essential Service Water (SX) Pump 1SX01PB and Unit 1 SX Pumps Discharge Check Valves, Revision 3

Section 1R20: Refueling and Other Outage Activities (Quarterly)

- IR 1176125; B1R17 Independent SDR Assessment Results, February 16, 2011
- BOP RH-8; Filling the Refueling Cavity for Refueling, Revision 19
- BMP 3118-1; Reactor Vessel Closure Head Removal, Revision 29
- NS-CE-1104; ReSAR 41; Drop Analysis, June 11, 1976
- MA-AP-7330381; Polar Crane Monthly/Yearly Inspection, Revision 5
- 1BGP 100-4; Power Dissension, Revision 41
- 1BGP 100-5; Plant Shutdown and Cooldown, Revision 57
- 1BGP 100-6; Refueling Outage, Revision 43
- 1BGP 100-6T4; Core Alteration/Fuel Movement Checklist, Revision 14
- NF-BY-310-2000; Special Nuclear Material and Core Component Movement Requirements for Byron, Revision 4
- NF-AA-309; Special Nuclear Material and Core Component Move Sheet Development, Revision 2
- OU-AA-101-1001; Outage Control Center Norms, Revision 8
- OU-AA-103; Shutdown Safety Management Program, Revision 11
- BOP RH-8; Filling the Refueling Cavity for Refueling, Revision 19
- Selected B1R17 OCC Outage Status, March 14 to March 31, 2011
- Selected B1R17 Outage News, March 14 to March 31, 2011
- B1R17 Shutdown Risk Assessment Check-In 01153319-01, February 07, 2011

Corrective Action Documents As a Result of NRC Inspection

- IR 1196650; Improper Procurement of 1B RCP Hydranuts FME Screw, April 02, 2011
- IR 1190237; NRC Identified Concerns with Cart Chocking-Potential Seismic Issue, March 21, 2011
- IR 1194679; B1R17 Walkdown – NRC Identified Issues, March 29, 2011

Section 1R22: Surveillance Testing (Quarterly)

- WO 1396773 01; 2BOSR 8.1.2-1, 2A DG Monthly Surveillance, January 18, 2011
- 2BOSR 6.6.2-1; Unit 2 Reactor Containment Fan Cooler Monthly Surveillance, Revision 25
- 2BOSR 8.1.2-1; Unit 2 Diesel Generator Operability Surveillance, Revision 21
- 2BOSR DG-8A; Unit 2 DG Turbocharger Spin Down Measurement, Revision 0
- IR 1142380; SX Flow for Unit 2 RCFC Below Desired Flow, November 18, 2010
- IR 1165434; Unplanned LOCAR Entry During Unit 2 RCFC Monthly Surveillance, January 21, 2011
- IR 1176023; 3 Loose Clamps on 2A DG Fuel Line, February 16, 2011
- IR 0300397; SSD&PC Issue with 1/2 BOSR 6.6.2-1, February 11, 2005
- IR 1084537; SX Flow for 2D RCFC Below Acceptance Criteria, June 25, 2010
- WO 1382657; 2SI001PB Group A IST Group A Pump Test, January 27, 2010
- Unit 2 Safety Injection System Health Reports, Updated on September 30, 2010
- WO 1398103; Unit 2 Train B AF Pump Surveillance, January 31, 2011

Corrective Action Documents As a Result of NRC Inspection

- IR 1170674; NRC Walkdown Identifies Bolting/Cabinet Closure Items, February 01, 2011

Section 2RS3: In-Plant Airborne Radioactivity Control and Mitigation (71124.03)

- Check-In Self-Assessment Report; Assignment #1123224; In-Plant Airborne Controls & Mitigation; 12/10/2010
- RP-AA-302; Determination of Alpha Levels and Monitoring; Revision 3
- RP-AA-440; Respiratory Protection Program; Revision 9
- RP-AA-825; Maintenance, Care and Inspection of Respiratory Protective Equipment; Revision 3
- RP-BY-825-1000; Maintenance, Care and Inspection of the ISI Viking Self-Contained Breathing Apparatus (SCBA); Revision 14
- PosiChek3 Test Results; ISI Viking Digital H/P; Serial Number 106637010055; 12/17/2009
- PosiChek3 Test Results; ISI Viking Digital H/P; Serial Number 106637010055; 10/12/2010
- PosiChek3 Test Results; ISI Viking Digital H/P; Serial Number 106637010002; 12/16/2009
- PosiChek3 Test Results; ISI Viking Digital H/P; Serial Number 106637010002; 10/12/2010
- PosiChek3 Test Results; ISI Viking Digital H/P; Serial Number 106637010055; 12/17/2009
- PosiChek3 Test Results; ISI Viking Digital H/P; Serial Number 106637010061; 12/17/2009
- PosiChek3 Test Results; ISI Viking Digital H/P; Serial Number 106637010061; 10/12/2010
- Course Code 06GRS2; Respiratory Level 2, ISI Viking SCBA; 4/20/2005
- IR 1161658; UFSAR Table 3.5-10 Contains Error; 1/12/2011 (NRC Identified)
- IR 1161398; RPT Procedure Compliance Deficiency Identified; 1/11/2011 (NRC Identified)
- IR 1161404; Procedure Issues w/ RP-BY-825-1000; 1/11/2011 (NRC Identified)
- IR 1161410; Respirator Cartridges past Expiration Dates; 1/11/2011 (NRC Identified)

Section 2RS4: Occupational Dose Assessment (71124.04)

- NUPIC Audit SA10-017; Mirion Technologies (GDS) Inc.; 1/3/2011
- Check-In Self-Assessment Report; Assignment #01097709-02; Dosimetry; 11/23/2010
- National Voluntary Laboratory Accreditation Program; Scope of Accreditation to ISO/IEC 17025:2005; NVLAP code 100555-0; Mirion Technologies (GDS) Inc.; Effective Dates 7/01/2010 through 6/30/2011
- RP-AA-211; Personnel Dosimetry Performance Verification; Revision 9
- RP-AA-211-2001; Radiation Protection Position Paper; Revision 1
- Personnel Dosimetry Performance Verification Results; 1st Quarter 2009 through 4th Quarter 2010
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- Byron Station Small Articles and Personnel Monitor Sensitivity Studies; 6/4/2010
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- IR 1064837; Area TLDs for the 1st Quarter of 2010; 5/3/2010
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Section 4OA1: Performance Indicator Verification (71151)

- Monthly Data Elements for NRC/WANO Unit/Reactor Shutdown Occurrences, March 2010 to February 2011

Section 4OA2: Identification and Resolution of Problems (71152)

- IR 1165006; Potential Concern with Westinghouse Containment Analysis, January 20, 2011
- IR 1178918; Tavg Coastdown Not Accounted for in MTO EC, February 23, 2011
- EC 383225; Operations Evaluation 11-002, Containment Pressure Analysis Error
- IR 1182838; Pressurizer Steam Space Sample Line Leak 1PS01CA, March 03, 2011
- IR 1183522; Unit 1 Train A SX Pump Room Sump Pump Not Pumping, March 04, 2011
- BOP CC-14; Post LOCA Alignment of the CC System, Revision 9, March 15, 2011
- OP-AA-111-101; Attachment 4, Model Log Entries, Rev. 6
- IR 774487; Containment Drain Leak Detection Flow High Alarm, May 12, 2008
- IR 793989; Unexpected Alarm Containment Drain Leak Detection Flow High, July 7, 2008
- IR 812092; Containment Drain Leak Detection Flow High Alarm, August 28, 2008
- IR 962490; Containment Drain Leak Detection Flow High Alarm, September 8, 2009
- IR 109547; Containment Drain Leak Detection Flow High Alarm, September 14, 2010
- IR 1162042; Unexpected Alarm Received, January 13, 2011
- Review of Operator Logs from January of 2008 through December of 2010
- EC 367065; Op Eval 07-007, Main Steam PORV Steam Relief Capacity, Rev. 3
- EC 376149; SG Volume Impact on Steam Generator Tube Rupture Margin to Overfill, Rev. 0

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- IR 1175772; NRC Regional Administrator Plant Walkdown Identifies Poor Housekeeping, February 16, 2011
- IR 1175941; NRC Concern with Installed Catch Basin Upstream of 2WG046
- IR 1185515; 2A DG CBM WO Cancelled, March 08, 2011
- IR 1189122; NRC Identified Minor Dry Fitting Leakage – 2FT-SI049
- IR 1189124; NRC Identified Minor Dry Fitting Leakage – 2FT-CS011
- IR 1175575; NRC Identified Improper Flagging on Control Switch in Main Control Room

Section 4OA3: Event Follow-Up (71153)

- NUREG/CR-4404; Analysis of Allowed Outage Times at the Byron Generating Station, June 1986
- 50.59 Review Coversheet Form; Alignment of the U-0 CC Pump and U-0 CC HX to a Unit, Post LOCA Alignment of the CC System, Isolation of CC Between Units 1 and 2, Alignment of the 0CC Pump to a Unit, Post LOCA Alignment of the CC System, Revision 1/1
- BB-MISC-009; Risk Management Review of Actions to Restore RH/CC System 7-Day AOTs, Revision 0
- WCAP-10526, Volume 1 and 2; Byron Generating Station Limiting Conditions for Operation Relaxation Program, April 1984
- Generic Letter 80030; Clarification of the Term “Operable” As it Applies to Single Failure Criterion for Safety Systems
- 50.59 Screening No. 6D-11-009/BRW-S-2011-37; BOP CC-10, BOP cc-14, BwOP CC-10, BwOP CC-14, Revision 0/0
- BOP CC-14; Post LOCA Alignment of the CC System, Revision 9
- BOP CC-10; Alignment of the U-0 CC Pump and U-0 CC HX to a Unit, Revision 25

- Standing Order Log Number 10-046; Component Cooling Water Pump and Residual Heat Removal Administrative Controls
- Standing Order Log Number 10-045; BOP CC-14 Performance during 1/2 BEP ES-1.3, November 12, 2010
- Standing Order Log Number 11-002; Component Cooling Water Pump and Residual Heat Removal Administrative Controls, January 13, 2011
- Standing Order Log Number 08-057; CC System Lineup During Cold Leg Recirc, December 11, 2008
- Amendment No. 14 to Facility Operating License No. NPF-37, January 21, 1988
- Root Cause #1139610; Inadequate License Amendment Request (LAR) Submittal for Component Cooling (CC)
- NRC Administrative Letter 98-10; Dispositioning of Technical Specifications That Are Insufficient to Assure Plant Safety, December 29, 1998
- License Amendment Request; Extend AOTs, September 29, 1987
- IR 880653; Design Deficiency in CC Surge Tank Makeup, February 13, 2009
- IR 1047544; Excessive Auto M/U to Unit 1 CC Surge Tank, March 25, 2010
- IR 1086976; CC Post-LOCA Passive Failure Licensing Basis Issue, July 01, 2010
- IR 1087703; Unexpected CC Surge Tank Level High Alarm, July 04, 2010
- IR 1090055; Indicated CC Surge Tank Level Change, July 12, 2010
- IR 1092613; Unit 2 CC Auto Makeup Above Expected Frequency, July 20, 2010
- IR 1097617; Component Cooling Design Concerns Not Resolved, August 03, 2010
- IR 1096383; Component Cooling Design Bases Concerns, July 30, 2010
- IR 1098089; Request CC Issues Be Addressed Using OP-AA-106-101-1002, August 04, 2010
- IR 1103555; CC Actions Assigned Without Required Support, August 17, 2010
- IR 1139610; Potential Non-Conservative Tech Specs for Component Cooling, November 12, 2010
- IR 1139728; CC System OLR Impact From IR 1139610, November 12, 2010
- IR 1141377; Additional Actions for Potential Non-Conservative TS, November 17, 2010
- IR 1141689; Request CC Op Evaluation be Cancelled, November 17, 2010
- IR 1143876; Use OP-AA-106-101-1002 for CC Issues Second Request, November 22, 2010
- IR 1150275; Inaccurate/Premature INFO in Gatehouse Handout, December 09, 2010
- IR 1159384; Issues Raised to Managers/Directors Not Resolved, January 06, 2011
- IR 1181858; Differences Between CC LAR Assumptions and System Operation, March 01, 2011
- IR 8700700; CDBI FASA; CC Surge Tank Makeup ASME Class Break Concern, January 23, 2009
- PIF 82000-01837; BOP CC-14, June 29, 2000
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- IR 841395; CDBI FASA: CC System Post-LOCA Passive Failures, November 06, 2008
- IR 920470; Unit 1 CC Surge TK Level Dropping, May 15, 2009
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- Technical Specification Bases; B 3.7.7 Component Cooling Water (CC) System
- UFSAR Section 9.2.2; Component Cooling System
- Licensee Evaluation Dated May 23, 1989; CHRON # PWR 127109, Post LOCA Alignment of the Component Cooling Water System
- System Health Report; Unit 2 CC, April 1, 2010 – June 30, 2010
- System Health Report; Common Unit CC Unit 0, April 1, 2010 – June 30, 2010
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- Sholly – Request for Publication in Bi-Weekly FR Notice – Notice of Consideration of Issuance of Amendments to Facility Operating License and Proposed No Significant Hazards Consideration Determination and Opportunity for a Hearing (TAC NOS. 57242 and 63256, October 20, 1987
- Component Cooling Water Pump and Residual Heat Removal Administrative Controls, Log Number 10-047, November 18, 2010

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- IR 1117656; NRC Questions on CC System Train Isolation Valves, September 24, 2010

Section 40A5: Other Activities

- 1BEP ES-1.3, Transfer to Cold Leg Recirculation, Unit 1, Revision 200
- 2BOSR 5.2.2-1, Unit Two ECCS Venting and Valve Alignment Monthly Surveillance, Revision 25
- IR8, Vortexing Review of CS Additive Tank, January 2, 2007
- IR 576894, Vortexing Not Addressed in VCT Level Calculation, January 9, 2007
- IR 779122; Gas Void Discovered After a Fill and Vent of 1A RH Suction, May 23, 2008
- IR 859683, Air Void Found During NDE of 1CS12AA-3, December 23, 2008
- IR 1038061, Small Amount of Gas Found in 1B CV Pump Discharge Piping, March 3, 2010
- IR 1066488, 2D SI Accumulator Level Lowering, May 6, 2010
- IR 1073813, 2A SI Accumulator Level Decrease, May 27, 2010
- IR 1085824, Gas Voids Discovered in Line 2SI06ABB Near 2SI8811B, June 29, 2010
- IR 1086883; Results from UT Exams on U2 ECCS; July 1, 2010
- BAR 1-3-B3, Alarm No 1-3-B3 Spray Add Tank LEVEL LO-2, Revision 3
- BOP CS-3, Filling and Venting the Containment Spray System, Revision 10
- BOP CV-3, Filling and Venting the CV System, Revision 24
- BOP RH-3, Fill and Vent of the Residual Heat Removal System, Revision 36
- BOP SI-3, Fill and Vent of the Safety Injection System, Revision 19
- BVP 900-40, Unit 2 Periodic Monitoring and Trending of Containment Spray and Emergency Core Cooling Systems for Gas Accumulation, Revision 2
- BYR-09-0102-M, Evaluation of Gas Voids Downstream of Valves 1/2CS009A and Valves 1/2SI8811A/B, 4/16/2010
- BYR-09-099, Void Volume and Froude Number for Potential Voids Downstream of Valves 1/2SI8811A/B, April 16, 2010
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- CC-AA-102, Design Input and Configuration Change Impact Screening, Revision 20
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- CS-9, Drawing CS01PB suction from RWST & ECCS Sump, Revision 1C
- CS-23, Drawing CS01PA Suction from RWST & ECCS Sump, Revision 17
- CV-1, Drawing CVCS, Revision 25
- CV-3, Drawing CV Suction from VCT & RWST to PDP and CV01PA, Revision 3
- CV-6, Drawing CV Suction from VCT, Revision 1E
- CV-12, Drawing CV Suction from VCT & RWST to PDP and CV01PB, Revision 6H
- EC 343684, Evaluation of Voiding in CS Pump Eductor Lines
- EC 371411, Generic Letter 08-01, Gas Accumulation in ECCS, CS, and DH Systems, Byron Residual Heat Removal (RH) System, Rev 1

- EC 371415, Generic Letter 08-01, Gas Accumulation in ECCS, CS, and DH Systems, Byron Residual Heat Removal (CS) System, October 6, 2008
- EC 371534, Technical Evaluation of Potential Gas Voids in Containment Spray System, Revision 0
- EC376126, Revise the Design Bases to Accept Potential Voided Piping Downstream of the 1/2CS009A Valves and the 1/2SI8811A/B Valves, October 22, 2010
- EC 379408, Past Operability Evaluation of Gas Void at 1SI8811A, Revision 0
- ER-AA-2009, Managing Gas Accumulation, Revision 1
- FAI/08-78, Methodology for Evaluating Waterhammer in the Containment Spray Header and Hot Leg Switchover Piping, August 22, 2008
- NAI-1459-001, Comparison of GOTHIC Gas Transport Calculations with Test Data, Rev. 1
- OP-AA-106, Equipment Return to Service, Revision 4
- OP-AA-108-111, Adverse Condition Monitoring Program and Contingency Planning Revision 7
- RH-2, Drawing RH01PA Suction from Hot Legs & ECCS Sump, Revision 4
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- RS-08-131, Nine Month Response to Generic Letter 2008-01, October 14, 2008
- RS-09-011, Supplemental Response to Generic Letter 2008-01, January 20, 2009
- SI-13, Drawing SI Suction from RWST to SI01PA & SI01PB, Revision 2
- SI-14, Drawing Suction Header from RWST, Revision 4
- SI-43, Drawing Suction from ECCS Sumps, Revision 2
- Corrective Action Program Documents Generated as a Result of the Inspection
- IR 1144576, Follow-up on Braidwood GL 2008-01 Inspection Issue, November 24, 2010
- IR 1146238, NRC GL 08-01 – Clarification to Calculation NAI-1419-001, November 30, 2010
- IR 1146838, NRC ID – Revise Calc to Show Disposition of Vortex in CSAT, December 1, 2010
- IR 1147124, NRC GL 08-01 – Missed Opportunity on Review of BWD EC 379707, December 1, 2010
- IR 1147147, GL 08-01: Procedure Enhancement for BVP 900-39 & 40, December 1, 2010
- IR 1148711, Potential Licensee ID'D NCV For Lack of CS Vortexing Calc, December 6, 2010
- IR 1148874, NRC Open Question on CS Piping Design Basis, December 6, 2010
- IR 1150198, Inconsistent Statement in the Byron GL 08-01 9-Month Letter, December 9, 2010

LIST OF ACRONYMS USED

ADAMS	Agency-Wide Document Access Management System
ALARA	As-Low-As-Is-Reasonably-Achievable
ASME	American Society of Mechanical Engineers
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CV	Chemical and Volume Control
DG	Diesel Generator
ECCS	Emergency Core Cooling System
ESLI	End-of-Service-Life Indicator
gpm	gallons per minute
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Inspection Report
IR	Issue Report
LER	Licensee Event Report
LOCA	Loss of Coolant Accident
NCV	Non-Cited Violation
NRC	U.S. Nuclear Regulatory Commission
OSP	Outage Safety Plan
PARS	Publicly Available Records System
PI	Performance Indicator
RCFC	Reactor Containment Fan Cooler
RFO	Refueling Outage
RH	Residual Heat Removal
SDP	Significance Determination Process
SSC	Systems, Structures, and Components
TI	Temporary Instruction
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
WO	Work Order

M. Pacilio

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Sincerely,

/RA/

Eric R. Duncan, Chief
Branch 3
Division of Reactor Projects

Docket Nos. 50-454; 50-455
License Nos. NPF-37; NPF-66

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SUBJECT: BYRON STATION, UNITS 1 AND 2, INTEGRATED INSPECTION
REPORT 05000454/2011-002; 05000455/2011-002

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