

Brunswick 2

3Q/2012 Plant Inspection Findings

Initiating Events

Significance: G Jun 30, 2012

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

Failure to follow plant procedure caused loss of E1 bus

A self-revealing Green NCV of Technical Specification (TS) 5.4.1, Procedures, was identified when the licensee failed to follow procedure 0MST-DG11R, Diesel Generator 1 Loading Test. During the preparation for the test, procedural steps were not performed correctly and the E1 electrical bus was inadvertently de-energized, requiring emergency diesel generator (EDG) 1 to auto-start and re-energize the bus. Once EDG 1 was supplying power to bus E1, the licensee exited from the surveillance procedure and restored offsite power to bus E1. The licensee entered the issue into their corrective action program as Action Request (AR) 529330.

The inspectors determined that the failure to follow procedure 0MST-DG11R, Diesel Generator 1 Loading Test, was a performance deficiency. The finding was determined to be more than minor because the finding was associated with the Initiating Events Cornerstone attribute of human performance and affected the cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, loss of the E1 bus adversely affected the shut down unit's defense-in-depth for the electrical power availability key safety function. Since Unit 1 was shut down at the time of the event, the finding's significance with regard to Unit 1 was evaluated using IMC 0609 Appendix G, Shutdown Operations Significance Determination Process. Since one offsite transmission network remained available to Unit 1 during the event, per Checklist 7 of IMC 0609 Appendix G, Attachment 1, the finding did not require a quantitative assessment. Therefore, the finding is of very low safety significance (Green) for Unit 1. Unit 2 was at power and was also affected by the finding. IMC 0609 Attachment 0609.04, Phase 1 - Initial Screening and Characterization of Findings, Table 4a for the Initiating Events Cornerstone was used to determine that the finding is of very low safety significance (Green) because the finding is a transient initiator that did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions would not be available. The finding has a cross-cutting aspect in the Human Performance cross-cutting area, Work Practices component, because the licensee failed to implement adequate error prevention techniques while performing plant procedure 0MST-DG11R, Diesel Generator 1 Loading Test. Specifically, technicians did not utilize adequate error prevention techniques to prevent them from connecting test recorders incorrectly, H.4(a). (4OA3)

Inspection Report# : [2012003](#) (*pdf*)

Significance: G Apr 04, 2012

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Properly Assemble Reactor Vessel Head Following Maintenance Outage

A self-revealing (Green) non-cited violation (NCV) of 10 CFR 50, Appendix B Criterion V, Instructions, Procedures, and Drawings was identified for failure to properly implement plant procedures for reactor pressure vessel (RPV) reassembly following the Unit 2 maintenance outage in November 2011. This resulted in excessive leakage from the Unit 2 RPV during reactor startup and pressurization on November 15 and November 16, 2011, and the declaration of

an Unusual Event for reactor coolant system (RCS) unidentified

leakage in excess of 10 gallons per minute on November 16, 2011. The unit was shut down and depressurized on November 16, 2011, and the issue entered into the licensee's CAP as NCR 500035.

The licensee's failure to correctly implement procedure 0SMP-RPV502, Reactor Vessel Reassembly, to ensure that the RPV head was properly reassembled following the November 2011 Unit 2 maintenance outage was a performance deficiency. The finding was more than minor because it was associated with the Initiating Events cornerstone attribute of equipment performance (the reliability of the RCS barrier integrity) and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical safety functions during shutdown or power operations. Specifically, the failure to adequately implement this procedure resulted in excessive leakage from the Unit 2 RPV during reactor startup and pressurization. Inspection Manual Chapter 0609, Significance Determination Process (SDP), Attachment 0609.04, Phase 1 Screening Worksheet was used to screen the significance of the finding. The finding required a Phase

2 SDP analysis because it resulted in unidentified RCS leakage exceeding technical specification limits. Evaluation of the finding using the NRC pre-solved SDP table was not appropriate because the table does not contain a suitable target for RPV vessel integrity. Therefore, a Phase 3 SDP analysis was required. A Phase 3 analysis was performed by the regional Senior Reactor Analyst. Since the finding resulted in a shutdown, the SDP was analyzed as an additional transient that had a small potential to result in a Small Loss of Coolant Accident (SLOCA). The actual leak rate was low enough to not be considered to be a SLOCA, but there was potential for larger leakage. The Phase 2 SDP process uses an order of magnitude increase in the initiating event frequency for issues with the potential to increase the frequency of a particular event. This philosophy was used in the Phase 3 SDP process to allow a risk-informed input to the SDP for the SLOCA potential for this finding, due to the difficulty in calculating an exact percentage of time that the condition of the head closure would result in a larger leak. This resulted in an analysis that assumed a transient occurred that would result in a SLOCA about 1 percent of the time. This result represents an upper bound for the finding. The results were a risk in the low E-7 range, and the finding is GREEN. The SLOCA contribution was less than E-7. Dominant sequences involved loss of secondary side cooling and makeup, with either loss of containment heat removal, or loss of high pressure injection and failure to depressurize the reactor to allow the use of the low pressure systems. Because of Brunswick's concrete lined torus, and the low contribution of the high pressure sequences, the Large Early Release Frequency did not result in an increase in the significance. The cause of this finding was directly related to the cross-cutting aspect of supervisory and management oversight in the Work Practices component of the Human Performance area because oversight of the RPV reassembly was inadequate to insure that workers were able to accurately execute the steps of procedure 0SMP-RPV502, Reactor Vessel Reassembly. [H.4(c)]

Inspection Report# : [2012007](#) (pdf)

Significance:  Apr 04, 2012

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Perform a Post Maintenance Test After Reactor Pressure Vessel Assembly

A self-revealing (Green) non-cited violation (NCV) of 10 CFR 50, Appendix B Criterion V, Instructions, Procedures, and Drawings was identified for failure to properly implement plant procedure 0PLP-20, Post Maintenance Testing, after reactor pressure vessel (RPV) reassembly following the Unit 2 maintenance outage in November 2011. This resulted in the failure to identify improperly elongated RPV head studs, and contributed to excessive leakage from the Unit 2 RPV during reactor startup and pressurization on November 15 and November 16, 2011. The unit was shut down and depressurized on November 16, 2011, and the issue entered into the licensee's CAP as NCR 500035.

The licensee's failure to comply with procedure 0PLP-20, Post Maintenance Testing, to ensure that a post maintenance test (PMT) was performed to verify that the RPV head was properly reassembled following the November 2011 Unit 2 maintenance outage was a performance deficiency. The finding was more than minor because it was associated with

the Initiating Events cornerstone attribute of equipment performance (the reliability of the RCS barrier integrity) and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical safety functions during shutdown or power operations. Specifically, the failure to perform a PMT after RPV reassembly contributed to excessive leakage from the Unit 2 RPV during reactor startup and pressurization. Inspection Manual Chapter 0609, Significance Determination Process (SDP), Attachment 0609.04, Phase 1 Screening Worksheet was used to screen the significance of the finding. The finding required a Phase 2 SDP analysis because it resulted in unidentified RCS leakage exceeding technical specification limits. Evaluation of the finding using the NRC pre-solved SDP table was not appropriate because the table does not contain a suitable target for RPV vessel integrity. Therefore, a Phase 3 SDP analysis was required. The regional Senior Reactor Analyst determined that failure to perform a post maintenance test would have had the potential to mitigate the failure to adequately torque the RPV head studs, which was analyzed to be a Green finding (see NCV 05000324/2012007-01 above). Since the impact of the mitigation would be less than the impact of the underlying finding, the failure to perform a post maintenance test is also a Green finding. The cause of this finding was directly related to the cross-cutting aspect of conservative assumptions in the decision making component of the Human Performance area because the licensee made nonconservative decisions regarding the need to perform a PMT following RPV assembly.

Inspection Report# : [2012007](#) (*pdf*)

Significance: G Apr 04, 2012

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Perform Adequate Training for Reactor Vessel Reassembly

NRC inspectors identified a Green non-cited violation (NCV) of 10 CFR 50, Appendix B Criterion V, Instructions, Procedures, and Drawings for failure to properly implement plant procedure TRN-NGGC-1000, Conduct of Training for training and qualifications of the reactor pressure vessel (RPV) reassembly team prior to RPV reassembly during the Unit 2 maintenance outage in November 2011. This resulted in inadequate worker knowledge of the tools and procedures associated with RPV reassembly, which contributed to the RPV head studs being inadequately tensioned and excessive leakage from the Unit 2 RPV during reactor startup and pressurization on November 15 and November 16, 2011. The unit was shut down and depressurized on November 16, 2011, and the issue entered into the licensee's CAP as NCR 500035.

The licensee's failure to comply with procedure TRN-NGGC-1000, Conduct of Training, to ensure that the maintenance team performing the RPV reassembly after the November 2011 Unit 2 maintenance outage received adequate training was a performance deficiency. The finding was more than minor because it was associated with the Initiating Events cornerstone attribute of human performance and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical safety functions during shutdown or power operations. Specifically, the failure to adequately implement procedure TRN-NGGC-1000 contributed to the failure to adequately tension the RPV head studs during the Unit 2 November, 2011 maintenance outage, which resulted in excessive leakage from the Unit 2 RPV during reactor startup and pressurization. Inspection Manual Chapter 0609, Significance Determination Process (SDP), Attachment 0609.04, Phase 1 Screening Worksheet was used to screen the significance of the finding. The finding required a Phase 2 SDP analysis because it resulted in unidentified RCS leakage exceeding technical specification limits. Evaluation of the finding using the NRC pre-solved SDP table was not appropriate because the table does not contain a suitable target for RPV vessel integrity. Therefore, a Phase 3 SDP analysis was required. The regional Senior Reactor Analyst determined that adequate training of the RPV assembly team would have had the potential to mitigate the failure to adequately torque the RPV head studs, which was analyzed to be a Green finding (see NCV 05000324/2012007-01 above). Since the impact of the mitigation would be less than the impact of the underlying finding, this finding is also Green. The cause of this finding was

directly related to the cross-cutting aspect of training in the Resources component of the Human Performance area because the licensee failed to provide sufficiently trained personnel to reassemble the RPV.

Inspection Report# : [2012007](#) (*pdf*)

Mitigating Systems

Significance: **G** Dec 31, 2011

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

Failure to Verify Bearing Oil Level Resulted in Residual Heat Removal Service Water Pump Failure

Green. A self-revealing Green non-cited violation of TS 5.4.1, Procedures, was identified for failure to implement procedural requirements for verifying lubrication levels on the 2B RHRSW Booster pump. This finding resulted in failure of the 2B RHRSW Booster pump. The condition was entered into the licensee's corrective action program as AR #489386 and the licensee investigated the failure and repaired the pump.

The failure to follow procedural requirements for verifying lubrication levels was a performance deficiency. The performance deficiency was more than minor because it was associated with the Mitigating Systems cornerstone attribute of Equipment Performance – Availability, and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the performance deficiency resulted in the failure of the 2B RHRSW booster pump which is credited for decay heat removal and service water injection. Using Inspection Manual Chapter 0609, Significance Determination Process, Attachment 0609.04, Phase 1 Screening Worksheet, the finding screened as potentially greater than green because it represented an actual loss of a single train of equipment for more than its Technical Specifications (TS) allowed outage time. Therefore, a phase 2 significance determination evaluation was required. The significance of this finding is designated as very low safety significance (Green) using Phase 2 pre-solved tables. The cause of the finding was directly related to the training cross-cutting aspect in the Resources component of the Human Performance area because the licensee failed to ensure that workers had adequate knowledge of the RHRSW pump oilers to execute procedures for verifying lubrication levels which caused a failure of a safety-related pump. [H.2(b)] (Section 1R12)

Inspection Report# : [2011005](#) (*pdf*)

Significance: **W** Nov 21, 2011

Identified By: NRC

Item Type: VIO Violation

Failure to Identify and Correct a Degraded Flood Barrier for the Emergency Diesel Generator Fuel Oil Tank Rooms

(TBD) The inspectors identified an Apparent Violation (AV) of 10 CFR Part 50 Appendix B Criterion XVI, Corrective Action, for failure to identify and correct a condition adverse to quality associated with the entrance enclosures for the Emergency Diesel Generator (EDG) fuel oil tank rooms. Specifically, the enclosures contained openings which would adversely impact their ability to mitigate external flooding of the EDG fuel oil tank rooms in the event of a design basis external event (hurricane). These openings were not identified or corrected by the licensee prior to the inspectors identifying the issue. The licensee corrected this condition by installing new sealant material to close the openings and entered the issue into their corrective action program. The licensee entered this issue into their corrective action program as AR 466253.

The licensee's failure to identify and correct the degradation of the access enclosures to the EDG fuel oil tank rooms was a performance deficiency. The finding is more than minor because it affects the Mitigating Systems cornerstone attribute of protection against external events and affects the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, the water entry pathways into the EDG fuel oil tank rooms increased the likelihood of EDG failure during an external weather event (hurricane). The significance of this finding was evaluated using Inspection Manual Chapter 0609, Significance Determination Process. Using the phase 1 worksheet tables 4a and 4b, the finding was evaluated to be potentially greater than green because it screens as potentially risk significant due to a seismic, flooding, or severe weather initiating event which would degrade two or more trains of a multi-train system or function. Table 4a of the phase 1 worksheet requires a phase 3 significance determination evaluation. Following the initial review of this matter using preliminary quantitative analysis, Appendix M was used considering the uncertainties in the bounding analysis and the insights from the qualitative review (See Appendix M in Enclosure 2 and Phase 3 in Enclosure 3 of this report). There is a lack of quantitative data and probabilistic risk assessment tools to accurately assess the risk significance of this performance deficiency in a timely manner. The NRC preliminarily concluded that, although licensee performance is outside the bounds of nominal performance, cornerstone objectives were met with minimal reduction in safety margin. The Agency concluded that the finding likely did not represent a decline in licensee performance with a significant reduction in safety margin. Based on the available information from the quantitative and qualitative analyses, and the guidance of Appendix M, the NRC concluded that this performance deficiency is preliminarily characterized as a low to moderate safety significance finding (White). This finding has a cross-cutting aspect in the Corrective Action Program component of the Problem Identification and Resolution area because the licensee did not identify the issue completely, accurately, and in a timely manner commensurate with its safety significance, [P.1(a)].

Final Determination Letter: 2011-014

During an NRC inspection conducted on April 20, 2011 a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

10 CFR Part 50 Appendix B Criterion XVI, Corrective Action states, in part, that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected.

Contrary to the above, as of April 20, 2011, the licensee failed to identify and promptly correct a condition adverse to quality involving the external flood barrier for the EDG fuel oil tank rooms. Specifically, the entrance enclosures which house the EDG fuel oil tanks had several openings, unsealed pin holes, and a narrow gap along the perimeter of the base walls, which would allow water intrusion into the EDG fuel oil tank rooms during a design basis external event (hurricane).

Inspection Report# : [2011012](#) (*pdf*)

Inspection Report# : [2011014](#) (*pdf*)

Barrier Integrity

Significance:  Mar 31, 2012

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Identify and Correct a Refrigerant Leak in the Instrument Air Dryer System

A self-revealing non-cited violation of 10 CFR 50 Appendix B, Criteria XVI, Corrective Action, was identified for the

licensee's failure to promptly identify and correct a condition adverse to quality related to the Control Room Air Conditioning (AC) system and the Control Room Emergency Ventilation (CREV) system. Specifically, the licensee failed to identify and correct a slow refrigerant leak in the instrument air dryer in the control building HVAC instrument air system, rendering both the control room AC and CREV systems inoperable. Upon discovery, the instrument air dryer was bypassed, air pressure was restored, and the control room AC and CREV systems were restored. The licensee entered this issue into the corrective action program as Action Request (AR) 502214. The failure to identify and correct the slowly lowering refrigerant pressure was a performance deficiency. This finding was more than minor because it was associated with the structure, system, and component (SSC) and barrier performance attribute of the Barrier Integrity Cornerstone. It also adversely affected the cornerstone objective of maintaining a radiological barrier for the control room. Specifically, the finding led to a loss of all air conditioning and filtering capability of control room air. The significance determination process was completed in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 – Initial Screening and Characterization of Findings, Table 4a for the Barrier Integrity Cornerstone. The finding was determined to be of very low safety significance (Green) because it only affected the radiological barrier function of the control room, and does not represent a degradation of the smoke or toxic atmosphere barrier function of the control room. This finding has a cross-cutting aspect in the corrective action program component of the Problem Identification and Resolution area because the licensee did not identify the issue completely, accurately, and in a timely manner commensurate with its safety significance. [P.1 (a)]
Inspection Report# : [2012002](#) (pdf)

Emergency Preparedness

Significance:  Sep 30, 2012

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

Failure to Maintain Reliability and Availability of Emergency Response Equipment for Emergency Response Facilities

A self-revealing Green NCV of 10 CFR 50.54(q)(2) was identified for the licensee's failure to properly evaluate or consider the impact to emergency response facilities of design change ESR98-00436 which was implemented in 1999. This resulted in the loss of Emergency Response Facility Information System (ERFIS), Emergency Response Data System (ERDS), Safety Parameter Display System (SPDS), and all displays including radiation monitors for the emergency response facilities. Specifically, the licensee failed to ensure that adequate emergency response facilities and equipment were available as required by the Brunswick Nuclear Plant Radiological Emergency Plan, Section 1.3.1.3 revision 80 and 10 CFR 50.47(b)(8). This issue was captured in the licensee's CAP as AR 542704.

The licensee's failure to properly evaluate or consider the impact to emergency response facilities of design change ESR98-00436 which was implemented in 1999 was a performance deficiency. Specifically, the licensee introduced a single point failure mode which did not meet the design requirements specified in their Design Basis Document (DBD 60) sections 3.6.7.2 and 3.6.7.3. This resulted in the licensee's failure to ensure that adequate emergency response facilities and equipment were available as delineated in the Updated Final Safety Analysis Report (UFSAR) Section 7.7.1.9, and required by the Brunswick Nuclear Plant Radiological Emergency Plan, Section 1.3.1.3, revision 80, and 10 CFR 50.47(b)(8). The finding was more than minor because it adversely affected the Emergency Preparedness Cornerstone objective of ensuring that the licensee was capable of implementing adequate measures to protect the health and safety of the public in the event of a radiological emergency. Specifically, the Facilities and Equipment attribute was affected during the time when the ERFIS, ERDS, SPDS, and all displays including radiation monitors for the emergency response facilities were degraded, and as a result did not meet 10 CFR 50.47(b)(8) Planning Standard program element, adequate emergency facilities and equipment to support the emergency response are

provided and maintained. The finding was assessed for significance in accordance with NRC IMC 0609, Appendix B Emergency Preparedness Significance Determination Process. Attachment 2 of Appendix B, Failure to Comply Significance Logic is as follows: Failure to comply; Loss of Risk Significant Planning Standard Function (RSPS), No; RSPS Degraded Function, No; Loss of Planning Standard Function, No; the result is a Green finding. The inspectors determined that this resulted in a very low safety significance finding (Green). No cross-cutting aspect was assigned to this finding because the performance deficiency occurred more than three years ago and is not reflective of current plant performance.

Inspection Report# : [2012004](#) (*pdf*)

Occupational Radiation Safety

Public Radiation Safety

Security

Although the Security Cornerstone is included in the Reactor Oversight Process assessment program, the Commission has decided that specific information related to findings and performance indicators pertaining to the Security Cornerstone will not be publicly available to ensure that security information is not provided to a possible adversary. Other than the fact that a finding or performance indicator is Green or Greater-Than-Green, security related information will not be displayed on the public web page. Therefore, the [cover letters](#) to security inspection reports may be viewed.

Miscellaneous

Last modified : November 30, 2012