UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

April 20, 2012

Mr. Michael Annacone
Vice President
Carolina Power and Light Company
Brunswick Steam Electric Plant
P. O. Box 10429
Southport, North Carolina 28461

SUBJECT: BRUNSWICK NUCLEAR PLANT – NRC INSPECTION REPORT 05000324/2012007

Dear Mr. Annacone:

On April 4, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an in-office inspection of one unresolved item (URI) associated with the Brunswick Nuclear Plant Unit 2. The URI that was identified in NRC inspection report 05000324/2011013 (ADAMS Accession Number ML 120250556), dated January 25, 2012, involved plant procedures for the reassembly of the reactor pressure vessel (RPV) head following the November 2011 Unit 2 maintenance outage. This issue was unresolved pending completion of the review of your root cause evaluation. The enclosed inspection report documents the inspection results, which were discussed on April 20, 2012, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the NRC's rules and regulations and with the conditions of your license.

Three self revealing findings of very low safety significance (Green) were identified during this inspection. These findings were determined to involve violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the Enforcement Policy.

If you contest these non-cited violations, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington DC 20555-0001; and the NRC Resident Inspector at the Brunswick Steam Electric Plant.

Additionally, if you disagree with the cross-cutting aspects 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 II, and the NRC Resident Inspector at the Brunswick Steam Electric Plant.

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

Sincerely,

/RA/

Randall A. Musser, Chief
Reactor Projects Branch 4
Division of Reactor Projects

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

Sincerely,

/RA/

Randall A. Musser, Chief
Reactor Projects Branch 4
Division of Reactor Projects

X PUBLICLY AVAILABLE ☐ NON-PUBLICLY AVAILABLE ☐ SENSITIVE X NON-SENSITIVE

ADAMS: X Yes ACCESSION NUMBER: ML12114A036 X SUNSI REVIEW COMPLETE X FORM 665 ATTACHED

OFFICE	RII:DRP	RII:DRP	RII:DRP	RII:DRP			
SIGNATURE	PBO by email	RAM					
NAME	POBryan	RMusser					
DATE	04/20/2012	04/20/2012					
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY DOCUMENT NAME: G:\DRPII\RPB4\BRUNSWICK\REPORTS\2012 REPORTS\12-07\BRUNSWICK 2012007.DOCX

cc w/encl:
Edward L. Wills, Jr.
Director Site Operations
Brunswick Steam Electric Plant
Electronic Mail Distribution

Robert J. Duncan II
Vice President
Nuclear Operations
Progress Energy
Electronic Mail Distribution

Joseph M. Frisco, Jr
Plant General Manager
Brunswick Steam Electric Plant
Progress Energy
Electronic Mail Distribution

Annette H. Pope
Manager, Support Services
Brunswick Steam Electric Plant
Progress Energy Carolinas, Inc.
Electronic Mail Distribution

Lee Grzeck
Supervisor - Licensing/Regulatory Programs
(Acting)
Brunswick Steam Electric Plant
Progress Energy Carolinas, Inc.
Electronic Mail Distribution

Randy C. Ivey
Manager, Nuclear Oversight
Brunswick Steam Electric Plant
Progress Energy Carolinas, Inc.
Electronic Mail Distribution

Paul E. Dubrouillet
Manager, Training
Brunswick Steam Electric Plant
Electronic Mail Distribution

Kelvin Henderson
General Manager
Nuclear Fleet Operations
Progress Energy
Electronic Mail Distribution

Joseph W. Donahue
Vice President
Nuclear Oversight
Progress Energy
Electronic Mail Distribution

David T. Conley
Senior Counsel
Legal Department
Progress Energy
Electronic Mail Distribution

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
Brunswick Steam Electric Plant
U.S. NRC
8470 River Road, SE
Southport, NC 28461

John H. O'Neill, Jr.
Shaw, Pittman, Potts & Trowbridge
2300 N. Street, NW
Washington, DC 20037-1128

Peggy Force
Assistant Attorney General
State of North Carolina
P.O. Box 629
Raleigh, NC 27602

Chairman
North Carolina Utilities Commission
Electronic Mail Distribution

Robert P. Gruber
Executive Director
Public Staff - NCUC
4326 Mail Service Center
Raleigh, NC 27699-4326

Anthony Marzano
Director
Brunswick County Emergency Services
Electronic Mail Distribution

(cc w/encl cont'd – See next page)

cc w/encl cont'd:
Public Service Commission
State of South Carolina
P.O. Box 11649
Columbia, SC 29211

W. Lee Cox, III
Section Chief
Radiation Protection Section
N.C. Department of Environmental
Commerce & Natural Resources
Electronic Mail Distribution

Warren Lee
Emergency Management Director
New Hanover County Department of
Emergency Management
230 Government Center Drive
Suite 115
Wilmington, NC 28403

Letter to Michael J. Annacone from Randall A. Musser dated April 20, 2012

SUBJECT: BRUNSWICK NUCLEAR PLANT – NRC INSPECTION REPORT 05000324/2012007

Distribution w/encl:
C. Evans, RII EICS
L. Douglas, RII EICS
OE Mail
RIDSNRRDIRS
PUBLIC
RidsNrrPMBrunswick Resource

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-324
License Nos.:	DPR-62
Report No:	05000324/2012007
Licensee:	Carolina Power and Light (CP&L)
Facility:	Brunswick Steam Electric Plant, Unit 2
Location:	8470 River Road, SE Southport, NC 28461
Dates:	February 7 to April 4, 2012
Inspectors:	P. O'Bryan, Senior Resident Inspector
Approved by:	Randall A. Musser, Chief Reactor Projects Branch 4 Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000324/2012-007; 02/07/2012 – 04/04/2012; Brunswick Steam Electric Plant, Unit 2; Other Activities

The report transmits the results of an in-office inspection of one unresolved item (URI). Three self-revealing Non-cited Violations (NCV) of very low safety significance (Green) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). The 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.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Initiating Events

Green: 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)] (Section 4OA5.1)

Green: 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 non-conservative decisions regarding the need to perform a PMT following RPV assembly. [H.1(b)] (Section 4OA5.1)

Green: 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. [H.2(b)] (Section 4OA5.1)

B. Licensee Identified Violations

None

REPORT DETAILS

4. OTHER ACTIVITIES

4OA5 Other Activities

.1 (Closed) Unresolved Item (URI)05000324/2011013-01, Failure to Properly Assemble Reactor Vessel Head Following Maintenance Outage.

a. Inspection Scope

The inspectors completed an in-office review of URI 0500324/2011013-01, Failure to Properly Assemble Reactor Vessel Head Following Maintenance Outage, which was documented in Inspection Report number 05000324/2011013. The inspector reviewed the licensee's root cause evaluation to verify that the root and contributing causes of the event were properly identified and the corrective actions were appropriate.

b. Findings

.1 Failure to Properly Assemble Reactor Vessel Head Following Maintenance Outage

Introduction: 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 accomplish 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.

Description: At approximately 8:00 p.m. on November 15, 2011, while in mode 2, Unit 2 operators noted increasing unidentified RCS leakage inside the drywell, which was indicated by an increasing frequency of automatic pumping by the drywell floor drain sump pumps. Leakage continued to increase and at 3:01 a.m. on November 16, 2011 the licensee declared an unusual event for RCS unidentified leakage exceeding 10 gallons per minute. At 3:09 a.m., operators scrammed the Unit 2 reactor and began depressurizing the reactor vessel. At 2:38 p.m. on November 16, 2011 Unit 2 entered mode 4 and the RCS unidentified leakage rate was reduced to 0.13 gallons per minute.

On November 17, 2011 it was determined that the RPV head flange was leaking due to inadequate RPV head stud tensioning. The RPV head studs were inadequately tensioned because maintenance personnel failed to properly execute procedure 0SMP-RPV502, Reactor Vessel Reassembly. Section 7.15 of 0SMP-RPV502 requires the operator of the stud tensioner's hydraulic pump to pressurize the tensioner to the pressure indicated on 0SMP-RPV502, Attachment 1. 0SMP-RPV502, Attachment 1 requires a tensioner pressure of approximately 13,000 lbs. to achieve the desired stud

elongation. However, the refuel floor team misinterpreted an indicated tensioner pressure of 1300 lbs. to be 13,000 lbs. because the tensioner operators were not familiar with the stud tensioner pressure instrument display. The refuel team supervisors assigned mechanics to operate the tensioner's hydraulic pump who weren't experienced in operating the pump and did not provide close oversight during operation of the equipment. Therefore, proper tensioning and elongation of the RPV studs did not occur.

Additionally, procedure 0SMP-RPV502, Reactor Vessel Reassembly, step 7.15.12 requires quality control (QC) personnel to verify stud tensioning has been satisfactorily completed by reviewing and signing the Attachment 1 RPV Head Stud Tensioning Data Table. The acceptance criterion for stud elongation is clearly specified in this table. However, on November 13, 2011, the Lead Mechanic and the QC inspector assigned to this task approved the elongation data even though the recorded data failed to meet the acceptance criteria. The Lead Mechanic and the QC inspector signed for the flawed data because they did not fully understand the stud elongation measurement device output. Instead of independently verifying the correct interpretation of the stud elongation measurement device output, the Lead Mechanic and the QC inspector relied on incorrect explanations of the device output from other members of the RPV reassembly maintenance team. Therefore, the RPV stud elongation error was not identified or corrected by the Lead Mechanic or the QC inspector.

Analysis: 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 [H.4(c)] 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.

Enforcement: 10 CFR 50 Appendix B, Criterion V states, 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. Procedure 0SMP-RPV502, Reactor Vessel Reassembly provides instructions for RPV head stud tensioning. Section 7.15 of 0SMP-RPV502 requires the operator of the stud tensioner's hydraulic pump to pressurize the tensioner to the pressure indicated on 0SMP-RPV502, Attachment 1. Procedure 0SMP-RPV502, Reactor Vessel Reassembly, step 7.15.12 requires the Lead Mechanic and QC personnel to verify stud tensioning has been satisfactorily completed by reviewing and signing the Attachment 1 RPV Head Stud Tensioning Data Table. The acceptance criterion for stud elongation is specified in this table.

Contrary to the above, on November 13, 2011, the licensee failed to follow these procedural instructions, resulting in improper tensioning of the RPV head studs. Specifically, maintenance personnel failed to properly pressurize the RPV head stud tensioner per section 7.15 of procedure 0SMP-RPV502, and the Lead Mechanic and QC inspector assigned to this task approved the Attachment 1 elongation data even though the recorded data failed to meet the acceptance criterion. As a result, upon startup and pressurization of the Unit 2 reactor on November 15 and 16, 2011, excessive RCS leakage occurred. Upon discovery of the excessive leakage, the licensee shut down and depressurized the Unit 2 reactor, and reassembled the Unit 2 RPV correctly. Because this finding was of very low safety significance (Green), and was entered into the licensee's CAP as AR 500035, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. This violation is therefore designated as NCV 05000324/2012007-01, Failure to Properly Assemble Reactor Vessel Head Following Maintenance Outage.

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

Introduction: 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.

Description: On November 13, 2011 the Unit 2 RPV was reassembled during a mid-cycle maintenance outage. Following the maintenance outage, the licensee did not perform a post maintenance test (PMT) to ensure that the RPV was reassembled correctly. The decision not to perform a PMT after the RPV reassembly was partly based on the American Society of Mechanical Engineers (ASME) Code Section XI hydrostatic test requirement that the RPV be pressure tested "each refueling outage." The licensee correctly concluded that the ASME code did not require a hydrostatic test because no refueling, RPV component repair, or RPV component replacement was performed. However, the licensee did not perform any other activity as a PMT. Plant procedure PMT 0PLP-20, Post Maintenance Testing, requires that "plant equipment shall be tested consistent with their safety functions following maintenance activities that may have impaired proper functioning of the component." However, the licensee failed to specify a post maintenance test to verify adequate pressure retaining capability of the RPV head after RPV reassembly during the November 2011 Unit 2 maintenance outage.

After the Unit 2 reactor was shut down on November 16, 2011, it was determined that the RPV head studs were not adequately tensioned. Subsequently, on November 28, 2011 the licensee correctly assembled the RPV and satisfactorily performed a non-ASME code pressure test as a post maintenance test.

Analysis: The licensee's failure to comply with procedure 0PLP-20, Post Maintenance Testing, to ensure that a 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 non-conservative decisions regarding the need to perform a PMT following RPV assembly. [H.1(b)].

Enforcement: 10 CFR 50 Appendix B, Criterion V states, 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. 0PLP-20, Post Maintenance Testing, requires that "plant equipment shall be tested consistent with their safety functions following maintenance activities that may have impaired proper functioning of the component." Contrary to the above, after RPV assembly during the November 2011 Unit 2 maintenance outage, the licensee failed to perform a PMT. As a result, the inadequately tensioned RPV head studs were not discovered prior to plant startup, contributing to excessive RCS leakage. Upon discovery of the failure to perform a PMT, the licensee reassembled the Unit 2 RPV correctly and performed a pressure test as a PMT. Because this finding was of very low safety significance (Green), and was entered into the licensee's CAP as AR 500035, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. This violation is therefore designated as NCV 05000324/2012007-02, Failure to Perform a Post Maintenance Test After Reactor Pressure Vessel Assembly.

.3 Failure to Perform Adequate Training for Reactor Vessel Reassembly

Introduction: 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.

Description: Procedure TRN-NGGC-1000, Conduct of Training, requires that training be conducted per the biennial period Training Matrix. The training matrix requires that refueling floor personnel receive initial qualification training (qualification code MB81) for reactor vessel reassembly per Lesson Plan ME501B. However, qualification code MB81 has not been maintained by maintenance personnel performing RPV disassembly and reassembly, and formal training associated with qualifications has not been conducted since 2000. In 2000, the licensee began conducting training using Lesson Plan ME501B prior to refueling outages only. Prior to the November 2011 Unit 2 maintenance outage, Lesson Plan ME501B training was not conducted. Instead, the licensee chose to only perform "refresher training" for the RPV assembly team. The inspectors found that nine of the people had not received the ME501B training, and the refresher training did not include critical information necessary for RPV assembly.

However, since the refresher training conducted prior to the November 2011 Unit 2 maintenance outage did not utilize the formal qualification training guidelines, it did not include all of the critical information that the RPV assembly team needed to successfully perform the RPV assembly. For example, the refresher training did not provide information for the use of the SEMS (III) RPV head stud elongation instrument. Also, since the refuel floor support training qualification (MB81) wasn't being formally tracked, nine of the twelve refuel floor personnel performing reactor vessel reassembly on November 13, 2011, did not have this qualification. Therefore, licensee personnel who reassembled the reactor were not adequately trained to perform RPV reassembly activities.

Analysis: 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. [H.2(b)].

Enforcement: 10 CFR 50 Appendix B, Criterion V states, 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. Procedure TRN-NGGC-1000, Conduct of Training, requires that training be conducted per the biennial period Training Matrix. The Training Matrix (qualification code MB81), requires that training for reactor vessel reassembly be conducted per Lesson Plan ME501B. Contrary to the above, prior to the Unit 2 November 2011 maintenance outage, the licensee failed to accomplish qualification training (qualification code MB81) for nine of the twelve people that reassembled the Unit 2 RPV. As a result, maintenance personnel did not have adequate knowledge to

correctly torque the RPV head studs, contributing to the excessive RCS leakage during reactor startup on November 15 and 16, 2011. Upon discovery of the inadequate training, the licensee conducted formal training per Lesson Plan ME501B, and reassembled the Unit 2 RPV correctly. Because this finding was of very low safety significance (Green), and was entered into the licensee's CAP as AR 500035, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. This violation is therefore designated as NCV 05000324/2012007-03, Failure to Perform Adequate Training for Reactor Vessel Reassembly.

URI 05000324/2011013-01, Failure to Properly Assemble Reactor Vessel Head Following Maintenance Outage, is closed.

4OA6 Meetings, including Exit

The inspector presented the inspection results to Mr. Annacone and other members of licensee management on April 20, 2012.

ATTACHMENT: SUPPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel:
M. Annacone, Site Vice President
J. Burke, Engineering Director
C. Dunsmore, Shift Operations Manager
K. Gerald, Maintenance Manager
S. Gordy, Operations Manager
L. Grzeck, Acting Licensing and Regulatory Affairs Supervisor
K. Hill, Control Room Supervisor
R. Ivey, Nuclear Oversight Services Manager
J. Miller, Operations Shift Manager
A. Pope, Support Services Manager
T. Sherrill, Technical Support Engineer

NRC personnel:
Randall A. Musser, Chief, Reactor Projects Branch 4, Division of Reactor Projects Region II

Attachment

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

05000324/2012007-01	NCV	Failure to Properly Assemble Reactor Vessel Head Following Maintenance Outage (Section 4OA5.1)
05000324/2012007-02	NCV	Failure to Perform a Post Maintenance Test After Reactor Pressure Vessel Assembly (Section 4OA5.1)
05000324/2012007-03	NCV	Failure to Perform Adequate Training for Reactor Vessel Reassembly (Section 4OA5.1)

Closed

05000324/2011013-01	URI	Failure to Properly Assemble Reactor Vessel Head Following Maintenance Outage

Attachment

LIST OF DOCUMENTS REVIEWED

AR # 500035: “Excessive Drywell Floor Drain Leakage During Startup From B220M2” root cause analysis report.

Attachment