UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

August 16, 2012

Mr. Larry Weber
Senior Vice President and
Chief Nuclear Officer
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

SUBJECT: D. C. COOK NUCLEAR POWER PLANT, UNITS 1 AND 2 TEMPORARY INSTRUCTION (TI) 2515/177, "MANAGING GAS ACCUMULATION IN EMERGENCY CORE COOLING, DECAY HEAT REMOVAL AND CONTAINMENT SPRAY SYSTEMS INSPECTION REPORT 05000315/2012008; 05000316/2012008(DRS)

Dear Mr. Weber:

On July 2, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your D. C. Cook Nuclear Power Plant, Units 1 and 2. The enclosed report documents the results of this inspection, which were discussed on July 2, 2012, with Mr. Carlson, and other members of your staff.

The inspection examined activities conducted under your license as they relate to actions taken to address recommendations provided in response to Generic Letter (GL)-2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal and Containment Spray Systems." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the inspection efforts, the inspection team concluded that this Temporary Instruction (TI) remains open.

Based on the results of this inspection, seven NRC-identified findings of very low safety significance were identified. Seven of the findings were determined to involve a violation of NRC requirements. However, because of the very low safety significance, and because the issues were entered into your corrective action program, the NRC is treating these issues as Non-Cited Violations (NCVs) in accordance with Section 2.3.2 of the NRC Enforcement Policy. In addition, one licensee-identified violation is described in Section 4OA7 of this report.

If you contest any of these findings, 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 D. C. Cook Nuclear Power Plant.

If you disagree with the cross-cutting aspect assigned to the 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 the D. C. Cook Nuclear Power 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 Publicly Available Records (PARS) component of NRC's Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74

Enclosure: Inspection Report 05000315/2012008; 05000316/2012008
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ™

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	05000315; 05000316
License Nos:	DPR-58; DPR-74
Report No:	05000315/2012008; 05000316/2012008
Licensee:	Indiana Michigan Power Company
Facility:	D. C. Cook Nuclear Power Plant, Units 1 and 2
Location:	Bridgman, MI
Dates:	January 23, 2012 – July 2, 2012
Inspectors:	C. Tilton, Senior Reactor Engineer (Lead) N. Féliz Adorno, Reactor Engineer
Approved by:	Ann Marie Stone, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000315/2012008, 05000316/2012008; 01/23/2012 - 06/26/2012; D. C. Cook Nuclear Power Plant, Units 1 and 2; Temporary Instruction (TI) 2515/177, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal and Containment Spray Systems"

This inspection was performed by two NRC regional inspectors. Seven (Green) findings were identified by the inspectors. All seven findings were considered as 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). 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 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. The inspectors identified a finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the failure to evaluate vortexing in the volume control, containment spray additive, and refueling water storage tanks. Consequently, the minimum allowable submergence for the suction piping of these tanks did not consider the potential for air entrainment due to vortices. This finding was entered into the licensee's corrective action program to evaluate the potential for vortexing at these tanks and revise the affected calculations.

  The performance deficiency was determined to be more than minor because it was associated with the Mitigating System cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. In addition, the finding was associated with the Containment Barrier cornerstone attribute of structure, system, component, 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. The finding screened as of very low safety significance (Green) because: (1) the finding examples associated with the volume control and refueling water storage tanks were deficiencies confirmed not to result in loss of operability in that the licensee performed an evaluation that reasonably concluded the current limit setpoints prevent vortexing in these tanks; and (2) the finding example associated with the containment spray (CTA) additive tank was a design deficiency of the physical integrity of the reactor containment that did not affect the barrier function of the control room against smoke or a toxic atmosphere, represent an actual open pathway in the physical integrity of reactor containment, or involve an actual reduction in function of hydrogen igniters in the reactor containment. This finding did not have an associated cross-cutting aspect because it was not confirmed to reflect current performance due to the age of the performance deficiency. (Section 4OA5.1c(1))

- Green. The inspectors identified a finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to correctly incorporate the interim methodology for developing acceptance criteria for suction voids in Emergency Core Cooling Systems, Decay Heat Removal, and Containment Spray Systems pumps into procedures. Specifically, the licensee did not translate the limitations of the acceptance criteria with respect to rated performance of pump operation. This finding was entered into the licensee's corrective action program to revise the affected procedure.

  The performance deficiency was determined to be more than minor because it was associated with the Mitigating System cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The finding screened as of very low safety significance (Green) because it was a design deficiency confirmed not to result in loss of operability. Specifically, a review of recent monitoring results determined that identified voids did not exceed the applicable acceptance criteria. 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. (Section 4OA5.1c(2))

- Green. The inspectors identified a finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to establish appropriate procedures to implement the requirements of performance monitoring of plant parameters for gas accumulation. Specifically, the licensee had not established instructions in procedures to control important aspects such as frequency of monitoring and acceptance criteria. This finding was entered into the licensee's corrective action program to determine the size of the limiting voids at the affected locations and establish appropriate acceptance criteria.

  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 of very low safety significance (Green) because it was a design deficiency confirmed not to result in loss of operability. Specifically, a review of a sample of recent plant parameter trends determined that unacceptable void formation had not occurred. This finding had a cross-cutting aspect in the area of human performance because the licensee did not make safety significant decisions using a systematic process. Specifically, the licensee decided to use informal trending mechanisms to track the critical plant parameters instead of creating a formal and systematic approach to programmatically control the activity. [H.1(a)] (Section 4OA5.1c(3))

- Green. The inspectors identified a finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to establish minimum flowrate and time required in procedures used to perform dynamic flushing activities affecting Emergency Core Cooling Systems, Decay Heat Removal, and Containment Spray Systems pumps. This finding was entered into the licensee's corrective action program to revise the affected procedures.

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, the failure to establish an appropriate procedure for flushing would have the potential of not removing voids to ensure system operability. The finding screened as of very low safety significance (Green) because it was a design deficiency confirmed not to result in loss of operability. Specifically, a historical review of previous dynamic flushing activities determined that sufficient flowrates and time values were achieved at the appropriate sequences. The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not confirmed to reflect current performance due to the age of the performance deficiency. (Section 4OA5.1c(4))

- Green. The inspectors identified a finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to include adequate venting instructions in the procedure use to respond to a MODE 4 loss-of-coolant accident. Specifically, the procedure did not include instructions to address all of the affected residual heat removal system high points, including the discharge piping. The finding was entered into the licensee's corrective action program to leave one train of the system idle while the other train cools down the reactor coolant system below 200°F to ensure that the discharge side of one train of residual heat removal system is not vulnerable to steam formation.

  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 of very low safety significance (Green) using a Phase II evaluation. 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 relevant external operating experience. Specifically, the licensee's evaluation of Information Notice 2010-11 incorrectly concluded that procedures contained sufficient direction to preclude flashing. [P.2(a)]. (Section 4OA5.1c(5))

- Green. The inspectors identified a finding of very low safety significance and associated Severity Level IV violation of 10 CFR 50.59, "Changes, Tests, and Experiments," for the failure to perform a written evaluation, which provided the bases for the determination that a change did not require a license amendment. Specifically, the licensee failed to provide a basis for not applying for a license amendment associated with a modification of the residual heat removal pump casing drain lines. The finding was entered into the licensee's corrective action program to: (1) stage a hose and pipe couplings to support venting at the residual heat removal pump casing vent; (2) create a work order request to flush flow through the abandoned drain lines that were cut from the pump casing vent to show the lines could still pass water; (3) develop an alternate means to accomplish this activity; and (4) evaluate the change.

  The performance deficiency was determined to be more than minor because it was associated with the Mitigating System cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the capability and availability of systems that respond to initiating events to prevent undesirable consequences. Violations of 10 CFR 50.59 are dispositioned using the traditional

enforcement process instead of the significance determination process because they are considered to be violations that potentially impede or impact the regulatory process. The finding screened as of very low safety significance (Green) using a Phase II evaluation. The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not confirmed to reflect current performance due to the age of the performance deficiency. (Section 4OA5.1c(6))

- Green. The inspectors identified a finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for failure to establish procedures for reduced inventory operations that were appropriate to preclude air entrainment into Residual Heat Removal (RHR) and Reactor Coolant Systems (RCS). Specifically, a procedure allowed operation of RHR while in reduced inventory operations with a minimum RCS level and maximum pump flowrate combination that was determined to result in air-entrainment vortices. The finding was entered into the licensee's corrective action program to place an administrative hold to the procedure until proper documentation is revised and updated and to revise the procedure to require stricter use of high accuracy level instrumentation.

  The performance deficiency was determined to be more than minor because it was associated with the initiating event cornerstone attribute of procedure quality and affected the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown operations. The finding screened as of very low safety significance (Green) using a Phase II evaluation. The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not confirmed to reflect current performance due to the age of the performance deficiency. (Section 4OA5.1c(7))

B. Licensee-Identified Violations

A violation of very low safety significance identified by the licensee has been reviewed by the inspectors. Corrective actions planned or taken by the licensee have been entered into the licensee's corrective action program. This violation and corrective action tracking number is listed in Section 4OA7 of this report.

REPORT DETAIL

4. OTHER ACTIVITIES

4OA5 Other Activities

.1 (Open) NRC Temporary Instruction (TI) 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 (ECCS), Decay Heat Removal (DHR), and Containment Spray (CS) 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 ECCS, DHR, and CS Systems (NRC Generic Letter 2008-01)," and considered the site-specific supplemental information provided by Office of Nuclear Reactor Regulations (NRR) to the inspectors.

The inspectors concluded the TI must remain open for DC Cook Nuclear Power Plant and additional inspection will be necessary. Specifically, at the conclusion of this inspection period, questions remained unresolved regarding the use of computer software for an operability determination and reduced inventory operations.

The documents reviewed are listed in the Attachment to this report.

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.

(1) Licensing Basis: The inspectors reviewed selected portions of licensing basis documents to verify they were consistent with the NRR assessment report and were processed by the licensee. The licensing basis verification included the verification of selected portions of Technical Specifications (TS), TS basis, and Final Safety Analysis Report (FSAR).

The inspectors also verified applicable documents that described the plant and plant operation, such as calculations, piping and instrumentation diagrams (P&IDs), procedures, and corrective action program (CAP) documents, addressed the areas of concern and were changed if needed following plant changes.

The inspectors noted TS did not contain a Surveillance Requirement (SR) to verify the pipe is full of water. The details of this observation are discussed in Section 4OA5.1.c(9)(a) of this report. The inspectors also confirmed the licensee's CAP captured the commitment to evaluate the Technical Specifications Task Force

(TSTF) traveler for gas accumulation to either supplement or replace the current TS requirements. This commitment was captured in the CAP as GT00839941. However, the inspectors noted GT00839941 did not capture the commitment's completion schedule stated in the GL 2008-01 responses. The details of this observation are discussed in Section 4OA5.1.c(9)(b) of this report.

(2) 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:

(a) The inspectors assessed the licensee's efforts for identifying the gas intrusion mechanisms that apply to the licensee's plant and noted several examples where the licensee failed to address the potential for vortexing as a gas intrusion mechanism. The details and enforcement of this issue are discussed in Section 4OA5.1.c(1) of this report.

The inspectors also verified the licensee had identified the gas intrusion mechanisms associated with an operability evaluation associated with residual heat removal (RHR) in an earlier inspection period. This additional activity counted towards the completion of this TI and was documented in Inspection Report 05000315/2010003; 05000316/2010003.

(b) The inspectors assessed if the licensee's void acceptance criteria were consistent with NRR's void acceptance criteria and noted that the licensee incorrectly translated the industry interim pump gas ingestion criteria into procedures. Specifically, the licensee did not translate the limitations of the acceptance criteria with respect to rated performance of pump operation. The details and enforcement of this issue are discussed in Section 4OA5.1.c(2) of this report. In addition, the inspectors noted an example where the licensee relied on the use of a computer code for past-operability evaluation of a void discovered at the RHR and CS suction, and the computer code was not benchmarked for this application. This issue is being followed up and is one of the reasons why this TI remains in open status.

The inspectors also reviewed the void acceptance criteria used by the licensee when evaluating the operability of RHR in an earlier inspection period. This additional activity counted towards the completion of this TI and was documented in Inspection Report 05000315/2010003; 05000316/2010003.

(c) The inspectors reviewed selected documents, including calculations and engineering evaluations with respect to gas accumulation in the subject systems. Specifically, the inspectors verified these documents addressed venting requirements, aspects where pipes are normally voided, and void control during system realignments. The inspectors noted an example where the licensee might not have adequately addressed void control during reduced inventory operations. Specifically, the limitations included in a procedure used during reduced inventory operations allowed for up to 2 percent air entrainment to the RHR and reactor coolant system (RCS). This issue is being followed up and is one of the reasons why this TI remains in open status.

(d) The inspectors conducted a walkdown of selected regions of ECCS and CS in sufficient detail to assess the licensee's walkdowns. The inspectors also verified the information obtained during the licensee's walkdown was consistent with the items identified during the inspectors' independent walkdown and noted that the licensee did not identify all void susceptible locations. The details of this observation are discussed in Section 4OA5.1.c(9)(c) of this report.

The inspectors also assessed if the piping and instrumentation diagrams (P&IDs) accurately described the subject systems and were up-to-date with respect to recent hardware changes. In addition, the inspectors assessed if the licensee had isometric drawings that describe the configurations of the GL 2008-01 scoped systems and had confirmed the accuracy of the drawings.

The inspectors also conducted a similar review of the chemical and volume control system (CVCS) and RHR in earlier inspection periods. These additional activities counted towards the completion of this TI and were documented in Inspection Report 05000315/2010002; 05000316/2010002, and Inspection Report 05000315/2010004; 05000316/2010004.

(e) The inspectors reviewed applicable documents to determine if the licensee's commitment to perform walkdowns had been completed and noted an inaccessible portion of ECCS discharge piping were walkdowns were not performed. The details of this observation are discussed in Section 4OA5.1.c(9)(d) of this report.

(3) Testing: The inspectors reviewed selected surveillance and post-modification test procedures and results to assess if the licensee approved and was using procedures that were adequate to address the issue of gas accumulation and/or intrusion in the subject systems. Specifically:

(a) The inspectors reviewed procedures used for conducting void periodic monitoring and determination of void volumes to ensure that the void criteria was satisfied and will be reasonably ensured to be satisfied until the next scheduled void surveillance. The inspectors noted an example where the void monitoring program was deficient. Specifically, the Gas Accumulation Condition Monitoring (GACM) Program relied on system performance monitoring of plant parameters as an alternative to conventional void monitoring methods such as ultrasonic examinations. However, the licensee had not developed procedures to implement performance monitoring requirements. The details and enforcement of this issue are discussed in Section 4OA5.1.c(3) of this report.

(b) The inspectors reviewed selected procedures used for void control, such as filling and venting, following conditions which may have introduced voids into the subject systems to verify the procedures addressed testing for such voids and provided processes for their reduction or elimination. The inspectors noted the procedures used for dynamic venting did not contain adequate instructions in that they failed to specify the minimum flowrate and flush duration to ensure gas removal. The details and enforcement of this issue are discussed in Section 4OA5.1.c(4) of this report.

(4) Corrective Actions: The inspectors reviewed selected licensee's assessment reports and CAP documents 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 nine-month and supplemental reports were documented. The inspectors also verified the commitments were included in the CAP.

The inspectors noted an example where the licensee identified a deficiency in a procedure used to relief system pressure that introduced gas into the ECCS discharge piping. The details of this licensee-identified finding are discussed in Section 4OA7 of this report.

In addition, the inspectors noted two examples where the CAP did not adequately evaluate operating experience. Specifically, the licensee received two operating experience documents associated with steam formation at the RHR piping following a MODE 4 loss of coolant accident (LOCA). In one example the operating experience was not processed through the CAP and in the second example the licensee evaluated the operating experience incorrectly. The details and enforcement of this issue are discussed in Section 4OA5.1.c(5) of this report.

c. Findings and Observations

(1) Vortexing Was Not Evaluated for the Volume Control, Containment Spray Additive, Refueling Water Storage Tanks

Introduction: A finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified by the inspectors for the failure to evaluate vortexing in the volume control tank (VCT), containment spray additive tank (SAT), and refueling water storage tank (RWST).

Description: On January 11, 2008, the NRC requested each addressee of GL 2008-01 to evaluate its ECCS, DHR, and CS systems licensing basis, design, testing, and corrective actions to ensure that gas accumulation was maintained less than the amount that would challenge the operability of these systems, and take appropriate actions when conditions adverse to quality were identified. The licensee's original actions to address these requests were, in part, to perform design reviews to identify and address gas intrusion mechanisms. GL 2008-01 identified vortexing as gas intrusion mechanisms. However, the inspectors identified the following three examples where vortexing was not addressed by the design of GL 2008-01 subject systems. Specifically,

- The VCT had a Lo-Lo-Level setpoint relied upon to isolate the charging pumps suction from the VCT to protect them from hydrogen entrainment and, thus, protect the ECCS function of the pumps. However, the potential for vortexing at the VCT was not evaluated. The inspectors were concerned because air-entraining vortices would lead to hydrogen ingestion into the pumps and the Lo-Lo-Level setpoint did not consider the potential for vortexing. As a result, the licensee performed a prompt operability review including informal calculations and determined there was reasonable assurance the Lo-Lo-Level setpoint was sufficient to prevent vortexing. The licensee captured the inspectors' concerns in the CAP as AR 2012-1236. The corrective actions being considered at the time of this inspection was to evaluate the potential for vortexing at the VCT.

- Similarly, the SAT had a Lo-Lo-Level setpoint relied upon to isolate the CS pumps suction from the SAT due to low level. However, the potential for vortexing at the SAT was not evaluated. Again, the inspectors were concerned because air-entraining vortices would lead to nitrogen ingestion into the CS pumps and the Lo-Lo-Level setpoint did not consider the potential for vortexing. As a result, the licensee performed a prompt operability review including informal calculations and determined there was reasonable assurance the Lo-Lo-Level setpoint was sufficient to prevent vortexing. The licensee captured the inspectors' concerns in the CAP as AR 2012-1236. The corrective actions being considered at the time of this inspection was to evaluate the potential for vortexing at the SAT.

- The potential for vortexing at the RWST was previously evaluated by calculation ENSM970606JJR, "RWST Vortexing." This calculation was superseded by MD-12-RWST-002, "RWST Vortex Model Test Result Evaluation." The latter evaluated the results of a site-specific scaled test and provided a mathematical model that could be used to determined the required RWST suction piping submergence to prevent vortexing as a function of flowrate. However, the inspectors noted that, although the original vortexing evaluation was retired from the design basis, the licensee did not develop a submergence requirement using the new mathematical model. As a result of the inspectors' questions, the licensee performed an evaluation and reasonably determined that the RHR and CS pumps isolation setpoint from the RWST was sufficient to address the new submergence requirement for the RWST. The licensee captured the inspectors' concerns in the CAP as AR 2012-1632 and AR 2012-1864. The corrective actions being considered at the time of this inspection was to review the affected calculations.

Analysis: The inspectors determined that the failure to evaluate vortexing in the VCT, SAT, and RWST was contrary to 10 CFR Part 50, Appendix B, Criterion III, "Design Control," and was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Mitigating System cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. In addition, the finding was associated with the Containment Barrier cornerstone attribute of structure, system, and component (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 charging, RHR, and CS pumps because the effects of vortexing in their respective tanks and potential gas entrainment to the system pumps suction were not analyzed.

The inspectors determined that the finding examples associated with the VCT and RWST could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of findings," Table 4a for the Mitigating System cornerstone. The finding screened as of very low safety significance (Green) because it was a design deficiency confirmed not to result in loss of operability. Specifically, the licensee performed an evaluation that reasonably concluded that current limit setpoints prevent vortexing in the VCT and RWST.

The inspectors determined that the finding example associated with the SAT could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of findings," Table 4a for the Containment Barrier cornerstone. The finding screened as of very low safety significance (Green) 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 inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not confirmed to reflect current performance due to the age of the performance deficiency. Specifically, the licensee would have been expected to review the vortexing evaluations when addressing GL 2008-01 in 2008.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculation methods, or by the performance of a suitable testing program.

Contrary to the above, as of January, 24, 2012, the licensee had not verified the adequacy of the CVCS, RHR, and CS design. Specifically, the licensee failed to evaluate vortexing in the VCT, RWST, and SAT. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR 2012-1236, AR 2012-1632, and AR 2012-1864, this violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000315/2012008-01; 05000316/2012008-01, vortexing was not evaluated for the volume control, containment spray additive, refueling water storage tanks).

(2) Incomplete Methodology for Developing Acceptance Criteria for Suction Voids

Introduction: A finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified by the inspectors for the failure to correctly incorporate the interim methodology for developing acceptance criteria for suction voids into procedures. Specifically, the licensee did not translate the limitations of the acceptance criteria with respect to rated performance of pump operation.

Description: On January 11, 2008, the NRC requested each addressee of GL 2008-01 to evaluate its ECCS, DHR, and CS systems licensing basis, design, testing, and corrective actions to ensure gas accumulation was maintained less than the amount that would challenge the operability of these systems, and take appropriate actions when conditions adverse to quality were identified. Part of the licensee's actions to address these requests was to develop acceptance criteria for void volumes that may be identified such as during periodic monitoring.

The inspectors noted the interim acceptance criteria methodology used for void volumes located at suction piping was incomplete. Specifically, the suction void acceptance criteria methodology contained in Procedure EHI-5202, "Gas Accumulation Condition Monitoring Program," did not consider pump operation with respect to its best efficiency

point (BEP). Specifically, the suction void acceptance criteria was based on the interim gas ingestion tolerance criteria of the PWR Owners' Group (PWROG) published on October of 2008 in V-EC-1866, "Pump Interim Gas Ingestion Tolerance Criteria: PA-SEE-450 Task 2." This interim criteria methodology was considered to be effective by the PWROG over a specific range of BEP flowrate. However, the expected range of flow conditions of the station's pumps was, in some cases, outside the specified range of BEP flowrate where the interim acceptance criteria was considered effective and Procedure EHI-5202 did not contained this limitation.

In addition, the inspectors noted the licensee's GL 2008-01 nine-month response included a commitment to monitor ongoing industry programs, in part, with respect to pump gas void ingestion tolerance limits. However, the licensee had not revised Procedure EHI-5202 to include the new industry acceptance criteria methodology to address the range of BEP flowrate where the interim criteria methodology was not effective. The new industry methodology was published in NEI 09-10, "Guidelines for Effective Prevention and Management of System Gas Accumulation," dated December 2010. As a result, the licensee initiated AR 2012-1174 to, in part; revise Procedure EHI-5202 to include the new methodology.

The inspectors were concerned because non-conservative acceptance criteria would allow potentially inoperable conditions to go undetected. For instance, the inspectors noted the licensee identified a void in the Unit 1 safety injection (SI) pump suction header during periodic monitoring with an as-found void fraction of 6.8 percent. The licensee captured this condition in the CAP as AR 2010-8851 and determined it satisfied the acceptance criterion of 10 percent void fraction. However, the expected limiting range of flow conditions was outside the range of applicability of the interim methodology and the licensee did not address this discrepancy. The inspectors also noted the applicable limit in accordance with the new methodology was 5 percent void fraction, which was exceeded by the as-found void size. The licensee captured the inspectors' concerns in the CAP as AR 2012-1841 and performed an evaluation. The licensee determined that the identified condition met the 5 percent criterion when accounting for the expected pressure increase upon system initiation which would compress the gas volume.

Analysis: The inspectors determined that the failure to correctly incorporate the interim methodology for developing acceptance criteria for suction voids into procedures was contrary to 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," and was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Mitigating System cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the application of the acceptance criteria methodology to conditions that do not meet its limitation would result in non-conservative acceptance criteria for suction voids. Non-conservative acceptance criteria do not ensure the availability, reliability, and capability of the applicable mitigating systems because it would allow a potentially inoperable system to go undetected.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of findings," Table 4a for the Mitigating System cornerstone. The finding screened as of very low safety significance (Green) because it

was a design deficiency confirmed not to result in loss of operability. Specifically, a review of recent monitoring results determined that identified voids did not exceed the applicable acceptance criteria.

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: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed and accomplished by procedures appropriate to the circumstances.

Contrary to the above, as of January 24, 2012, the instructions contained in Procedure EHI-5202 were not appropriate to develop suction void acceptance criteria. Specifically, the procedure did not include the limitations of applicability of the acceptance criteria methodology and these limitations were not always met. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR 2012-1174 and AR 2012-1841, this violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000315/2012008-02; 05000316/2012008-02, Incomplete methodology for developing acceptance criteria for suction voids).

(3) Procedures Were Not Developed for Performance Monitoring of Plant Parameters

Introduction: A finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified by the inspectors for the failure to establish appropriate procedures to implement the requirements of performance monitoring of plant parameters for gas accumulation. Specifically, the licensee had not established instructions in procedures to control important aspects such as frequency of monitoring and acceptance criteria.

Description: On January 11, 2008, the NRC requested each addressee of GL 2008-01 to evaluate its ECCS, DHR, and CS systems licensing basis, design, testing, and corrective actions to ensure that gas accumulation was maintained less than the amount that would challenge the operability of these systems, and take appropriate actions when conditions adverse to quality were identified. On October 14, 2008, the licensee submitted their nine-month response to the NRC, which included a commitment to create a GACM Program document to include, in part, performance monitoring of plant parameters that may indicate an increased potential for gas accumulation. As a result, the licensee developed Procedure EHI-5202 to identify the administrative requirements for the GACM Program. Section 4.4, "Performance Monitoring," described three plant parameters to be used as indicators of increased potential for gas accumulation. These were the RCS high/low pressure interface across the RCS pressure isolation check valves, accumulator level, and pressure within the ECCS piping network.

The inspectors noted the performance monitoring of these plant parameters was not programmatically controlled. Specifically, the licensee had not established instructions in procedures to control important aspects such as frequency of monitoring and acceptance criteria. For instance, when the inspectors questioned what accumulator level would trigger an action to investigate the potential for gas accumulation, the licensee stated that the Maintenance Rule (MR) Program requires placing the

accumulator in enhanced monitoring classification a(1) if the level decreases to a pre-established amount. As part that action, the licensee would initiate an action in the CAP to address all possible deficiencies including the potential for gas accumulation. However, the inspectors noted this informal reliance of the GACM Program on the MR Program was ineffective because, under worst-case conditions, the required level decreased to create a gas volume of concern assuming worst-case conditions was significantly smaller than the level decreased requiring an action under the MR Program. In addition, the licensee had not established the maximum allowable non-condensable void size for the affected portion of pipe. Similarly, the inspectors noted the acceptance criteria used for the other monitored plant parameters were not formally established.

The licensee captured the inspectors' concerns in the CAP as AR 2012-1768. The corrective actions considered at the time of this inspection were to determine the size of the limiting voids at the affected locations and establish appropriate acceptance criteria. In addition, a review of recent trend data confirmed there was no evidence of gas accumulation at the affected locations because the applicable plant parameters were stable.

Analysis: The inspectors determined the failure to establish appropriate procedures to implement performance monitoring requirements was contrary to 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," 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 appropriate procedures to implement performance monitoring were not developed, performance monitoring activities were not assured to detect void formation in the applicable susceptible locations. As a consequence, the potential existed for an unacceptable void to go undetected affecting the operability of GL 2008-01 subject systems. This finding affected the Mitigating System cornerstone.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of findings," Table 4a for the Mitigating System cornerstone. The finding screened as of very low safety significance (Green) because it was a design deficiency confirmed not to result in loss of operability. Specifically, a review of a sample of recent plant parameter trends determined that unacceptable void formation had not occurred.

The inspectors determined that this finding had a cross-cutting aspect in the area of human performance because the licensee did not make safety-significant decisions using a systematic process. Specifically, the licensee decided to use informal trending mechanisms to track the critical plant parameters instead of creating a formal and systematic approach to programmatically control the activity. [H.1(a)]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed and accomplished by procedures appropriate to the circumstances.

Contrary to the above, as of January, 23, 2012, the licensee had not prescribed appropriate procedures for implementing performance monitoring requirements. Specifically, the GACM Program required performance monitoring of critical plant

parameters to detect void formation but the licensee had not develop procedures containing the necessary instructions and acceptance criteria for this activity. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR 2012-1768, this violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000315/2012008-03; 05000316/2012008-03, procedures were not developed for performance monitoring of plant parameters).

(4) Minimum Flowrates and Time Requirements for Dynamic Flushing Were Not Established

Introduction: A finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," was identified by the inspectors for the failure to establish minimum flowrate and time required in procedures used to perform dynamic flushing activities.

Description: On January 11, 2008, the NRC issued GL 2008-01 to discuss, in part, the subject of gas control. Such as, it stated that "where vents are not installed at high points, ultrasonic measurements can provide a check for gas, and a high flowrate may be useful to ensure that gas has been swept from high points." On October 14, 2008, the licensee submitted their nine-month response to the NRC, which stated that "The ECCS systems are dynamically flushed to remove entrained air. Froude number calculations performed for the systems at these system flush rates indicate that the fluid velocity is sufficient to sweep the voids." In addition, it stated that "After RHR has been restored, pump and valve in-service tests are performed at or near maximum design flow for RHR, SI, and charging systems." These statements were incorporated into the requirements of Procedure EHI-5202.

Procedure EHI-5202 stated that a sufficiently high flowrate corresponds to a Froude number greater than or equal to 1.0 for dynamic flushing. The inspectors requested calculations for determining the minimum flow rate required in applicable systems to ensure dynamic flushing (i.e., flow rates resulting in Froude numbers greater than or equal to 1.0.) The licensee acknowledged such calculations did not exist. The inspectors noticed Procedures 1/2-4021-003-001, "Letdown charging and seal water operation," 1/2-OHP-4021-008-001, "Filling and venting the SI, RHR, and boron injection tank," 1/2-OHP-4030-108-008R, "ECCS check valve test," and 1/2-OHP-4021-002-12, "Restoration from RCS draindown," relied on dynamic flushing following a fill and vent in lieu of confirmatory ultrasonic examinations to ensure a successful fill and vent activity by sweeping any remaining voids in the applicable systems. However, the inspectors were concerned because some of these procedures did not specify the minimum required flowrates and flow duration to ensure the voids were flushed from the system while other procedures included a minimum required flowrate but these values were not supported by calculations. These procedural limitations are necessary to assure a successful void removal.

In addition, the inspectors noticed examples of flow path configurations allowed by dynamic flushing procedures that resulted in Froude number less than 1.0 even when the applicable pump was operated at maximum capacity. Specifically, some portions of parallel piping of two trains were dynamically flushed using only one pump via a cross-connection line. This configuration halved the flowrate at each parallel pipe resulting in Froude numbers below what is required for a successful dynamic flush.

The licensee captured the inspectors' concerns in the CAP as AR 2012-1177. The corrective action considered at the time of this inspection was to revise the affected procedures. A review of the sequence of fill and vent, and flushing of applicable systems during the last refueling outage reasonably determined the activity was performed in a manner where the required flowrates were achieved.

Analysis: The inspectors determined the failure to establish minimum flowrate and time required in procedures used to perform dynamic flushing activities was contrary to 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," 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, the failure to establish an appropriate procedure for flushing would have the potential of not removing voids to ensure system operability. This finding affected the Mitigating System cornerstone.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of findings," Table 4a for the Mitigating System cornerstone. The finding screened as of very low safety significance (Green) because it was a design deficiency confirmed not to result in loss of operability. Specifically, a review of the sequence of fill and vent, and flushing of applicable systems during the last refueling outage reasonably determined the activity was performed in a manner where the required flowrates were achieved.

The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not confirmed to reflect current performance due to the age of the performance deficiency. Specifically, the licensee would have been expected to review dynamic flushing requirements when addressing GL 2008-01 in 2008.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," requires, in part, for procedures to include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

Contrary to the above, as of January, 25, 2012, the licensee did not include appropriate quantitative acceptance criteria for determining that important dynamic flushing activities have been satisfactorily accomplished. Specifically, the minimum required flowrate and duration for dynamic flushing was not established and incorporated in procedures. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR 2012-1177, this violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000315/2012008-04; 05000316/2012008-04, Minimum flowrates and time requirements for dynamic flushing were not established).

(5) Inadequate Procedure for Responding to a MODE 4 LOCA

Introduction: A finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified by the inspectors for the failure to include adequate venting instructions in the procedure use to respond to a MODE 4 LOCA.

Description: The licensee received in 2009 Nuclear Safety Advisory Letter (NSAL) 09-8, "Presence of vapor in ECCS/RHR in Modes 3/4 LOCA conditions." This operating experience discussed the potential for water flashing to steam in the RHR piping upon switching from DHR to ECCS mode of operation. High temperature water in the RHR system had the potential to flash to steam during a LOCA scenario while in Mode 4. Specifically, the RHR system operating in its DHR mode of operation would be at RCS temperature and pressure. Following a LOCA, the trapped fluid in the RHR lines would flash because it would suddenly be exposed to lower pressures resulting from swapping the suction of RHR over to the RWST following system realignment to its ECCS mode of operation. The RWST is open to the atmosphere. However, the inspectors noted the licensee did not process this operating experience through the CAP and, thus, it was not evaluated. The licensee captured this process deficiency in the CAP as AR 2012-0970.

On August 17, 2010, the licensee completed an evaluation of NRC Information Notice (IN) 2010-11, "Potential for Steam Voiding Causing RHR System Inoperability." This operating experience addressed the same technical issues as NSAL 09-8. The licensee's evaluation of IN 2010-11 concluded the existing procedures contained sufficient direction to preclude steam formation. Specifically, Procedure 1/2-OHP-4022-002-015, "MODE 4 LOCA," contained instructions to: (1) depressurize the RHR pump casing when temperatures are greater than 185°F; and (2) fill the suction side of the pump slowly over a period of 10 minutes using the RWST to collapse any steam void. These actions are required to be performed before initiating the system in its ECCS mode of operation. However, the inspectors noted steam formation would occur at all locations where the system pressure is lowered below its saturation point and the pump casing was not the only system high point. Thus, the inspectors were concerned because the procedure did not include instructions to address the rest of the system high points, including the discharge piping. In addition, the licensee had not evaluated the system for water-hammer.

Section 3.5.3 of TS, "ECCS – Shutdown," required one train of ECCS mode of operation of RHR to be operable at Mode 4, "Hot Shutdown," to ensure that sufficient ECCS flow is available to the core following a shutdown LOCA. However, TS Basis 3.5.3 stated that due to the stable conditions associated with operation in MODE 4 and the reduced probability of occurrence of a Design Basis Accident (DBA), the ECCS operational requirements are reduced. It further stated that it is understood in these reductions that automatic injection actuation is not available and that, in this MODE, sufficient time exists for manual actuation of the required ECCS to mitigate the consequences of a DBA. This allowed operation of RHR in the DHR mode during Mode 4 to provide force circulation for decay heat removal and transport. Both trains of RHR were typically placed into service in the DHR mode to shorten the cooldown time. The DHR mode of RHR operation was governed by TS 3.4.6, "RCS Loops – Mode 4."

The licensee captured the inspectors' concerns in the CAP as AR 2012-1830. The corrective action considered at the time of this inspection was to leave one train of RHR idle while the other train cools down the RCS below 200°F to ensure that the discharge side of one train of RHR is not vulnerable to steam formation.

Analysis: The inspectors determined the failure to include adequate venting instructions in the procedure use to respond to a MODE 4 LOCA was contrary to 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," 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, the failure to include adequate instructions in RHR procedures to ensure that steam voids were removed prior to system initiation would have the potential to result in water-hammer, which is not part of the system's design. This finding affected the Mitigating System cornerstone.

Since this concern only exists while the plant is in MODE 4, the Region III Senior Reactor Analyst (SRA) evaluated this finding in accordance with IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process (SDP)." Using IMC 0609, Appendix G, Attachment 1, Checklist 1, this finding was determined to degrade the licensee's ability to add RCS inventory, which required a Phase II SDP analysis. Therefore, the risk evaluation continued with IMC 0609, Appendix G, Attachment 2, "Phase II Significance Determination Process Template for PWR during Shutdown."

The exposure time was when Unit 1 was operating in MODE 4 with RHR in service at a temperature high enough that flashing could occur if the system was suddenly depressurized. The licensee provided historical time periods for Unit 1 during the last year for when Unit 1 was operating in MODE 4 with RHR in service. The time period of unavailability of RHR while in MODE 4 for Unit 1 during the last 12 months was about three hours. Unit 2 was not operated in MODE 4 during the last year.

The SRA determined that the applicable initiating event for this condition in IMC 0609, Appendix G, Attachment 2 for this finding was Worksheet 5 – SDP for a Pressurized Water Reactor Plant – Loss of Inventory in Plant Operating State 1 (RCS Closed). The SRA used a bounding exposure time of less than three days with no credit for RHR, credit for one train of safety injection, and nominal credit for the remaining modeled functions. This resulted in one sequence with a result of "8." Based on the above, the SRA concluded that the risk due to the performance deficiency was of very low safety significance (Green).

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 relevant external operating experience. Specifically, the licensee's evaluation of IN 2010-11 incorrectly concluded that procedures contained sufficient direction to preclude flashing. [P.2(a)]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed and accomplished by procedures appropriate to the circumstances.

Contrary to the above, as of February 8, 2012, Procedure 1/2-OHP-4022-002-015 was not appropriate to the circumstances. Specifically, the procedure did not contain adequate instructions to remove the steam that would form at the RHR piping following a shutdown-LOCA prior to system realignment to ECCS injection. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR 2012-1830, this violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000315/2012008-05; 05000316/2012008-05, Inadequate procedure for responding to a MODE 4 LOCA).

(6) 10 CFR 50.59 Evaluation for Modification of RHR Pump Casing Drain Lines Was Not Performed

Introduction: The inspectors identified a finding of very low safety significance and an associated Severity Level IV, Non-Cited Violation of 10 CFR 50.59, "Changes, Tests, and Experiments," for the failure to perform a written evaluation, which provided the bases for the determination that a change did not require a license amendment. Specifically, the licensee failed to provide a basis for not applying for a license amendment associated with a modification of the RHR pump casing drain lines.

Description: Procedure 1/2-OHP-4022-002-015, "MODE 4 LOCA," contained instructions to respond to a LOCA occurring while in MODE 4, including instructions to realign RHR from its DHR mode of operation to its ECCS mode of operation. As part of this realignment, the procedure directed operators to depressurize and cool down the RHR pump casing when temperatures were greater than 185 to remove and collapse any steam void resulting from system depressurization associated with the realignment. Specifically, the procedure required opening the RHR pump casing drains 1/2-RH-106E and 1/2-RH-106W.

These valves were originally operated from the outside of the RHR pump rooms via reach-rods and discharged through hard piping connected to the waste disposal system (WDS). Engineering modifications 1-MOD-45699, "Isolate Unit 1 ECCS and CTS Pump Drain," and 2-MOD-45698, "Isolate Unit 2 ECCS and CTS Pump Drains," modified these valves to remove the reach-rods and hard piping connecting the outlet of the valves to the WDS, and added threaded caps. These modifications were put into place to eliminate possible leakage paths for the ECCS system for ECCS leakage dose concerns. The documentation associated with the engineering modifications did not acknowledge these valves were used as part of the mitigation strategy included in Procedure 1/2-OHP-4022-002-015.

Section 3.5.3 of TS, "ECCS – Shutdown," required one train of ECCS mode of operation of RHR to be operable at Mode 4, "Hot Shutdown," to ensure that sufficient ECCS flow is available to the core following a shutdown LOCA. However, the inspectors noted engineering modifications 1-MOD-45699 and 2-MOD-45698 added a complicated manual action affecting their MODE 4 LOCA mitigation strategy. Specifically, the opening of the pump casing drains required additional actions to prevent discharging the drains to the room atmosphere. Opening the pump casing drains to the room atmosphere would allowed the RHR fluid to flash to steam creating both an industrial and radiological safety concern for the operator opening the valve. The resulting hazardous environment has the potential to adversely affect the ability of the operator to complete RHR realignment to its ECCS mode of operation.

In addition, the inspectors were concerned because these additional actions were not included in the MODE 4 LOCA procedure. Without a procedure describing these actions, the potential outcome is uncertain. Also, the associated human factors and timing of these actions were not evaluated.

The inspectors determined this adverse effect resulting from a physical change in the facility could delay the time required to realign RHR to the ECCS mode of operation. A delay in RHR injection could have detrimental effects in reactor water level as RHR together with a high-head pump are credited by TS to provide 100 percent water

capability. The inspectors concluded the impact of this physical change to the facility should have been evaluated and documented in a safety evaluation. Specifically, 10 CFR 50.59(c)(2)(ii) requires licensees to obtain a license amendment prior to implementing a proposed change, test, or experiment if the change, test, or experiment would result in more than a minimal increase in the likelihood of occurrence of a malfunction of a SSC important to safety previously evaluated in the FSAR. Section 6.1 of the FSAR stated that the ECCS systems which must operate following a design basis accident (DBA) include the RHR system. A LOCA is one of the DBAs evaluated in Section 14 of the FSAR. However, the licensee did not perform an evaluation to demonstrate that modifications 1-MOD-45699 and 2-MOD-45698 did not represent a more than minimal increase in the likelihood of occurrence of a malfunction of the RHR system.

The licensee captured the inspectors' concerns in the CAP as AR 2012-1751 and AR 2012-1830. The corrective actions considered at the time of this inspection were to: (1) stage a hose and pipe couplings to support venting at the RHR pump casing vent; (2) create a work order request to flush flow through the abandoned drain lines that were cut from the pump casing vent to show the lines could still pass water; (3) develop an alternate means to accomplish this activity; and (4) evaluate the change.

Analysis: The inspectors determined the failure to perform a written evaluation, which provided the bases for the determination that a change did not require a license amendment was contrary to 10 CFR 50.59(d)(1) and was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Mitigating System cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the capability and availability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the design of RHR did not ensure the capability of its ECCS mode of operation to perform its mitigating function while in Mode 4.

Violations of 10 CFR 50.59 are dispositioned using the traditional enforcement process instead of the SDP because they are considered to be violations that potentially impede or impact the regulatory process. In addition, the associated finding is evaluated under the SDP to determine the significance of the violation. Since this concern only exists while the plant is in MODE 4, the Region III Senior Reactor Analyst (SRA) evaluated this finding in accordance with IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process (SDP)." Using IMC 0609, Appendix G, Attachment 1, Checklist 1, this finding was determined to degrade the licensee's ability to add RCS inventory, which required a Phase II SDP analysis. Therefore, the risk evaluation continued with IMC 0609, Appendix G, Attachment 2, "Phase II Significance Determination Process Template for PWR during Shutdown."

The exposure time was when Unit 1 was operating in MODE 4 with RHR in service at a temperature high enough that flashing could occur if the system was suddenly depressurized. The licensee provided historical time periods for Unit 1 during the last year for when Unit 1 was operating in MODE 4 with RHR in service. The time period of unavailability of RHR while in MODE 4 for Unit 1 during the last 12 months was about three hours. Unit 2 was not operated in MODE 4 during the last year.

The SRA determined that the applicable initiating event for this condition in IMC 0609, Appendix G, Attachment 2 for this finding was Worksheet 5 – SDP for a Pressurized

Water Reactor Plant – Loss of Inventory in Plant Operating State 1 (RCS Closed). The SRA used a bounding exposure time of less than three days with no credit for RHR, credit for one train of safety injection, and nominal credit for the remaining modeled functions. This resulted in one sequence with a result of "8." Based on this Phase II analysis, the SRA determined that the finding was of very low safety significance (Green).

The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not confirmed to reflect current performance due to the age of the performance deficiency. Specifically, the licensee would have been expected to perform a 50.59 evaluation when the modifications were planned in 2005 and 2006.

Enforcement: Title 10 CFR 50.59, "Changes, Tests, and Experiments," Section (d)(1) requires the licensee to maintain records of changes in the facility, of changes in procedures, and of tests and experiments made pursuant 10 CFR 50.59(c). It also requires that these records include a written evaluation, which provides the bases for the determination that the change, test, or experiment does not require a license amendment.

Contrary to the above, since August 24, 2004, the licensee did not provide a written evaluation, which provided the bases for determining that a change, test or experiment made pursuant to 10 CFR 50.59(c) did not require a license amendment. Specifically, the licensee made a change pursuant to 10 CFR 50.59(c) in that the licensee permanently cut and capped the RHR drain lines, and these lines were relied upon by the procedure used to respond to a MODE 4 LOCA. The licensee did not provide a written evaluation providing a basis for determining that the change would not result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC as the change adversely affected the manner in which operator action was performed.

Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR 2012-1751 and AR 2012-1830, this violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000315/2012008-06; 05000316/2012008-06, 10 CFR 50.59 evaluation for modification of RHR pump casing drain lines was not performed).

The associated finding is evaluated separately from the traditional enforcement violation and therefore the underlying finding is being assigned a separate tracking number (FIN 05000315/2012008-06; 05000316/2012008-07, 10 CFR 50.59 evaluation for modification of RHR pump casing drain lines was not performed).

(7) Inadequate Procedure for RCS Vacuum Fill During Reduced Inventory Operations

Introduction: A finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified by the inspectors for the failure to establish procedures for reduced inventory operations that were appropriate to preclude air entrainment into RHR and RCS. Specifically, a procedure allowed operation of RHR while in reduced inventory operations with a minimum RCS level and maximum pump flowrate combination that was determined to result in air-entrainment vortices.

Description: While reviewing two procedures used during reduced inventory, 1-OHP-4021-002-005, “RCS Draining" and the 1/2-OHP-4021-002-013, “Reactor Coolant System Vacuum Fill,” the inspectors noted a discrepancy between the operating limits between the two procedures. Both procedures allowed operation of the RHR while in reduced inventory with a minimum RCS level and maximum pump flowrate combination that were derived from Westinghouse’s recommended methodology as described in WCAP-11916, “Loss of RHR Cooling While RCS is Partially Filled.” The WCAP-11916 methodology allowed a vortex of up to 2 percent continuous air entrainment and/or sporadic gulps of air of up to 5 percent void fraction. However, the inspectors noted the following:

- The operational limits stated in procedure 1/2-OHP-4021-002-013 were based on Design Information Transmittal, (DIT)-B-01065-03, “Identification of Minimum RCS Hot Leg Level vs RHR Pump Discharge Flow.” This DIT is directly based on the WCAP methodology and allows up to 2 percent continuous air entrainment and/or sporadic gulps of air of up to 5 percent void fraction. It also included flow and level instrument uncertainties which were not considered in the WCAP document. The output of DIT B-01065-03 is a table of indicated RCS level as read on high accuracy instrumentation (NLI-122) vs indicated RHR flow.

- The operational limits contained in Procedure 1-OHP-4021-002-005 were more restrictive and were based on DIT-B-00687-01, “RHR Mid Loop Operations,” which incorporated an adjustment factor to the data contained in Westinghouse Commercial Atomic Power (WCAP)-11916 to ensure 0 percent air entrainment.

The licensee stated the differences with the operational limits for these procedures had no impact on plant operations because the pumps and level instruments would not be affected by up to 2 percent continuous air entrainment.

The inspectors reviewed DIT B-01065-03 and confirmed it did not incorporate the adjustment factor that ensured 0 percent air entrainment. The inspectors also noted procedure 1/2-OHP-4021-002-013 specified an indicated RHR flow during RCS vacuum fill to be between 2400 gpm and 3400 gpm. The corresponding indicated RCS level for RHR flows of 3400 gpm as calculated by DIT B-01065-03 was 614.4 ft. Therefore, to prevent air entrainment of greater than 2 percent, RCS level would be required to be greater than 614.4 ft for a corresponding RHR flow of 3400 gpm. However, Procedure 1/2-OHP-4021-002-013 allowed RCS level to be as low as 614.2 ft (as read in NLI-122 or NLI-1000). This RCS level would result in air entrainment higher than 2 percent. Because the requirements of DIT B-01065-03 were not properly translated into procedure 1/2-OHP-4021-002-013, the inspectors were also concerned the operability of the RHR pumps during vacuum fill evolutions could be affected as this procedure inadequacy allowed more than 2 percent air entrainment exceeding the acceptance criteria for pump air ingestion.

On April 18, 2012, operators were using Procedure 1/2-OHP-4021-002-013 to perform an RCS vacuum fill during reduced inventory operations. As vacuum was being established in the RCS, the level appeared to be lowering on all functioning indications except the high accuracy level instrument NLI-1000. Procedure 1/2-OHP-4021-002-013 required the use of at least three level instruments for redundancy purposes. One of these level instruments had to be a high accuracy level instrument (NLI-1000 or NLI-122) specified in the procedure as the controlling level instrument. The other two

required level instruments were of lower accuracy. During the evolution, the licensee used NLI-1000 as the high accuracy controlling instrument in addition to NLI-112 (differential pressure) and NGG-1000 (gauge glass). While drawing vacuum, the operators noticed RCS level decreasing in the two less accurate instruments (i.e., NLI-112 and NGG-1000). Despite the fact that NLI-1000 was the controlling level instrument, the operators stopped the vacuum fill evolution.

On April 19, 2012, operators restarted the RCS vacuum fill evolution and encountered a similar problem. This time, level instrument NLI-122 was the high accuracy controlling instrument. While performing the vacuum fill evolution, level instrument NLI-112 provided a higher level indication than the rest of the level instruments. The operators continued drawing vacuum using the other two level instruments as well as additional level instruments not required by procedure. All remaining level instruments were in agreement.

In their post-event evaluation, the licensee determined the most accurate instruments, NLI-1000 (April 18), and NLI-122 (April 19), provided actual RCS level with no abnormalities. The other less accurate level instrumentation experienced abnormal operation, (i.e., read lower than expected on April 18 and a higher reading on April 19). The inspectors noted anomalous level indication during reduced inventory operations was the subject of several generic communications including GL 87-12, “Loss of RHR While the RCS Is Partially Filled,” GL 88-17, “Loss of DHR,” as well as GL 2008-01. The inspectors were concerned that Procedure 1/2-OHP-4021-002-013 required only one high accuracy level instrument to be in service. Without independent high accuracy instrumentation, the operators could make erroneous decisions based on less accurate level instruments which are susceptible to 2 percent air entrainment.

The licensee captured the inspectors’ concerns in the CAP as AR 2012-6226 and AR 2012-5156. These corrective actions included placing the vacuum fill procedure in an administrative hold until proper documentation is revised and performing a historical review to determine previous non-conformances. The result of this historical review revealed there were no instances of operation beyond the 2 percent air entrainment limit. In addition, the licensee is revising the RCS vacuum fill procedure to require the following: (1) operators to rely on the high accuracy indications of level instruments NLI-1000 and NLI-122; (2) include trending of the RCS absolute pressure indication level instruments NLI-1000 and NLI-122; and, (3) verify the operation of the level instruments NLI-1000 and NLI-122 data logging function prior to performing RCS vacuum fill.

Analysis: The inspectors determined that failure to establish procedures for reduced inventory operations that were appropriate to manage gas accumulation was contrary to 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” and was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the initiating event cornerstone attribute of procedure quality and affected the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown operations. Specifically, the failure to establish procedures for reduced inventory operations that were appropriate to manage gas accumulation could increase the likelihood of events caused by air entrainment into the RHR and RCS. Operating experience has shown that air entrainment during reduced inventory operations can lead to loss of RHR and undesired RCS instrument behavior and inappropriate operator response.

Since the plant was shutdown in Mode 5 for a refueling outage, the Senior Reactor Analysts (SRAs) conducted an assessment of the risk significance of the issue in accordance with IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process." Table 1, "Losses of Control," includes criteria for assessing a loss of thermal margin and a loss of level. This finding did not meet any of the criteria for Losses of Control.

The SRAs reviewed Appendix G, Attachment 1, "Phase I Operational Checklists for Both PWRS and BWRS." The applicable checklist was Checklist 3, "PWR Cold Shutdown and Refueling Operation RCS Open and Refueling Cavity Level < 23' OR RCS Closed and No Inventory in Pressurizer Time to Boiling < 2 hours." The applicable line item was:

- Item II.B.(3) – discusses procedures implemented to avoid operations that could lead to perturbations in RCS level control or RHR flow.

Since this line item was not met, Appendix G required a Phase II analysis. The SRAs reviewed Appendix G, Attachment 2, "Phase II Significance Determination Process Template for PWR during Shutdown." In Phase II, the Plant Operating State was POS-2 (reduced inventory operations) with a late time window, since the reduced inventory operation occurred after fuel moves were completed.

Regarding the failure to establish procedures for reduced inventory operations that were appropriate to preclude air entrainment into the RHR and RCS systems, the SRAs reviewed the deficiency against the safety functions of core heat removal, RCS inventory control, power availability, containment control, and reactivity control as described in Checklist 3. The SRA determined that the licensee reasonably met these safety functions, except for Item II.B.(3), which discusses procedures implemented to avoid operations that could lead to perturbations in RCS level control or RHR flow. However, since there have been no actual air entrainment problems that have occurred using the procedures, the exposure time for potential air entrainment into the RHR and RCS systems was small, and the full complement of required mitigation equipment was available, this finding is best characterized as having very low safety significance (Green).

The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not confirmed to reflect current performance due to the age of the performance deficiency. Specifically, the licensee would have been expected to review the vortexing evaluations and procedures when addressing GL 2008-01 in 2008.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed and accomplished by procedures appropriate to the circumstances.

Contrary to the above, as of May 11, 2012, procedure 1/2-OHP-4021-002-013 was not appropriate to the circumstances. Specifically, the instructions contained in this procedure were not appropriate to prevent air entrainment during reduced inventory operations. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR 2012-6226 and AR 2012-5156, this violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the

NRC Enforcement Policy (NCV 05000315/2012008-08; 05000316/2012008-08, Inadequate Procedure for RCS Vacuum Fill During Reduced Inventory Operations).

(8) Computer Program Used for Operability Evaluation Was Not Benchmarked

Introduction: The inspectors identified an unresolved item (URI) regarding the use of computer program Flow-3D in one past-operability evaluation. Specifically, this computer program was not verified against test data.

Description: Flow-3D is a general-purpose computer code for modeling the dynamic behavior of liquids and gases influenced by a wide variety of physical processes. It is a computational fluid dynamic (CFD) analysis based on the conservation of mass, momentum, and energy and was constructed for the analyses of time-dependent multi-dimensional fluid flow problems with a special focus on free surface flow processes.

The licensee used Flow-3D Version 9.0 for a past-operability evaluation of a gas void found in the containment recirculation sump suction piping. Specifically:

- Calculation ALION-CAL-AEP-4462-04, "D.C. Cook Recirculation Containment Sump Hydraulic Analysis – Task 4 Results," was performed in the early development of the GSI-191 response effort to postulate an air pocket venting from the CS and RHR suction lines into the recirculation sump. This analysis was performed to evaluate the necessary transition period to avoid air entrainment in the pumps and the pressure transients as they impact the recirculation sump strainers. This analysis was not used for any design basis or engineering modification; however, it was used as a tool for a past-operability evaluation of a gas void found in the sump suction piping.

- Calculation ALION-CAL-AEP-7354-02, "D.C. Cook Unit 1 Operability Analysis to Evaluate Gas Void in ECCS Sump Suction Piping," was performed for a void evaluated in the same location as the one evaluated by ALION-CAL-AEP-4462-04. However, this analysis was performed to evaluate the past-operability of the void volume found in January 2009 as oppose to a postulated volume. Specifically, an air pocket was discovered downstream of the Unit 1 sump isolation valve (i.e., 1-ICM-306) in the 'B' train suction pipe. This discovery was captured in the CAP as AR 00844125.

The licensee did not own or maintain a license for Flow-3D. These analyses were performed by an outside contractor under the contractor's Quality Assurance Program and were accepted by the licensee through their Owner's Acceptance Review Process. However, when the inspectors questioned if the computer code was verified against test data, the contractor informed the licensee that no benchmark flow modeling was conducted for these software applications.

NRC Regulatory Issue Summary (RIS) 2005-20, Revision 1, "Revision to NRC Inspection Manual Part 9900 Technical Guidance, 'Operability Determinations and Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety,'" informed licensees that the NRC had revised NRC Inspection Manual Part 9900. Guidance provided in Appendix C, Section C.4 of the inspection manual stated "The use of any analytical method must be technically

appropriate to characterize the SSCs involved, the nature of the degraded or nonconforming condition, and specific facility design." It further stated that general considerations for establishing this adequacy include, in part, acceptable alternative methods such as the use of "best estimate" codes, methods, and techniques. The inspection guidance also stated that "In these cases, the evaluation should ensure that the SSC's performance is not over-predicted by performing a benchmark comparison of the non-current licensing basis (CLB) analysis methods to the applicable CLB analysis methods." The inspectors consulted with NRR and determined the operability evaluation relied on a computer code that has not been demonstrated to be technically appropriate for the intended applications. Specifically, the computer code had not been qualified by benchmarking against test or plant data to demonstrate its applicability to the type of analyses being conducted.

This issue is unresolved pending licensee past-operability evaluation and determination of NRC courses of action for resolution of the issue. (URI 05000315/2012008-09; 05000316/2012008-09, Computer Program Used for Operability Evaluation Was Not Benchmarked).

(9) Observations

(a) SR 3.5.2.3 Not Included in Licensee's Improved Technical Specifications

The inspectors reviewed information pertaining to the licensee's transition to improved Technical Specifications (ITS). During their review, the inspectors noticed the licensee did not include SR 3.5.2.3, "Verify ECCS is full of water" in ITS. This decision was in alignment with D.C. Cook licensing basis. However, as part of their justification for not including SR 3.5.2.3 in ITS, the licensee stated that: "a review of plat records indicate that water hammers in the ECCS trains are not a concern at CNP (Cook Nuclear Plant)." The inspectors requested water hammer evaluations in ECCS systems and the licensee acknowledge the ECCS has not been evaluated for water hammer because voids were not considered within the design of the systems. That is, the station has a zero tolerance policy with regards to gas accumulation. The inspectors were concerned because ITS did not contain a requirement to verify that the systems were water solid consistent with their design. However, after further review of licensee's records and gas intrusion prevention methods, the inspectors noticed that the licensee was relying on the GACM Program to verify the systems were water solid and was committed to evaluate the TSTF traveler for gas accumulation to either supplement or replace current TS requirements.

(b) The CAP Was Not Tracking the Completion Schedule for the TSTF Traveler Commitment

The inspectors noted that the CAP document (i.e., GT00839941) that captured the commitment to evaluate the TSTF traveler for gas accumulation did not capture the completion schedule described in the licensee's GL responses to NRR. Specifically, the licensee stated in their responses that the TSTF traveler will be reviewed within 60 days of approval by the NRC. As a result of this observation, the licensee initiated AR 2012-1770 to include the 60-day deadline in GT00839941.

(c) GL 2008-01 Evaluations Did Not Adequately Verify the Design for Susceptible Locations of Gas Accumulation in Piping Systems

The licensee's original design reviews did not identify all void susceptible locations. Specifically, the inspectors found two void susceptible locations that were not previously identified and evaluated. Void susceptible locations are pipe geometries that can trap voids which could be of concern. This issue was determined to be a minor design control deficiency because the maximum possible void size at the affected locations was very small relative to the maximum allowable size. This issue was captured by the CAP as AR 2012-1176 and AR 2012-1793.

(d) GL 2008-01 Walkdowns Did Not Include Portions of Discharge Piping

The licensee's GL 2008-01 nine-month response included a commitment to complete a walkdown of piping inside the auxiliary building leak detection enclosures (LDEs). The licensee's nine-month supplemental response stated that this action was complete. However, the inspectors noted that this action was only performed for the suction piping within the LDEs. As a result of the inspectors' questions, the licensee indicated that drawings of the discharge piping within the LDEs showed that the piping was horizontal and, based on the completed walkdowns, a discrepancy between the actual configuration of the pipe and drawings was not expected. In addition, this section of piping has a vent that is periodically monitored to ensure that the piping is full of water. The licensee captured this issue in the CAP as AR 2012-1417, in part, to determine if another submittal to the NRC is required for clarification.

4OA6 Management Meetings

.2 Interim Meeting Summary

On February 10, 2012, the inspectors presented the preliminary inspection results to Mr. M. Carlson 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. The inspectors had outstanding questions that required additional review and a follow-up exit meeting.

.1 Exit Meeting Summary

On July 2, 2012, the inspectors presented the inspection results to Mr. M. Carlson, 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.

4OA7 Licensee-Identified Violations

The following violation of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements, which meets the criteria of Section 2.3.2 of the NRC Enforcement Policy for being dispositioned as an NCV.

- Title 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed and accomplished by procedures appropriate to the circumstances. Contrary to the above, on or about

December 14, 2011, the licensee identified that Procedure 1-OHP-SP-238, “Venting Pressure from the SI Discharge Header,” was not appropriate to the circumstances. Specifically, on December 14, 2011, the licensee found a void at the affected location during a periodic gas monitoring surveillance and determined a previous depressurization evolution led to void formation because the depressurization procedure did not include instructions to verify that the piping was left full of water. The corrective action being considered at the time of the inspection was to add a step to Procedure 1-OHP-SP-238 to perform ultrasonic examinations. The performance deficiency was determined to be more than minor because it was associated with the Mitigating System cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. The finding screened as of very low safety significance because the identified void was determined not to result in loss of operability of the safety injection system.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

M. Carlson, VP Site Support Services
S. Lies, Plant Manager
M. Scarpello, Regulatory Affairs and Performance Improvement Department Manager
R. West, Licensing Activity Coordinator (Compliance)

Nuclear Regulatory Commission

A. M. Stone, Chief, Engineering Branch 2
P. LaFlamme, Resident Inspector

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

05000315/2012008-01; 05000316/2012008-01	NCV	Vortexing was not evaluated for the volume control, containment spray additive, refueling water storage tanks (Section 4OA5.1.c(1))
05000315/2012008-02; 05000316/2012008-02	NCV	Incomplete methodology for developing acceptance criteria for suction voids (Section 4OA5.1.c(2))
05000315/2012008-03; 05000316/2012008-03	NCV	Procedures were not developed for performance monitoring of plant parameters. (Section 4OA5.1.c(4))
05000315/2012008-04; 05000316/2012008-04	NCV	Minimum flowrates and time requirements for dynamic flushing were not established (Section 4OA5.1.c(5))
05000315/2012008-05; 05000316/2012008-05	NCV	Inadequate Procedure for Responding to a MODE 4 LOCA (Section 4OA5.1.c(6))
05000315/2012008-06; 05000316/2012008-06	NCV	10 CFR 50.59 evaluation for modification of RHR pump casing drain lines was not performed (Section 4OA5.1.c(6))
05000315/2012008-07; 05000316/2012008-07	FIN	10 CFR 50.59 evaluation for modification of RHR pump casing drain lines was not performed (Section 4OA5.1.c(6))
05000315/2012008-08; 05000316/2012008-08	NCV	Inadequate Procedure for RCS Vacuum Fill During Reduced Inventory Operations (Section 4OA5.1.c(7))

Opened

05000315/2012008-09; 05000316/2012008-09	URI	Computer Program Used for Operability Evaluation Was Not Benchmarked (Section 4OA5.1.c(8))

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety, but rather, that selected sections of 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.

Calculations and Evaluations:

1-2-I9-03 Calc 7; RWST Minimum Technical Specification Volume; 5/4/2009

920804; Cook Plant CTS Waterhammer Analysis; 11/2/1992

ALION-CAL-AEP-7092-02; D.C. Cook Unit 1 Froude Number Review; 10/10/2008

DIT B-01065-03; Identification of Minimum RCS Hot Leg Level vs. RHR Pump Discharge Flow; 4/5/2002

EC49543; GL2008-01 Vent Modifications; 8/27/2009

EC49544; GL2008-01 Vent Modifications; 3/2/2009

GL 2008-01 Gas Accumulation Walkdown Report; 2/10/2010

GT2010-6177; IN 2010-11; 6/28/2010

MD-12-CTS-012-N; RWST Level; 4/24/2000

MD-12-RWST-002-N; RWST Vortex Model Test Result Evaluation; 4/3/2000

Corrective Action Documents Generated During the Inspection:

AR 2012-0722; Documentation Provided for NRC Info Request Was Incomplete; 1/16/2012

AR 2012-0970; Westinghouse Nuclear Safety Advisory Letter, NSAL-09-08; 1/20/2012

AR 2012-1770; GT Tracking Commitment Does Not Address 60-Day Schedule; 2/8/2012

AR 2012-1174; Managing Gas Accumulation Acceptance Criteria; 1/25/2012

AR 2012-1176; Vent Valve 1-RH-138 May Not Be In Optimum Location; 1/25/2012

AR 2012-1177; ECCS Dynamic Flush Criteria Bases; 1/25/2012

AR 2012-1236; Vortex Calculations Not Performed for VCT and SAT; 1/26/2012

AR 2012-1417; Inspections inside Leak Detection Enclosures for GL 2008-01; 1/31/2012

AR 2012-1632; Superseded Calculation Referenced In Current Approved Calculations; 2/3/2012

AR 2012-1751; Using RHR Pump Casing Drains during MODE 4 LOCA; 2/7/2012

AR 2012-1768; Gas Accumulation Condition Monitoring; 2/8/2012

AR 2012-1830; Workability Issue Identified with MODE 4 LOCA Procedure; 2/8/2012

AR 2012-1841; Void Under 1-SI-152 in the Fall of 2010; 2/9/2012

AR 2012-1864; RWST Vortex Elevation References A Superseded Calc; 2/9/2012

AR 2012-1894; Past Operability Evaluation Did Not Address All Technical; 2/9/2012

AR 2012-2052; Root Cause Evaluation for TI-177 Inspection Results; 2/15/2012

AR 2012-6226; Deficiency Identified During Vacuum Fill Procedures; 5/11/2012

AR 2012-8187; Adequacy of Past-Operability Determination Questioned; 7/2/2012

Corrective Action Documents Reviewed During the Inspection:

AR839239; 1-SI-120N Identified Air/Gas Void in Piping; 9/30/2008

AR839240; 1-SI-120S Identified Air/Gas Void in Piping; 9/30/2008

AR844125; 1-ICM-306 Downstream Piping Found Void of Water; 1/9/2009

AR 2011-2136; Gas Void in RHR Crosstie to Safety Injection; 2/17/2011

AR 2011-2308; Gas Void Found in U-1 West RHR at Vent 1-RH-152; 2/22/2011

AR 2011-9260; Gas Void Identified in RHR Crosstie to SI Piping; 8/17/2011

AR2011-14416; Corrective Action Condition Monitoring Program; 12/13/2011

AR 2011-14450; 1-SI-120S Identified Void in Piping; 12/16/2011

AR 2012-5156; Indicated RCS Level Abnormalities during Vacuum Fill; 4/18/2012

Drawings:

1-CS-32; CVCS-Isometric; Revision 24

1-CS-33; CVCS-Isometric; Revision 15

1-CS-34; CVCS-Isometric; Revision 22

1-CS-35; CVCS-Isometric; Revision 18

1-CS-36; CVCS-Isometric; Revision 8

1-SI-47 SH.1; SI-Isometric; Revision 15

1-SI-1; SI-Isometric; Revision 18

1-SI-2; SI-Isometric; Revision 27

1-SI-3; SI-Isometric; Revision 26

1-SI-4; SI-Isometric; Revision 21

1-SI-5 SH.1; SI-Isometric; Revision 13

1-SI-5 SH.2; SI-Isometric; Revision 8

1-SI-31; SI-Isometric; Revision 12

1-SI-47 SH.1; SI-Isometric; Revision 15

1-SI-47 SH.2; SI-Isometric; Revision 8

1-RH-3; RHR-Isometric; Revision 21

1-RH-5; RHR-Isometric; Revision 24

1-RH-9; RHR-Isometric; Revision 17

1-CTS-2; CTS-Isometric; Revision 17

1-CTS-3; CTS-Isometric; Revision 16

1-CTS-5; CTS-Isometric; Revision 15

1-CTS-6; CTS-Isometric; Revision 16

1-CTS-19 SH.1; CTS-Isometric; Revision 13

1-CTS-19 SH.2; CTS-Isometric; Revision 11

1-CTS-19 SH.3; CTS-Isometric; Revision 14

1-CTS-19 SH.4; CTS-Isometric; Revision 16

1-CTS-19 SH.5; CTS-Isometric; Revision 10

2-CS-80; CVCS-Isometric; Revision 8

2-CS-81; CVCS-Isometric; Revision 8

2-CS-82 SH.1; CVCS-Isometric; Revision 17

2-CS-82 SH.2; CVCS-Isometric; Revision 8

2-CS-83; CVCS-Isometric; Revision 13

2-CS-84; CVCS-Isometric; Revision 12

2-CS-85; CVCS-Isometric; Revision 11

2-CS-86; CVCS-Isometric; Revision 9

2-CS-87; CVCS-Isometric; Revision 10

2-RH-22; RHR-Isometric; Revision 12

Procedures:

OP-1-5129-61; CVCS-Reactor Letdown and Charging; 9/23/2011

OP-2-5129-53; CVCS-Reactor Letdown and Charging; 9/23/2011

OP-1-5142-45; ECCS (SIS); 10/1/2011

OP-1-5143-74; ECCS (RHR); 3/9/2009

OP-1-5143-74; ECCS (CTS); 10/11/2010

PMP-2350-SES-001; 10 CFR 50.59 Reviews; Revision 9

PMP-5040-ECC-001; Engineering Configuration Changes; Revision 15

01-OHL-4030-SOM-031; U1 Tours – U1 CR M1&2 Shift Chks; Revision 35

1-OHP-4021-002-005; RCS Draining; Revision 47

1-OHP-4023-ES-1.3; Transfer to Cold Leg Recirculation; Revision 14

1-OHP-4023-ECA-1.1; Loss of Emergency Coolant Recirculation; Revision 15

1-OHP-SP-238; Venting Pressure from the SI Discharge Header; Revision 3

1-OHP-4021-001-001; Plant Heat-up; Revision 56

1-OHP-4021-017-003; Removing RHR from Service; Revision 14

1-OHP-4022-0020-015; Mode 4 LOCA; Revision 12

1-OHP-4022-017-001; Loss of RHR Cooling; Revision 20

1-OHP-4021-002-012; Restoration from RCS Draindown; Revision 12

1-OHP-4021-003-001; Letdown, Charging and Seal Water Operation; Revision 58

1- OHP-4021-008-001; Filling and Venting the Safety Injection System, Residual Heat Removal System and Boron Injection Tank; Revision 28

1-OHP-4021-008-007; Operations of the Safety Injection Pumps; Revision 7

1- OHP-4021-009-001; Placing the Containment Stray System in Standby Readiness; Revision 15

1-OHP-4030-108-008R; ECCS Check Valve Test; Revision 16

1-OHP-4030-109-007E; East Containment Spray System Test; Revision 34

1-OHP-4030-109-007W; West Containment Spray System Test; Revision 31

1-OHP-4030-117-054E; East Residual Heat Removal Train Operability Test – Shutdown; Revision 8

1-OHP-4030-117-054W; West Residual Heat Removal Train Operability Test – Shutdown; Revision 8

02-OHL-4030-SOM-031; U2 Tours – U2 CR M1&2 Shift Chks; Revision 35

2-MOD-45698-R0; Isolate Unit 2 ECCS and CTS Pump Drains; 9/1/2004

12-QHP-5050-NDE-025; UT for Identifying Sediment and Air/Gas Voids in Piping; Revision 2

12-EHP-5040-MOD-009; Engineering Change Reference Guide; Revision 29

Work Orders:

WO55317391; NQQS Perform UT for Gas Voids; 10/15/2008

WO55317389-06; NQQS Perform UT for Gas Voids; 10/10/2008

WO55317389; PRF080014 U1 GL 2008-01 ECCS Gas Binding; 1/9/2009

WO55332054-13; EC-49543: Install U1 RCP Seal; 3/18/2010

WO55317391; PRF080015 U2 GL 2008-01 ECCS Gas Binding; 3/6/2010

WO55332054-22; EC-49543: Install U1 RCP Seal; 4/5/2010

WO55332054-21; EC-49543: Install U1 RCP Seal; 4/5/2010

WO55332054-23; EC-49543: Install U1 RCP Seal; 4/8/2010

WO55332054-20; EC-49543: Install U1 RCP Seal; 4/8/2010

WO55369113; 1-SI-120N, Perform UT on Vent Valve; 2/22/2011

WO55379165; 1-SI-120N, Perform UT on Vent Valve; 6/8/2011

WO55383629; 2-SI-120N, Perform UTI on Vent Valve; 11/4/2011

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access Management System
AR	Action Request
BEP	Best Efficiency Point
CAP	Corrective Action Program
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
CLB	Current Licensing Basis
CNP	Cook Nuclear Plant
CS	Containment Spray
CTS	Containment Spray
CVCS	Chemical and Volume Control System
DBA	Design Basis Accident
DHR	Decay heat Removal
DIT	Design Information Transmittal
ECCS	Emergency Core Cooling Systems
FSAR	Final Safety Analysis report
GACM	Gas Accumulation Condition Monitoring
GL	Generic Letter
IMC	Inspection Manual Chapter
ITS	Improved Technical Specifications
LDE	Leak Detection Enclosure
LOCA	Loss of Coolant Accident
MR	Maintenance Rule
NCV	Non-Cited Violation
NRC	U.S. Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
NSAL	Nuclear Safety Advisory Letter
OE	Operating Experience
PARS	Publicly Available Records
PRA	Probabilistic Risk Analysis
PWR	Pressurized Water Reactors
PWROG	Pressurized Water Reactors Owners' Group
RCS	Reactor Coolant System
RIS	Regulatory Issue Summary
RWST	Refueling Water Storage Tank
SAT	Spray Additive Tank
SDP	Significance Determination Process
SI	Safety Injection
SPAR	Standard Plant Analysis Risk
SR	Surveillance Requirement
SRA	Senior Risk Analyst
SSC	Structure Systems and Components
TI	Temporary Instruction
TS	Technical Specification
TSTF	Technical Specification Task Force
URI	Unresolved Item
USAR	Updated Safety Analysis Report
VCT	Volume Control Tank
WCAP	Westinghouse Commercial Atomic Power
WO	Work Order

If you disagree with the cross-cutting aspect assigned to the 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 the D C. Cook Nuclear Power 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 Publicly Available Records (PARS) component of NRC's Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74

Enclosure: Inspection Report 05000315/2012008; 05000316/2012008
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ™

DISTRIBUTION:
See next page

DOCUMENT NAME: G:\DRSIII\DRS\Work in Progress\DCCOOK 2012 008 TI 177 CET.docx
□ Publicly Available □ Non-Publicly Available □ Sensitive □ Non-Sensitive
To receive a copy of this document, indicate in the concurrence box "C" = Copy without attach/encl "E" = Copy with attach/encl "N" = No copy

OFFICE	RIII		RIII							
NAME	AMStone for CTilton:ls		AMStone							
DATE	08/16/12		08/16/12							

OFFICIAL RECORD COPY

Letter to Mr. Larry Weber from Ms. Ann Marie Stone dated August 16, 2012.

SUBJECT: D. C. COOK NUCLEAR POWER PLANT, UNITS 1 AND 2 TEMPORARY INSTRUCTION (TI) 2515/177, "MANAGING GAS ACCUMULATION IN EMERGENCY CORE COOLING, DECAY HEAT REMOVAL AND CONTAINMENT SPRAY SYSTEMS INSPECTION REPORT 05000315/2012008 AND 05000316/2012008

DISTRIBUTION:
Silas Kennedy
RidsNrrDorlLpl3-1 Resource
RidsNrrPMDCCook Resource
RidsNrrDirsIrib Resource
Chuck Casto
Cynthia Pederson
Steven Orth
Jared Heck
Allan Barker
Carole Ariano
Linda Linn
DRPIII
DRSIII
Patricia Buckley
Tammy Tomczak
ROPreports.Resource@nrc.gov