



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION III
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LISLE, IL 60532-4352

June 17, 2010

Mr. Christopher R. Costanzo
Vice President
Duane Arnold Energy Center
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SUBJECT: NEXTERA ENERGY DUANE ARNOLD, LLC, NRC TRIENNIAL HEAT SINK PERFORMANCE INSPECTION AND MANAGING GAS ACCUMULATION IN EMERGENCY CORE COOLING, DECAY HEAT REMOVAL, AND CONTAINMENT SPRAY SYSTEMS TEMPORARY INSPECTION REPORT 05000331/2010008

Dear Mr. Costanzo:

On June 9, 2010, the U.S. Nuclear Regulatory Commission (NRC) completed a triennial heat sink performance inspection and a managing gas accumulation in emergency core cooling, decay heat removal, and containment spray systems temporary inspection at your NextEra Energy Duane Arnold, LLC. The enclosed report documents the inspection results, which were discussed on June 9, 2010, with Mr. Kleinheinz and other members of your staff.

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

Based on the results of these inspections, three NRC-identified findings of very-low-safety significance were identified. The findings involved violations of NRC requirements. However, because of their very-low-safety significance, and because the issues were entered into your corrective action program, the NRC is treating the issues as Non-Cited Violations (NCVs) in accordance with Section VI.A.1 of the NRC Enforcement Policy.

If you contest the subject or severity of this NCV, 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 NextEra Energy Duane Arnold, LLC. In addition, if you disagree with the characterization of any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region III, and the NRC Resident Inspector at the NextEra Energy Duane Arnold, LLC. The information that you provide will be considered in accordance with Inspection Manual Chapter 0305.

C. Costanzo

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In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any), will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS), 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 No. 50-331; 72-032
License No. DPR-49

Enclosure: Inspection Report 05000331/2010008
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ

U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Docket No: 05000-331
License No: DPR-49

Report No: 05000331/2010008

Licensee: NextEra Energy

Facility: NextEra Energy Duane Arnold, LLC

Location: Palo, IA

Dates: March 8 through June 9, 2010

Inspectors: N. J. Féliz Adorno, Reactor Engineer,
G. F. O'Dwyer, Reactor Engineer

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

Enclosure

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SUMMARY OF FINDINGS

IR 05000331/201008; 03/08/2010 – 06/09/2010; NextEra Energy Duane Arnold, LLC; Triennial Heat Sink Performance Inspection and Temporary Inspection 2515/177.

The triennial heat sink inspection was a one-week onsite baseline inspection that focused on safety-related heat exchangers and ultimate heat sink performance. The inspection was conducted by two regional inspectors. The managing gas accumulation inspection was a two-week onsite temporary inspection that focused on gas accumulation management in emergency core cooling, decay heat removal, and containment spray systems. The inspection was conducted by one regional inspector. Three Green findings were identified by the inspectors. The findings were considered Non-Cited Violations (NCV) 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). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," having very- low-safety significance for the failure to evaluate the past operability of the 'B' control building chiller condenser following the discovery of an unanalyzed condition. Specifically, an operability evaluation was not performed when about 45 percent of the heat exchanger tubes were found to be either plugged or heavily fouled due to silt accumulation. No acceptance criteria for tube plugging existed at the time of this discovery. The licensee entered this issue into its corrective action program.

The performance deficiency was determined to be more than minor because it affected the cornerstone objective of ensuring the capability of systems. Due to the extensive number of plugged or heavily fouled tubes, there was reasonable doubt on the past operability of the control room chillers condenser. The finding screened as very-low-safety significance because the licensee was able to demonstrate the cooler had sufficient flow such that the finding did not represent an actual loss of safety function of a single train for duration greater than its Technical Specification allowable outage time. 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. (1R07.1.b(1))

- Green. The inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," having very-low-safety significance for the failure to take corrective actions in response to a previous NCV concerning the residual heat removal pump seal water cooling requirements. Specifically, the licensee had not performed a new evaluation under 10 CFR 50.59 to address the previous NRC concerns associated with a change to eliminate the need for residual heat removal pump seal water cooling; had not corrected the updated final safety analysis after learning that the previous 10 CFR 50.59 evaluation was not technically adequate to

support the change; and had not replaced the seal with ones designed for higher temperatures. The licensee entered this issue into its corrective action program.

The performance deficiency was determined to be more than minor because, if left uncorrected, it had the potential to lead to a more significant safety concern. Specifically, termination of flow to the RHR pump seal water coolers would result in operation outside the seal's design. The finding screened as very-low-safety significance because cooling water had been provided to the seals for the residual heat removal pumps. 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. (1R07.1.b(2))

- Green. The inspectors identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," having very-low-safety significance for the failure to correct the lack of barriers to prevent low pressure core injection (LPCI) from becoming inoperable in Mode 3. Specifically, the licensee allowed the possibility of LPCI becoming inoperable in Mode 3 due to pressure locking of the residual heat removal crosstie valves when operating the system in shutdown cooling mode. The licensee entered this issue into its corrective action program.

The performance deficiency was determined to be more than minor because it was associated with the mitigating system cornerstone attribute of equipment performance and adversely 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 very-low-safety significance because a review of the operators' log demonstrated that the Technical Specification allowable outage time of LPCI was never exceeded. Therefore, the finding did not represent an actual loss of safety function of a single train for duration greater than its Technical Specification allowable outage time. 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. (4OA5.1.c)

B. Licensee-Identified Violations

No violations of significance were identified.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R07 Heat Sink Performance (71111.07T)

.1 Triennial Review of Heat Sink Performance

a. Inspection Scope

The inspectors reviewed operability determinations, completed surveillances, vendor manual information, associated calculations, performance test results and cooler inspection results associated with the 'B' control building chiller condenser, the core spray pump motor coolers, and the service water systems. These heat exchangers/coolers were chosen based on their risk-significance in the licensee's probabilistic safety analysis and their important safety-related mitigating system support functions.

For the 'B' control building chiller condenser and the core spray pump motor coolers, the inspectors verified that testing, inspection, maintenance, and monitoring of biotic fouling and macrofouling programs were adequate to ensure proper heat transfer. This was accomplished by verifying the test method used was consistent with accepted industry practices, or equivalent, the test conditions were consistent with the selected methodology, the test acceptance criteria were consistent with the design basis values, and results of heat exchanger performance testing. The inspectors also verified that the test results appropriately considered differences between testing conditions and design conditions, the frequency of testing based on trending of test results was sufficient to detect degradation prior to loss of heat removal capabilities below design basis values and test results considered test instrument inaccuracies and differences.

In addition, the inspectors reviewed the methods and results of heat exchanger inspections. The inspectors verified if the methods used to inspect and clean heat exchangers were consistent with as-found conditions identified and expected degradation trends and industry standards, the licensee's inspection and cleaning activities had established acceptance criteria consistent with industry standards, and the as-found results were recorded, evaluated, and appropriately dispositioned such that the as-left condition was acceptable.

The inspectors also verified the condition and operation of the 'B' control building chiller condenser and the core spray pump motor coolers were consistent with design assumptions in heat transfer calculations and as described in the updated final safety analysis report (UFSAR). This included verification that the number of plugged tubes was within pre-established limits based on capacity and heat transfer assumptions. The inspectors verified the licensee evaluated the potential for water hammer and established adequate controls and operational limits to prevent heat exchanger degradation due to excessive flow-induced vibration during operation. In addition, eddy current test reports and visual inspection records were reviewed to determine the structural integrity of the heat exchanger.

The inspectors verified the performance of ultimate heat sinks (UHS) and their subcomponents such as piping, intake screens, pumps, valves, etc. by tests or other equivalent methods to ensure availability and accessibility to the in-plant cooling water systems. The inspectors reviewed the results of the licensee's inspection of the UHS weirs or excavations. The inspectors verified that identified settlement or movement indicating loss of structural integrity and/or capacity was appropriately evaluated and dispositioned by the licensee. In addition, the inspectors verified the licensee ensured sufficient reservoir capacity. The inspector performed a system walkdown of the service water intake structure to verify the licensee's assessment on structural integrity and component functionality. This included the verification that the licensee ensured proper functioning of traveling screens and strainers, and structural integrity of component mounts. In addition, the inspectors verified that service water pump bay silt accumulation was monitored, trended, and maintained at an acceptable level by the licensee. The inspectors also verified the licensee's ability to ensure functionality during adverse weather conditions.

In addition, the inspectors reviewed condition reports related to the heat exchangers/coolers and heat sink performance issues to verify that the licensee had an appropriate threshold for identifying issues and to evaluate the effectiveness of the corrective actions. The documents that were reviewed are included in the Attachment to this report.

These inspection activities constituted three heat sink inspection samples as defined in IP 71111.07-05.

b. Findings

(1) Failure to Evaluate the Past Operability of the 'B' Control Building Chiller Condenser

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 evaluate the past operability of the 'B' control building chiller condenser following the discovery of an unanalyzed condition.

Description: On March 10, 2010, the inspectors identified that the licensee failed to perform an operability evaluation associated with the 'B' control building chiller condenser on January 24, 2005, following an inspect and clean activity that found the heat exchanger in an unanalyzed condition.

The inspectors noted that the licensee's inspection of the 'B' control building chiller condenser performed in 2005 found approximately 29 percent of the tubes to be plugged and an additional 15 percent of the tubes to be heavily fouled with a visible reduction of internal diameter. The cause for the degradation was accumulation of silt. Although the licensee corrected the condition by cleaning the heat exchanger before returning it to service, the inspectors noted that the condition was not captured in the licensee's corrective action program (CAP) and, consequently, an operability evaluation was not performed. The inspectors determined that this was an unanalyzed condition because the licensee had not established acceptance criteria for the maximum number of tubes that were allowed to be plugged without adversely affecting the ability of the equipment to perform its intended function. In addition, the inspectors noted that the licensee's procedure FP-OP-OL-01, "Operability Determination," stated that a determination of

operability shall be performed for structures, systems, and components found in an existing but previously unanalyzed condition.

The inspectors were concerned because the failure to evaluate for past operability of a system that is found to be in a degraded condition could result in the failure to identify an inoperable system. The failure to recognize that the system was inoperable could lead to a failure to take appropriate corrective actions, to determine if the clean and inspect frequency needed to be shortened, and/or to evaluate if the condition met any of the criteria for reportable events described in 10 CFR 50.73. For instance, licensee's procedure ACP 1402.3, "Regulatory Reporting Activities," stated that a licensee event report shall be prepared and submitted to the NRC within 60 days after discovery of any operation or condition prohibited by the plant's Technical Specifications (TS). This was consistent with 10 CFR 50.73(a)(2)(i)(B), which stated that the licensee shall report any operation or condition which was prohibited by the plant's TS. This was further explained by NUREG-1022, "Event Reporting Guidelines": "An License Event Report (LER) is required if a condition existed for a time longer than permitted by the TS [i.e., greater than the allowed outage time (or completion time in ISTS)] even if the condition was not discovered until after the allowable time had elapsed and the condition was rectified immediately upon discovery." In Section 3.7.5 of the plant's TS, "Control Building Chiller Systems," stated that the allowable outage time for one inoperable control building chiller was 30 days. The function of the control building chiller system was to provide temperature control for: (1) control room equipment; (2) control room habitability for a 30-day continuous occupancy; and (3) essential switchgear rooms.

The licensee captured the inspectors' concerns in their corrective action program as CAP073762. In addition, the licensee performed an engineering calculation that determined that, around the time of the discovery of the condition, the 'B' control building chiller condenser had sufficient flow resulting in adequate heat removal capacity margin. The corrective actions included reinforcing to personnel that unexpected conditions must be entered into the corrective action program to assure that appropriate reviews take place in a timely manner.

Analysis: The inspectors determined that the failure to evaluate the past operability of the 'B' control building chiller condenser was contrary to the licensee's procedures 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 of systems that respond to initiating events to prevent undesirable consequences. Specifically, the inspectors had reasonable doubt on the past operability of the control room chillers condenser because the as-found condition was not evaluated. The failure to evaluate for past operability of a system that is found to be in a degraded condition could result in the failure to identify that the system was inoperable and, subsequently, to take appropriate corrective actions and/or to evaluate if the condition was reportable to the NRC.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of findings," Table 3b for the mitigating system cornerstone. The finding screened as very-low-safety significance (Green) because the licensee was able to demonstrate the cooler had sufficient flow such that the finding did

not represent an actual loss of safety function of a single train for a duration greater than its TS allowable outage time.

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 evaluate the past operability of the 'B' control building chiller condenser when the adverse condition was identified in 2005.

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

Contrary to the above, on January 25, 2005, the licensee did not follow procedure FP-OP-OL-01. Specifically, the licensee failed to perform an operability evaluation to address the discovery of a previously unanalyzed condition affecting the 'B' control building chiller condenser. Because this violation was of very-low-safety significance and it was entered into the licensee's corrective action program as CAP073762, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000331/2010008-01, Failure to evaluate the past operability of the 'B' control building chiller condenser).

(2) Failure to Take Corrective Actions In Regard to Residual Heat Removal (RHR) Pump Seals

Introduction: A finding of very-low-safety significance (Green) and associated Non-Cited Violation (NCV) of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," was identified by the inspector for the licensee's failure to take corrective actions to a previously identified issue.

Description: On April 15, 2003, the NRC issued Inspection Report 05000341/2003-003, which documented a finding concerning the RHR pump seal water cooling requirements. Specifically, in 1999 or 2000, the licensee performed an evaluation under 10 CFR 50.59, revised the UFSAR Table 9.2-1, "ESW [emergency service water] Flow Requirements" to list the required flow for the RHR pump seals as zero (0) gallons per minute (gpm), and removed the seal water coolers from the Generic Letter 89-13 testing program. This item had previously been identified as an unresolved item in Inspection Report 05000341/2002-011. In 2003, the inspectors concluded that the RHR pump seal water coolers required cooling flow because vendor information indicated that the seals were only qualified to 150 degrees Fahrenheit (°F) and the licensee's evaluation did not address the ability of the lubricating seal water to stay within this limitation without cooling. The inspectors determined the issue was of very-low-safety significance (Green) because the seal water coolers appeared to have cooling water at the time. In addition, the seals were not damaged when they were previously subjected to temperatures above 300 °F. The inspection report documented that, in response to the 2002 unresolved item, the licensee restored the seal water coolers to the testing program and initiated actions to replace the pump seals.

During the current inspection, the inspectors determined that, while the licensee was maintaining the seal water coolers in the testing program, it had not performed a new evaluation under 10 CFR 50.59 to address the previous NRC concerns; had not returned the UFSAR to the previous value; and had not replaced the seals with ones designed for higher temperatures. Therefore, the concerns previously identified in the unresolved item and NCV still existed in 2010. As a result, it also appeared that the licensee had not adequately addressed or explored the following possible aspects from an extent of condition perspective that the inspectors believed may be pertinent in any such decision or in the treatment of the seal water coolers with respect to RHR pump operability:

- Given the failure to address the seal water cooler flow value in the UFSAR, a potential existed for the licensee to consider an RHR pump operable with a non-functioning seal water cooler without performing a suitable evaluation to support that decision.
- The licensee had classified the seal water coolers as non-safety-related. Given the previous NRC finding and NCV, the inspector did not find evidence that the licensee had adequately considered that information in verifying the previous classification justification remained applicable and was sufficient.
- Given the current seal water cooler flow value in the UFSAR and the licensee's non-safety-related classification, and depending on answers to the above two items, the licensee may have treated the seal water coolers incorrectly with respect to previous activities such as operability evaluations and operating and maintenance practices including application of quality assurance requirements, risk-assessment, and performance indicator data. Hence, it was not clear if there were any future impacts from related past decisions.
- The inspectors noted that the NRC credited a 1.5 gpm limit for RHR seal leakage in Section 2.2.1.e, "Leakage from Emergency Core Cooling Systems," of the NRC Safety Evaluation Report supporting the license amendment granted on July 31, 2001, for the use of the Alternate Source Term. The licensee did not have an evaluation which supported that the RHR seal leakage would remain below 1.5 gpm with 0 gpm cooling to the seals water coolers.
- Without proper seal water cooling, the potential existed that one or more RHR pump seals could fail during a shutdown and allow sufficient leakage to cause excessive heat-up of the RHR pump rooms causing the pumps to fail and prevent the plant from reaching cold shutdown after a fire, possibly contrary to the Fire Plan.

In summary, while the licensee had taken action in response to the previous NRC finding to address one focus of the inspection, specifically placing the seal water coolers back into the testing program, questions remained regarding the current required seal water cooler flow value specified in the UFSAR and the resulting broader implications that lay at the core of the inspectors' concern, namely seal water cooling as a necessary support function of the RHR pumps.

Analysis: The failure to take corrective actions in response to the previous NCV was contrary to 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," and was a performance deficiency.

The performance deficiency was determined to be more than minor because, if left uncorrected, it had the potential to lead to a more significant safety concern. Specifically, if the licensee terminated the flow to the RHR pump seal water coolers as allowed presently by the UFSAR, the seals could be operated outside their design and one or more of the RHR pump seals could fail during a design basis accident. This finding was primarily associated with the mitigating systems cornerstone.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of findings," Table 3b for the mitigating system cornerstone. The finding was of very-low-safety significance (Green) because the seal water coolers appeared to be providing their function of providing cooling to the seal water for the RHR pumps. Water was identified as flowing in the site glasses and the licensee had restored the seal water coolers to the testing program.

There was no cross-cutting aspect associated with this finding in that it was not confirmed to reflect current performance due to age of the performance deficiency. Specifically, the licensee would have been expected to correct or justify the current value in the USFAR when addressing the previous finding in 2003.

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

Contrary to the above, from April 15, 2003, to March 26, 2010, the licensee did not promptly correct a condition adverse to quality. Specifically, on April 15, 2003, the NRC issued an NCV for the failure to ensure that the design basis of the RHR seals considered potential failure modes due to loss of seal water cooling; this was a condition adverse to quality. No corrective actions were taken in response to the NCV, in that a planned modification did not occur and the UFSAR change was not re-evaluated. Because this violation was of very-low-safety significance and it was entered into the licensee's corrective action program as CAP 074081, "RHR Pump Seal Cooler - NRC Finding," this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy (NCV 5000331/2010008-02, Failure to take corrective actions in regard to RHR pump seals).

4. OTHER ACTIVITIES

4OA5 Other Activities

.1 (Closed) 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, Decay Heat Removal, and Containment Spray Systems." Specifically, the inspectors verified that the licensee has implemented or was in the process of implementing the

commitments, modifications, and programmatically controlled actions described in the licensee's response to GL 2008-01. The inspection was conducted in accordance with Temporary Instruction (TI) 2515/177, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems (NRC Generic Letter 2008-01)," and considered the site-specific supplemental information provided by the Office of Nuclear Reactor Regulations (NRR) to the inspectors.

b. Inspection Documentation

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

Licensing Basis: The inspectors reviewed selected portions of licensing basis documents to verify that they were consistent with the NRR assessment report and that they were processed by the licensee. The licensing basis verification included the verification of selected portions of Technical Specifications (TS), TS basis, final safety analysis report (FSAR), and technical requirements manual (TRM). The inspectors also verified that 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 also confirmed that the frequency of selected surveillance procedures were at least as frequent as required by TSs. Finally, the inspectors verified that the licensee was committed to evaluate and adopt as necessary the applicable changes that will be contained in the Technical Specification task force (TSTF) traveler. Specifically, the inspectors noted that the licensee is tracking this commitment in its CAP as COM032036.

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

- The inspectors verified that the licensee had identified the gas intrusion mechanisms that apply to the licensee's plant. However, the inspectors noted that the licensee's design change process did not provide guidance to verify if a design change introduced or increased the potential for gas intrusion and/or accumulation. The inspectors also noted that the licensee captured this observation in their CAP during their GL 2008-01 self-assessment as CAP073588.
- The inspectors verified that the licensee's void acceptance criteria was consistent with NRR's void acceptance criteria. Specifically, the inspectors confirmed that the licensee had various industry reports and NRC draft guidelines as reference for performing any operability evaluations and that the references were consistent with the latest acceptance criteria of NRR.
- The inspectors selectively reviewed applicable documents, including calculations, engineering evaluations, and vendor technical manuals, with respect to gas accumulation in the subject systems. Specifically, the inspectors verified that these documents addressed venting requirements, keep-full systems, aspects where pipes are normally void such as some spray piping inside containment, and void control during system realignments.

- The inspectors conducted a walkdown of selected regions of the high pressure core injection (HPCI) and residual heat removal system (RHR) systems in sufficient detail to assess the licensee's walkdowns. The inspectors also verified that the information obtained during the licensee's walkdown was consistent with the items identified during the inspector's independent walkdown. The inspectors verified that selected portions of the P&IDs accurately described the subject systems and were up-to-date with respect to recent hardware changes. Also, that any discrepancies between as built configurations, the isometric drawings, and the P&IDs were documented and entered into the CAP for resolution. In addition, the inspectors verified that the licensee had isometric drawings that describe the HPCI system configurations and had confirmed the accuracy of a selected portion of these drawings. The inspectors' review of these isometric drawings considered the following:
 1. High point vents were identified.
 2. High points that do not have vents were recognizable.
 3. Other areas where gas can accumulate and potentially impact subject system operability, such as at orifices in horizontal pipes, isolated branch lines, heat exchangers, improperly sloped piping, and under closed valves, were described in the drawings or in referenced documentation.
 4. Horizontal pipe centerline elevation deviations and pipe slopes in nominally horizontal lines were identified.
 5. All pipes and fittings were clearly shown.
 6. The drawings were up-to-date with respect to recent hardware changes and that any discrepancies between as-built configurations and the drawings were documented and entered into the CAP for resolution.
- The inspectors verified that licensee's walkdowns have been completed. In addition, the inspectors selectively verified that information obtained during the licensee's walkdowns were addressed in procedures, the CAP, and training documents.

Testing: The inspectors reviewed selected surveillance, post-modification test, and post maintenance test procedures, and results to verify that the licensee has approved and was using procedures that were adequate to address the issue of gas accumulation and/or intrusion in the subject systems. This review included the verification of procedures used for conducting surveillances and determination of void volumes to ensure that the void criteria was satisfied and will be reasonably ensured to be satisfied until the next scheduled void surveillance. Also, the inspectors reviewed procedures used for filling and venting following conditions, which may have introduced voids into the subject systems to verify that the procedures addressed testing for such voids and provided processes for their reduction or elimination.

The inspectors noted that the surveillance procedures did not provide guidance for quantifying the size of identified voids. Specifically, the procedures directed the performer to vent the process line until a steady stream was observed and to initiate a CAP if an unexpected condition was detected. The inspectors learned through interviews with plant personnel that the expected response was to stop the venting

activity and to perform ultrasonic testing (UT) following the CAP entry. However, the inspectors noted that this expectation was not clearly stated in the procedures and that, therefore, the licensee was relying solely in the knowledge of the performer of the activity to recognize the appropriate follow up actions. Also, the inspectors noted that the expected activity had the potential for underestimating the size of the void. Specifically, the UT would not be able to account for the volume of gas that was already vented and the procedures did not provide guidance for quantifying the gas that was vented. Therefore, the evaluator of the void would have to be aware of this limitation and conservatively estimate the amount of gas that was vented prior to the performance of the UT. The inspectors noted that the licensee captured a similar observation in the CAP during their GL 2008-01 self-assessment as CAP073580.

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 that commitments were included in the CAP.

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

Based on this review, the inspectors concluded there is reasonable assurance the licensee will complete all outstanding items and incorporate this information into the design basis and operational practices. Therefore, this TI is considered closed.

c. Findings

Failure to Ensure the Operability of Low Pressure Core Injection (LPCI) in Mode 3

Introduction: A finding of very-low-safety significance and associated NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," was identified by the inspectors for the failure to ensure LPCI operability in Mode 3.

Description: On March 9, 2010, the inspectors noted a caution note in Operating Instruction (OI) 149, "Residual Heat Removal System," Section 5.5, "Shutdown Cooling Startup," that indicated that the RHR crosstie valves, MO-2010 and V-19-48, may experience thermal binding when they are closed and shutdown cooling (SDC) mode of RHR is initiated from hot conditions. The note also recognized that given this condition TS 3.5.1, "Emergency Core Cooling Systems – Operating," will not be met in Mode 3 and that LPCI will not be available. Although the procedure also included a step to ensure compliance with TS 3.5.1 for LPCI inoperable and that plant risk was updated to reflect LPCI unavailability, the inspectors were concerned that TS 3.5.1 was not being interpreted and implemented as intended. Specifically, LPCI was required to be operable during Modes 1, 2, and 3 by TS 3.5.1. In addition, surveillance requirement (SR) 3.5.1.2 included a note that stated that LPCI is considered operable during alignment and operation for SDC in Mode 3 if capable of being manually realigned and not otherwise inoperable. The realignment included the opening of the crosstie valves. However, according with the caution note, the crosstie valves may experience thermal binding when they are closed and shutdown cooling (SDC) mode of RHR is initiated in Mode 3.

The inspectors also noted that the licensee-identified that the RHR crosstie valve experienced thermal binding on March 24, 2003, when attempting to swap SDC from the 'B' loop to the 'A' loop. This activity required MO-2010 to open. However, the licensee was not able to open the valve until the valve bonnet pressure was relieved by relaxing the valve stem packing. The licensee captured this condition in the CAP as CAP026345 and completed Apparent Cause Evaluation (ACE) No. 0011144. The licensee determined that the apparent cause was that the valve remained hot from going into SDC resulting in expansion of the water in the valve bonnet that increased the pressure preventing the valve from opening. In addition, the ACE determined that there was no precaution in OI-149 to allow the system adequate time for cool down prior to opening MO2010. The corrective action was to revise OI-149 to include a caution note to make the operators aware of the potential condition.

The inspectors discussed this issue with NRR and reviewed applicable licensing basis documents. As a result, it was determined that the intent of TS 3.5.1 was to ensure LPCI operability in Mode 3 and that it was not acceptable to rely on TS required actions and associated completion times as compensatory/corrective actions for conditions adverse to quality that are known and expected. Consequently, the licensee's corrective actions were determined to be inadequate to correct the condition adverse to quality. In addition, the inspectors reviewed the operators' logs and found that the caution note was not consistently interpreted by the operators. The inspectors did not find an instance where the TS allowable outage time of LPCI was exceeded.

In response to the inspectors' concerns, the licensee initiated CAP074083 and conducted a review of system operating procedures, piping and valve configurations, and the timeline from the 2003 pressure locking event. The licensee determined that MO-2010 was likely to become pressure locked when the 'B' SDC loop was placed in service with pressure just below the SDC interlock. At the conclusion of this inspection, the licensee was considering a revision of OI-149 to state that MO-2010 will become pressure locked vice thermally bound, clarify the conditions under which this will occur, and identify the operator actions required.

Analysis: The inspectors determined that the failure to ensure LPCI operability in Mode 3 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 adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the current operating procedures and the design of RHR did not ensure the availability and capability of the LPCI mode of RHR during Mode 3.

The inspectors determined that the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of findings," Table 3b for the mitigating system cornerstone. The finding screened as of very-low-safety significance (Green) because the finding did not represent an actual loss of safety function of a single train for duration greater than its Technical Specification allowable outage time. Specifically, the operators' log where reviewed and no instance was found where the allowable outage time of LPCI was exceeded.

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 correct this condition adverse to quality when it was identified in 2003.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected.

Contrary to the above, the licensee's corrective actions failed to promptly correct a condition adverse to quality following its discovery in March 24, 2003. Specifically, the licensee's corrective actions failed to correct the lack of barriers to prevent LPCI from becoming inoperable in Mode 3 when operating SDC. Because this violation was of very-low-safety significance and it was entered into the licensee's corrective action program as CAP074083, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000331/2010008-03, Failure to ensure the operability of LPCI in Mode 3).

4OA6 Management Meetings

.2 Interim Exit Meeting Summary

On March 26, 2010, the inspectors presented the interim inspection results to Mr. Costanzo, 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.

.1 Exit Meeting Summary

On June 9, 2010, the inspectors presented the final inspection results to Mr. Kleinheinz, 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.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

K. Kleinheinz, Engineering Director
S. Catron, Licensing Manager
B. Murrell, Licensing Engineer Analyst
P. Collingsworth, System Engineer

Nuclear Regulatory Commission

K. O'Brien, Deputy Division Director, Division of Reactor Safety
D. Hills, Chief, Engineering Branch 1
P. Loughheed, Acting Chief, Engineering Branch 2
A. M. Stone, Chief, Engineering Branch 2

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000331/2010008-01	NCV	Failure to evaluate the past operability of the 'B' control building chiller condenser
05000331/2010008-02	NCV	Failure to update the UFSAR to reflect required cooling to the RHR pump seals
05000331/2010008-03	NCV	Failure to ensure the operability of LPCI in Mode 3

Closed

05000331/2010008-01	NCV	Failure to evaluate the past operability of the 'B' control building chiller condenser
05000331/2010008-02	NCV	Failure to update the UFSAR to reflect required cooling to the RHR pump seals
05000331/2010008-03	NCV	Failure to ensure the operability of LPCI in Mode 3
TI 2515/177	TI	Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems (NRC Generic Letter 2008-01)

Discussed

None

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.

1R07 Heat Sink Performance (71111.07T)

STP 3.7.5-01B; Quarterly Surveillance Test for "B" Control Building Chiller Operability; 1/9/2010

STP 3.7.5-01B; Quarterly Surveillance Test for "B" Control Building Chiller Operability; 10/9/2009

STP 3.7.5-01B; Biannual Surveillance Test for "B" Control Building Chiller Operability; 7/9/2008

STP NS540002; Emergency Service Water Operability Test; 2/3/2010

CAP 066572; A Chiller Will Not Remain Running More Than 3-5 Min after Start; 4/16/2009

CAP 063302; Chiller Placed In 50.65(A)(1) Maintenance Rule RED; 1/29/2009

CAP 061115; B Chiller Tripped With No Alarm in the Control Room; 10/21/2008

CAP051235; CAQ – Loose Material in Lower RHRSW Pump Motor Air Flow Area, 7/20/2007

CAP061471; CAQ – B SBDG Jacket Water HX Leaked 100 Dpm; 11/2/2008

CAP062296; NCAQ – ESW Flange Leak from Scavenging Air Cooler; 12/12/2008

CAP062658; RHRSW Pump Motor Windings PI Results Were Not Sat; 1/5/2009

CAP072204; NCAQ – ESW Leak from B JWHX; 1/7/2010

CAP062296; NCAQ – ESW Flange Leak from Scavenging Air Cooler; 12/12/2008

CAL-466-M007; Chiller Performance; 9/21/1990

CAL-466-M-003; ESW Heat Loads; 9/24/2007

WO1141621; Heat Exchanger Bio/Silt Fouling Inspection Form; 4/13/2009

WO1126573; Heat Exchanger Bio/Silt Fouling Inspection Form; 1/24/2005

WO1137879; Calibration Data Sheet: TC6924B; 5/21/2007

WO1145232; Calibration Data Sheet: PI6932B; 4/15/2009

WO1137870; Calibration Data Sheet: PI6932B; 5/20/2007

WO1145410; Calibration Data Sheet: TC6924B; 10/05/2009

PWO 1147549; Inspect and Clean A Intake Structure Pit Completed; 9/15/2009

PWO 1147554; Inspect and Clean A RHRSW/ESW Pit Completed; 9/11/2009

PWO 1147557; Inspect/Clean River Side of Intake Structure Pits Completed; 9/11/2009

PWO 1147574, Inspect/Clean Pumphouse Stilling Basin Completed; 9/1/2009
PWO 1147569; Inspect and No Cleaning Needed B RHRSW and ESW Pits Completed;
9/2/2009
PWO 1147564; Inspect and No Cleaning Needed B Intake Structure Pit Completed;
8/21/2009
PWO 1147561; Inspect and No Cleaning Needed B Intake Structure Pit Completed;
6/2/2009
PWO 1147566; Inspect and Clean B RHRSW and ESW Pit Voided; 6/2/2009
PWO 1147571; Inspect and No Cleaning Needed and No Growth Pumphouse Stilling
Basin Completed; 6/1/2009
PWO 114570; Inspect and No Cleaning Needed Pumphouse Stilling Basin Completed;
4/7/2009
NMC47-DAEC-02, Control Building Chiller B 1E235B; 1E236B; 1E237B; 1/26/2005
SE-99-041; 10 CFR 50.59 Safety Evaluation to Remove The Requirement For ESW
Flow To The RHR Pump Seal Water Coolers From The TS Bases And The FSAR;
Revisions 0 and 1

4OA5 Other Activities

CAL-M03-006; Appendix R – RHR and CS Keep Fill Calculation; 11/13/2003.
CAL-M06-022; HPCI System Transient Thermal Hydraulic Analysis; 3/27/2007
WO1146485; GL2008-01, Perform Inspection of “A” CS Discharge Piping for High Point
Areas And Potential Gas Accumulation Points; 2/2/2009
WO1146488; GL2008-01; Perform Inspection of “B” RHR Suction Piping for High Point
Areas and Potential Gas Accumulation Points; 2/2/2009
WO1146490; GL2008-01, Perform Inspection of “B” RHR Discharge Piping for High
Point Areas and Potential Gas Accumulation Points; 2/2/2009
WO1146430; Inspection of High Point Areas of HPCI Suction; 9/22/2008
WO1146431; Inspection of High Point Areas of HPCI Discharge; 9/22/2008
WO1146422; Inspection of High Point Areas of CS A Suction; 9/8/2008
WO1146425, Inspection of High Point Areas of CS B Discharge; 9/6/2008
STP 3.5.1-13; HPCI System Water Fill Test; Revision 6
STP 3.5.1-13; Monthly Surveillance - HPCI System Water Fill Test; 1/1/2010
STP 3.5.1-13; Monthly Surveillance - HPCI System Water Fill Test; 12/3/2009
STP 3.5.1-14A; Monthly Surveillance - A Core Spray System Water Fill Test; 12/22/2009
STP 3.5.1-14A; Monthly Surveillance - A Core Spray System Water Fill Test; 1/16/2010
STP 3.5.1-14B; Monthly Surveillance - B Core Spray System Water Fill Test; 12/17/2009
STP 3.5.1-14B; Monthly Surveillance - B Core Spray System Water Fill Test; 1/20/2010
STP 3.5.1-15; RHR System Water Fill Test; Revision 1

STP 3.5.1-15; Monthly Surveillance - RHR System Water Fill Test; 12/18/2009
STP 3.5.1-15; Monthly Surveillance - RHR System Water Fill Test; 1/22/2010
OI-149; Residual Heat Removal System; Revision 113
OI-151; Core Spray System; Revision 58
OI-152, High Pressure Coolant Injection System; Revision 95
CAP060038; Small Air Pocket Found Upstream of MO2137; 9/4/2008
CAP060106, Air Pocket Measured Upstream of CV2037; 9/8/2008
COM030103; Complete GL 2008-01 Walkdowns Deferred to RFO 21; 7/1/2008
COM032036; Track Commitment to Evaluate and Adopt the Industry TSTF Traveler;
9/22/2008
CAP073588; Design Review Checklist; 3/3/2010
CAP073580; GL 2008-01 Procedural Enhancements; 3/3/2010
CAP026345; MO2010 Tripped on Thermal Overload; 3/24/2003
SA043604; GL 2008-01/Self-Assessment for NRC Inspection In Accordance With NRC
TI 2515/177; 3/8/2010
BECH-M123; HPCI Water Side; Revision 43
ISO-EBB-005-01; HPCI Pump Discharge; Revision 2
ISO-HBB-008-01; HPCI Pump Suction; Revision 1
ISO-EBB-006-01; HPCI Minimum Recirculation Line; Revision 1

Corrective Action Program Documents Generated as A Result of the Inspections

CAP074017; Enhance OI-149 Cautions to Alert Operators about Potential Valve
Thermal Binding; 3/23/2010
CAP074021; Screening 4202 Does Not Appear Adequate to Support PWR25605;
3/23/2010
CAP074083; CAQ - NRC Finding - MO 2010 Pressure Locking; 3/25/2010
CAP073762; Tubes Found Plugged During 1/24/2005 Cleaning of CB Chiller Condenser
Were Not Evaluated; 3/10/2010
CAP073747; Conflicting Parameters between ACP1208.4 and STP 3.7.5-01; 3/9/2010
CAP073821; Missing Jam Nuts for 1VHX031A&B; 3/11/2010
CAP073369; CAQ – V42-0012 Not Full Stroke Exercised as Required By ASME;
2/23/2010
CAP074081; RHR Pump Seal Water Cooler – NRC Finding; 3/25/2010

LIST OF ACRONYMS USED

ASME	American Society of Mechanical Engineers
CAP	Corrective Action Program
CFR	Code of Federal Regulations
ESW	Emergency Service Water
FSAR	Final Safety Analysis Report
HPCI	High Pressure Core Injection
IP	Inspection Procedure
NCV	Non-Cited Violation
NRC	U.S. Nuclear Regulatory Commission
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
SDP	Significance Determination Process
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
WO	Work Order

C. Costanzo

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Sincerely,

/RA/

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

Docket No. 50-331; 72-032
License No. DPR-49

Enclosure: Inspection Report 05000331/2010008
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