March 9, 2004

Mr. Mark Peifer
Site Vice-President
Duane Arnold Energy Center
Nuclear Management Company, LLC
3277 DAEC Road
Palo, IA 52324

SUBJECT: DUANE ARNOLD ENERGY CENTER
NRC SAFETY SYSTEM DESIGN AND PERFORMANCE CAPABILITY
INSPECTION 050000331/2004006(DRS)

Dear Mr. Peifer:

On February 13, 2004, the U.S. Nuclear Regulatory Commission (NRC) completed a baseline inspection at your Duane Arnold Energy Center. The enclosed report documents the inspection findings which were discussed on February 13, 2004, with Mr. J. Bjorseth and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and to 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. Specifically, this inspection focused on the design and performance capability of the high pressure coolant injection and reactor core isolation cooling systems.

Based on the results of this inspection, there were two NRC-identified findings of very low safety significance, both of which were determined to involve violations of NRC requirements. However, because of their very low safety significance and because these issues were entered into your corrective action program, the NRC is treating these issues as Non-Cited Violations in accordance with Section VI.A.1 of the NRC's Enforcement Policy.

If you contest the subject or severity of a Non-Cited Violation, you should provide a response within 30 days of the date of this inspection report, with a 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, 801 Warrenville Road, Lisle, Il 60532-4351; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Duane Arnold Energy Center.

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Sincerely,

/RA/

David E. Hills, Chief
Mechanical Engineering Branch
Division of Reactor Safety

Docket No. 50-331
License No. DPR-49

Enclosure: Inspection Report 05000331/2004006(DRS)

cc w/encl: E. Protsch, Executive Vice President -
Energy Delivery, Alliant;
President, IES Utilities, Inc.
J. Cowan, Executive Vice President and Chief Nuclear Officer
J. Bjorseth, Plant Manager
S. Catron, Manager, Regulatory Affairs
J. Rogoff, Esquire, Vice President, Counsel, & Secretary
B. Lacy, Nuclear Asset Manager
Chairman, Linn County Board of Supervisors
Chairperson, Iowa Utilities Board
The Honorable Charles W. Larson, Jr.
Iowa State Senator
D. McGhee - Department of Public Health

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-331
License No:	DPR-49
Report No:	05000331/2004006(DRS)
Licensee:	Alliant, IES Utilities Inc.
Facility:	Duane Arnold Energy Center
Location:	3277 DAEC Road Palo, Iowa 52324-9785
Dates:	January 26 through February 13, 2004
Inspectors:	P. Lougheed, Senior Engineering Inspector L. Kozak, Senior Engineering Inspector H. Walker, Senior Engineering Inspector J. Neurauter, Engineering Inspector S. Sheldon, Engineering Inspector T. Bilik, Reactor Inspector
Approved by:	David E. Hills, Chief Mechanical Engineering Branch Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000331/2004006(DRS), 01/26/2004 - 02/13/2004; Duane Arnold Energy Center; Safety System Design and Performance Capability.

The inspection was a three week baseline inspection of the design and performance capability of the high pressure coolant injection and reactor core isolation cooling systems. The inspection was conducted by regional engineering inspectors. The inspection identified two issues of very low significance. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter 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 3, dated July 2000.

A. <u>Inspector-Identified and Self-Revealed Findings</u>

Cornerstone: Mitigating Systems

- Green. The team identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance. Specifically, when relocating a high pressure coolant injection turbine exhaust line valve the licensee failed to correctly use the original design anchor bolt safety factor in the supporting calculation. Following discovery, the licensee entered the violation into their corrective action system as condition report CAP 030373.

  The finding was determined to be greater than minor because the calculation error would be expected to necessitate extensive calculation rework and possibly a modification in order to demonstrate that the support meets design acceptance limits commensurate with those applied to the original design. The issue was of very low safety significance because the support remained "operable but degraded." (Section 1R21.2.b.1)

- Green. The team identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," having very low safety significance. Specifically, the licensee failed to promptly identify and evaluate a calculation error that resulted in a potentially non-conservative technical specification value for the condensate storage tank low level setpoint. The licensee agreed that the issue was not adequately entered into the corrective action program, initiated CAP 030703 to address the issue, and performed an immediate operability review.

  This issue was more than minor because it required an analysis to be reperformed and could require a change to the licensee's technical specifications. The issue was of very low safety significance because HPCI remained operable throughout the period. (Section 4OA2.1b1)

B. <u>Licensee-Identified Violations</u>

None.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Mitigating Systems

1R21 Safety System Design and Performance Capability (71111.21)

Introduction: Inspection of safety system design and performance verifies the initial design and subsequent modifications and provides monitoring of the capability of the selected systems to perform design bases functions. As plants age, the design bases may be lost and important design features may be altered or disabled. The plant risk assessment model is based on the capability of the as-built safety system to perform the intended safety functions successfully. This inspectable area verifies aspects of the mitigating systems cornerstone for which there are no indicators to measure performance.

The objective of the safety system design and performance capability inspection is to assess the adequacy of calculations, analyses, other engineering documents, and operational and testing practices that were used to support the performance of the selected systems during normal, abnormal, and accident conditions.

The systems and components selected were the high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) systems (two samples). These systems were selected for review based upon:

- having a high probabilistic risk analysis ranking;
- having had recent significant issues;
- not having received recent NRC review; and
- being interacting systems.

The criteria used to determine the acceptability of the system's performance was found in documents such as:

- licensee technical specifications;
- applicable final safety analysis report sections; and
- the systems' design documents.

The following system and component attributes were reviewed in detail:

System Requirements

Process Medium - water, fuel oil, electricity;
Energy Source - electrical power, fuel oil, air;
Control Systems - initiation, control, and shutdown actions;
Operator Actions - initiation, monitoring, control, and shutdown; and
Heat Removal - ventilation.

System Condition and Capability

Installed Configuration - elevation and flow path operation;
Operation - system alignments and operator actions;
Design - calculations and procedures; and
Testing - flow rate, pressure, temperature, voltage, and levels.

Component Level

Equipment Qualification - temperature and radiation; and
Equipment Protection - tornado and electrical.

.1 System Requirements

a. Inspection Scope

The inspectors reviewed the updated safety analysis report, technical specifications, system descriptions, drawings and other available design basis information, as listed in the attached List of Documents, to determine the performance requirements of HPCI, RCIC, and their associated support systems. The reviewed system attributes included process medium, energy sources, control systems, and operator actions. The rationale for reviewing each of the attributes was:

Process Medium: This attribute required review to ensure that the HPCI and RCIC systems would supply the required amount of water to the reactor following design basis events.

Energy Sources: This attribute needed to be reviewed to ensure that the HPCI and RCIC systems would start when called upon, and that appropriate valves would have sufficient power to change state when so required.

Controls: This attribute required review to ensure that the automatic controls for the HPCI and RCIC systems were properly established. Additionally, review of alarms and indicators was necessary to ensure that operator actions would be accomplished in accordance with the design.

Operations: This attribute was reviewed because the operators took a number of actions during the monthly and quarterly surveillance tests that had the potential for affecting HPCI and RCIC automatic operation. In addition, the emergency operating procedures permitted the operators to manually control HPCI and RCIC operation to maintain desired reactor water levels. Therefore, operator actions played an important role in the ability of the HPCI and RCIC systems to achieve their safety related functions.

Heat Removal: This attribute was reviewed to ensure that there was sufficient heat removal capability for the HPCI and RCIC systems from the associated room coolers.

b. Findings

.1 Station Blackout Coping Analysis

Introduction: An unresolved item was identified concerning the licensee's station blackout (SBO) coping analysis performed to support the extended power uprate.

Description: The revised SBO analysis showed that, as a result of increased decay heat load, the suppression pool water temperature would reach the heat capacity temperature limit (HCTL) as defined in the emergency operating procedures (EOPs) approximately 3.5 hours into the postulated event. The licensee determined that the 4 hour coping period continued to be met, despite reaching the HCTL limit, because operators would begin another reactor vessel cooldown as suppression pool temperature approached or exceeded the HCTL. The rate of cooldown was judged to be slow enough that the end of the 4 hour coping period would be reached before the RCIC system, which was used to maintain reactor vessel water level, isolated on low reactor pressure. At the end of the 4 hour period, offsite power was assumed to be restored and operators would bring the plant to cold shutdown.

The inspectors determined that the EOPs would direct operators to perform an emergency depressurization if suppression pool temperature and reactor pressure vessel pressure could not be maintained below the HCTL limit. The inspectors were concerned that an emergency depressurization during a SBO event would result in losing all sources of core cooling systems for injection to the reactor vessel. Since this limit was shown to be exceeded prior to the end of the 4 hour coping period, the inspectors could not conclude that the coping period was met.

The SBO analysis also showed that the drywell shell temperature limit would be reached approximately 3.7 hours into a postulated SBO event. The analysis concluded that adequate drywell integrity was maintained because the duration above the temperature limit was short and the drywell pressure was low. The inspectors determined that the EOPs would again direct operators to perform an emergency depressurization if this limit could not be restored and maintained. Since this limit also was shown to be reached prior to the end of the 4 hour coping period, and could result in emergency depressurization and loss of all core cooling systems for injection, the inspectors could not conclude that the coping period was met.

Because this information impacted a document which was previously reviewed by the NRC as part of the extended power uprate, the inspectors discussed this issue with the Office of Nuclear Reactor Regulation staff, who planned additional review of the issue. This issue will remain an unresolved item pending further review by NRC staff to determine if the licensee's analysis and justification adequately support the required 4 hour SBO coping period. (URI 05000331/2004006-01)

.2 System Condition and Capability

a. Inspection Scope

The inspectors reviewed design basis documents and plant drawings, abnormal and emergency operating procedures, requirements, and commitments identified in the updated safety analysis report and technical specifications. The inspectors compared the information in these documents to applicable electrical, instrumentation and control, and mechanical calculations, setpoint changes and plant modifications. The inspectors also reviewed operational procedures to verify that instructions to operators were consistent with design assumptions.

The inspectors reviewed information to verify that the actual system condition and tested capability was consistent with the identified design bases. Specifically, the inspectors reviewed the installed configuration, the system operation, the detailed design, and the system testing, as described below.

Installed Configuration: The inspectors confirmed that the installed configuration of the HPCI and RCIC systems met the design basis by performing detailed system walkdowns. The walkdowns focused on the installation and configuration of piping, components, and instruments; the placement of protective barriers and systems; the susceptibility to flooding, fire, or other environmental concerns; physical separation; provisions for seismic and other pressure transient concerns; and the conformance of the currently installed configuration of the systems with the design and licensing bases.

Operation: The inspectors performed procedure walk-throughs of selected manual operator actions to confirm that the operators had the knowledge and tools necessary to accomplish actions credited in the design basis.

Design: The inspectors reviewed the mechanical, electrical and instrumentation design of the HPCI and RCIC systems to verify that the systems and subsystems would function as required under accident conditions. The review included a review of the design basis, design changes, design assumptions, calculations, boundary conditions, and models as well as a review of selected modification packages. Instrumentation was reviewed to verify appropriateness of applications and set-points based on the required equipment function. Additionally, the inspectors performed limited analyses in several areas to verify the appropriateness of the design values.

Testing: The inspectors reviewed records of selected periodic testing and calibration procedures and results to verify that the design requirements of calculations, drawings, and procedures were incorporated in the system and were adequately demonstrated by test results. Test results were also reviewed to ensure automatic initiations occurred within required times and that testing was consistent with design basis information.

b. Findings

.1 Incorrect Factor of Safety Specified in Design Evaluation of HPCI Pipe Support

Introduction: The inspectors identified a finding of very low significance involving a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, “Design Control.” Specifically, the inspectors identified that the design bases for a HPCI turbine exhaust line pipe support were not correctly translated into calculations or drawings.

Description: The inspectors reviewed calculation CAL-M96-010, “Relocation of Valve V22-0016 Next to V22-0017,” which was performed to evaluate the effects of relocating a HPCI turbine exhaust line valve 50 feet closer to the torus. The inspectors noted that, for support 200S, the calculation listed the allowable anchor bolt load for Level D pipe reactions as twice that for Levels A, B or C. The inspectors determined that the anchor bolt load design capacity should not have increased for Level D pipe reactions if the original anchor bolt design requirement had been met. The original design requirement was that wedge type anchor bolts had a safety factor greater than or equal to four based on the ultimate bolt capacity.

The licensee determined that calculation CAL-M96-010 specified the operability limit for the anchor bolt allowable load instead of the design limit. The operability limit only required that wedge type anchor bolts had a safety factor greater than or equal to two, based on the ultimate bolt capacity. The use of the operability limit did not meet design requirements.

Further review by the inspectors verified that the original support design bases calculation, 25.2638.1170.03, “Support Analysis: HBB-6-SS-22 (200S),” used the correct design safety factor based on the ultimate bolt capacity and had evaluated the installed asymmetric anchor bolt configuration. While the increased pipe reactions due to relocating valve V22-0016 were revised on the pipe support design drawing, the calculation had not been revised. The licensee determined that support HBB-6-SS-22 was “operable but degraded.”

Analysis: Evaluation of this issue concluded that it was a design control deficiency resulting in a finding of very low significance (Green). The deficiency was due to the licensee not using the correct minimum safety factor as required by the original design to determine the wedge type anchor bolt acceptance limit as in the original design bases calculation for support HBB-6-SS-22. The mitigating systems cornerstone was affected as the failure of a HPCI turbine exhaust pipe support could result in the failure of the HPCI system to fulfill its design function. No other cornerstones were determined to be degraded as a result of this issue.

The finding was determined to be greater than minor because the calculation error would be expected to necessitate extensive calculational rework and possibly a modification to ensure that the support met design acceptance limits.

The finding was assessed through Phase I of the significance determination process. The inspectors agreed with the licensee’s position that the pipe support was “operable but degraded.” Therefore, the inspectors concluded that the finding did not represent an actual loss of a safety function, and the issue screened out as having a very low safety significance or Green.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures be established to assure that applicable regulatory requirements and the design bases are correctly translated into specifications, drawings, procedures, and instructions.

Contrary to the above, as of February 13, 2004, the design bases for the HPCI turbine exhaust line piping and supports were not correctly translated into specifications, drawings, procedures, and instructions, in that design calculation CAL-M96-010, "Relocation of Valve V22-0016 Next to V22-0017," did not use a factor of safety equal to or greater than four based on the ultimate anchor bolt capacity for pipe support HBB-6-SS-22 commensurate with the original design requirements. Because the licensee entered the violation into their corrective action system as condition report CAP 030373, this violation is being treated as a Non-Cited Violation consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000331/2004006-02)

.2 HPCI Injection Piping Hydraulic Transient Susceptibility

Introduction: The inspectors identified an unresolved item concerning the potential for conditions to exist in the HPCI injection piping which could result in a hydraulic transient event whenever the system was called upon to function.

Description: The inspectors reviewed the licensee's evaluation of a Dresden hydraulic transient which occurred in July 2001. The Dresden licensee determined the event occurred due to a combination of air pockets and steam voids in the Unit 3 HPCI injection piping. The inspectors noted several similarities between the Dresden and Duane Arnold HPCI piping configurations which signified that a similar hydraulic transient event could be possible at Duane Arnold upon an automatic HPCI injection.

The inspectors determined that three conditions combined to cause the Dresden hydraulic transient: (1) a length of stagnant heated water between two closed valves in the HPCI injection line; (2) an air pocket at the high point of the system; and (3) an injection valve which opened prior to HPCI system pressure being high enough to overcome the feedwater system pressure. When the injection valve began to open during system initiation, heated water between the injection valve and downstream check valve flashed to steam into the low pressure air pocket immediately upstream of the injection valve. The HPCI steam void subsequently collapsed as pump discharge pressure increased, resulting in a system hydraulic transient.

The inspectors were concerned that the Duane Arnold HPCI system could also be susceptible to a hydraulic transient due to system similarities between the two plants: the proximity of the piping downstream of the injection valve to the interfacing feedwater system, the physical layout of the injection line with the system high point immediately upstream of the injection valve and a valve initiation logic which did not have a pressure interlock.

At Duane Arnold, similar to Dresden, the HPCI system injected into the feedwater system. However, Duane Arnold had a longer segment of piping between the normally closed injection and check valves which was filled with stagnant water. No information was available during the inspection as to the temperatures in this segment of piping during normal operation. Therefore, the inspectors could neither prove nor disprove whether the water volume between the HPCI injection valve and downstream check valve would flash to steam when the injection valve opened.

On both the Duane Arnold and Dresden HPCI systems, the high point in the piping occurred just prior to the injection valve. However, Dresden had intermediate high points which did not exist at Duane Arnold. The inspectors verified that, at Duane Arnold, the HPCI pump discharge piping was filled and vented prior to plant operation. The inspectors also confirmed that the system was not routinely vented during plant operation, unless the suction piping was not aligned to its normal source, the condensate storage tank. Therefore, the inspectors were unable to confirm that an air void either did or did not exist at the HPCI injection valve high point due to air coming out of solution over time.

The inspectors confirmed that the Duane Arnold initiation logic allowed the HPCI injection valve to begin opening independently of the pump start. Therefore, the inspectors determined that low pressure conditions could be present when the valve first opened.

Based on the above, the inspectors concluded that the licensee had insufficient information to demonstrate that the Duane Arnold HPCI system would not be subject to transient hydraulic loads. The licensee also did not have any evaluation which demonstrated that the system could function if it did experience a hydraulic transient.

This item is being held as an unresolved item pending sufficient additional information from the licensee to demonstrate that the system is either susceptible or not susceptible to a hydraulic transient. Furthermore, the unresolved item encompasses the need for a licensee evaluation of the severity and impact of a hydraulic transient, if the additional information concludes that susceptibilities do exist. The licensee entered this issue into their corrective action system as condition report CAP 030715.
(URI 05000331/2004006-03)

.3 Unverified Methodology for Analysis of Torus Attached Piping

Introduction: The inspectors identified a an unresolved item concerning design changes to the HPCI turbine exhaust subsystem which were not subject to design control measures commensurate with those applied to the original design.

Description: The inspectors reviewed a HPCI modification which relocated a valve to decrease the potential to siphon suppression pool water into the HPCI turbine exhaust line due to steam condensation. The valve, V22-0016, was relocated close to valve V22-0017 in order to minimize the trapped water volume between the two valves. The HPCI turbine exhaust line penetrated primary containment at torus penetration N214, and terminated inside the torus below the suppression pool water level.

The inspectors determined that the design loads for the redesigned HPCI turbine exhaust line had to include the torus response to a loss of coolant accident (LOCA) and a safety-relief valve (SRV) discharge, because of the location of the valves in relation to the torus penetration. The inspectors ascertained that the effect of LOCA and SRV discharge loads was expected to attenuate as the piping distance from the torus increased. However, valve V22-0016 was relocated more than 50 linear piping feet closer to the torus and was finally positioned within a few feet of the torus. As described in Updated Final Safety Analysis Report (UFSAR) Section 6.2.1.6.2.2, "Mark I Containment Long Term Program," the NRC reviewed and accepted the Duane Arnold plant unique analysis report for the Mark I containment. In the NRC safety evaluation related to the structural review of the Mark I containment long term program, the NRC concluded, in part, that the original design used properly determined loadings and load combinations, and that the licensee's analyses were verified by independent audit and approved by the staff under LOCA and SRV discharge loads. The inspectors determined that response spectra for LOCA and SRV discharge loads typically had sharp peaks at narrow critical frequency ranges. Therefore, the inspectors concluded that small changes in piping system resonant frequency near LOCA or SRV discharge load critical frequencies could produce large changes in the piping system analysis results.

The inspectors reviewed the licensee's piping evaluation in calculation CAL-M96-010, "Relocation of Valve V22-0016 Next to V22-0017." The inspectors determined that the calculation did not evaluate the effect of torus LOCA and SRV discharge loads using the original design methodology. Instead, the calculation estimated the change in pipe moments and reaction forces for the LOCA and SRV discharge loads by comparing piping system frequency responses for the unmodified and modified piping systems. The calculation assumed that, if the resultant changes in frequency response were less than ten percent, the overall change in system acceleration response for the modified piping would be insignificant from the original analysis. Pipe moment and support reactions due to LOCA and SRV discharge loads for the modified system were then increased based on static analyses of the piping system mass redistribution due to the valve relocation.

The inspectors could not determine that the licensee's simplified methodology was at least as conservative as the original design methodology. The licensee did not benchmark the simplified methodology against the original design methodology nor did the licensee provide any information to verify the reliability or accuracy of the assumptions used in the simplified methodology. The licensee's calculation did not provide justification that the original design methodology included sensitivity analyses or other methods to support the ten percent assumption.

The inspectors noted that the piping stress level documented in CAL-M96-010 was at 90 percent of design acceptance limits, and that pipe support allowable reactions were at 94 percent of design acceptance limits, or very close to the maximum allowables. Due to the complexity of the original design analysis methodology, the inspectors determined that the licensee's calculation did not provide sufficient information to demonstrate whether or not the effect of piping system resonant frequency changes was bounded by the results of the originally analyzed LOCA and SRV discharge loads.

This item is being held as an unresolved item pending sufficient additional information from the licensee to demonstrate that the simplified methodology used was bounded by the original design methodology. Furthermore, the unresolved item encompasses the need for licensee re-evaluation of piping and piping support loads, if the additional information concludes that the simplified methodology was not bounded. The licensee had not entered this issue into their corrective action system as of the end of the inspection. (URI 05000331/2004006-04)

.3 Components

a. Inspection Scope

The inspectors examined the HPCI and RCIC systems to ensure that component level attributes were satisfied. Specifically, the following attributes of the HPCI and RCIC systems were reviewed:

Equipment/Environmental Qualification: This attribute verifies that the equipment is qualified to operate under the environment in which it expected to be subjected to under normal and accident conditions. The inspectors reviewed design information, specifications, and documentation to ensure that the HPCI and RCIC components were qualified to operate in within the temperatures and radiation fields specified in the environmental qualification documentation.

Equipment Protection: This attribute verifies that the HPCI and RCIC systems are adequately protected from natural phenomenon and other hazards, such as high energy line breaks, floods or missiles. The inspectors reviewed design information, specifications, and documentation to ensure that the HPCI and RCIC systems were adequately protected from those hazards identified in the updated safety analysis report which could impact their ability to perform their safety function.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES (OA)

4OA2 Problem Identification and Resolution

.1 Review of Condition Reports

a. Inspection Scope

The team reviewed a sample of HPCI and RCIC system problems that were identified by the licensee and entered into the corrective action program. The inspectors reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions related to design issues. In addition, condition reports written on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the corrective action system. The specific corrective action documents that were sampled and reviewed by the team are listed in the attachment to this report.

b. Findings

.1 Condensate Storage Tank Low Level Setpoint

Introduction: The inspectors identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," having very low safety significance (Green) for failing to promptly identify and evaluate a calculation error that resulted in a potentially non-conservative technical specification value. Specifically, the inspectors identified that the licensee recognized an error in the condensate storage tank (CST) low level setpoint calculation, but failed to adequately enter the issue into the corrective action program.

Description: The inspectors reviewed calculation CAL-E93-027, "Condensate Storage Tank Low Level LS5218 and LS5219." This calculation provided the basis for the CST low level setpoint described in Table 3.3.5.1-1, item 3d, and Table 3.3.5.2-1, item 3, in the Duane Arnold technical specifications. The safety function of the setpoint was to initiate transfer of HPCI and RCIC suction from the CST to the torus once the water volume of the CST was depleted. The inspectors determined that the calculation did not take into account the time that necessary to complete the transfer nor did it include process measurement error. With the setpoint at the allowed value, the inspectors determined that vortexing could occur in the HPCI suction prior to the completion of the suction transfer. This would allow air to be drawn into the pump.

The licensee determined that the above deficiencies were previously identified during a self-assessment performed in December 2003. The deficiencies had been noted, but had not been entered into the licensee's corrective action program until a low level tracking item, OTH037080, was generated in February 2004. This low level tracking item did not get a review for operability. The inspectors noted that operability of the system would be affected if the CST were at the technical specification allowable value. The licensee agreed that the issue had not been adequately entered into the corrective action program, initiated CAP 030703, "CAPs not Written for CAQs Discovered During Self Assessment," on February 12, 2004, and performed the required operability review. The licensee concluded that during the period from December 2003, until February 12, 2004, the HPCI system was operable as the actual setpoint was sufficiently higher than the technical specification allowable value and provided reasonable assurance that the system would perform its design basis function.

Analysis: Evaluation of this issue concluded that it was a performance deficiency resulting in a finding of very low safety significance (Green). The performance deficiency was the failure to promptly identify and correct a potentially non-conservative technical specification value. The inspectors concluded that the finding was greater than minor because it required an analysis to be reperformed and could require a change to the licensee's technical specifications. This finding affected the mitigating system cornerstone, as the underlying calculational error affected the reliability of HPCI, a system designed to mitigate the consequences of an accident.

The finding was assessed through Phase I of the significance determination process. The inspectors agreed with the licensee's position that the actual setpoint was sufficiently higher than the technical specification allowable value and provided reasonable assurance that the system would perform its design basis function. Therefore, the inspectors concluded that the finding did not represent an actual loss of a safety function, and the issue screened out as having a very low safety significance or Green.

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, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected.

Licensee procedures ACP114.5, "Action Request System," and ACP 117.4, "Snapshot Self-Assessment Process," required that a corrective action plan CAP be initiated for conditions adverse to quality.

Contrary to the above, as of February 11, 2004, the licensee failed to assure that a condition adverse to quality was promptly identified and corrected. Specifically, a potentially nonconservative technical specification allowed value was first identified during the week of December 2, 2003. On February 2, 2004, the licensee initiated a low level tracking document, OTH037080, rather than a CAP. This OTH document bypassed the process for operability review. The licensee finally entered this issue into its corrective action program as part of CAP 030703, "CAPs not Written for CAQs Discovered During Self Assessment," on February 12, 2004, and performed the required operability review. Because this violation was of very low safety significance and because it was entered into the licensee's corrective action program, this violation is being treated as a non-cited violation consistent with Section VI.A of the NRC Enforcement Policy. (NCV 05000331/2004006-05)

4OA6 Meetings, Including Exits

.1 Exit Meeting

The inspectors presented the inspection results to Mr. J. Bjorseth and other members of licensee management at the conclusion of the inspection on February 13, 2004. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. Proprietary information was reviewed during the inspection. The inspectors confirmed that the proprietary material had been returned and discussed the likely content of the inspection report. The licensee did not indicate any potential conflicts with information presented.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
R. Anderson, Business Support Manager
J. Bjorseth, Plant Manager
S. Catron, Manager Regulatory Affairs
D. Curtland, Engineering Director
T. Evans, Operations Manager
S. Haller, Systems Engineering Manager
P. Hansen, Outage and Scheduling Manager
G. Hawkins, Plant Engineering Supervisor
M. Peifer, Site Vice President
R. Morrell, Performance Improvement Manager
K. Schneider, Nuclear Oversight Manager

Nuclear Regulatory Commission
R. Caniano, Deputy Director, Division of Reactor Safety
S. Caudill, Resident Inspector
G. Wilson, Senior Resident Inspector

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000331/2004006-01	URI	Station Blackout Coping Analysis (Section 1R21.1.b.1)
05000331/2004006-02	NCV	Incorrect Factor of Safety Specified in Design Evaluation of HPCI Pipe Support (Section 1R21.2.b.1)
05000331/2004006-03	URI	HPCI Pump Discharge Piping Hydraulic Transient Susceptibility (Section 1R21.2.b.2)
05000331/2004006-04	URI	Unverified Methodology for Analysis of Torus Attached Piping (Section 1R21.2.b.3)
05000331/2004006-05	NCV	Failure to Promptly Enter a Condition Adverse to Quality into the Corrective Action Program (Section 4OA2.1.b.1)

Closed

05000331/2004006-02	NCV	Incorrect Factor of Safety Specified in Design Evaluation of HPCI Pipe Support (Section 1R21.2.b.1)
05000331/2004006-05	NCV	Failure to Promptly Enter a Condition Adverse to Quality into the Corrective Action Program (Section 4OA2.1.b.1)

LIST OF DOCUMENTS REVIEWED

The following is a list of licensee documents reviewed during the inspection, including documents prepared by others for the licensee. Inclusion on this list does not imply that NRC inspectors reviewed the documents in their entirety, but rather that selected sections or portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document in this list does not imply NRC acceptance of the document, unless specifically stated in the inspection report.

1R21 Safety System Design and Performance Capability

Annunciator Response Procedures

1C23A-C-1; HPCI Room Cooler 1V-AC-14A Outlet Air Air High Temperature; Revision 4

1C23A-C-2; HPCI Room Cooler 1V-AC-14A Outlet Air Low Temperature or Inlet Air High Temperature; Revision 4

1C23A-C-3; RCIC Room Cooler 1V-AC-15A Outlet Air Air High Temperature; Revision 4

1C23A-C-4; RCIC Room Cooler 1V-AC-15A Outlet Air Low Temperature or Inlet Air High Temperature; Revision 4

1C03C; Reactor and Containment Isolation and Cooling; Revision 29

Calculations

25.2638.0952.01; Small Bore Piping Attached to Line N212; Revision 0

25.2638.0952.08; Pipe Stress Combination and Evaluation; Revision 0

25.2638.0956.01; Geometry – Vacuum Breaker Line Off N214; Revision 0

25.2638.0956.02; Load Combinations for Vacuum Breaker Line Off of N214; Revision 0

25.2638.1170.03; Support Analysis: HBB-6-SS-22 (200S); Revision 4

234-010; Room Flood Levels After High Energy Line Break; Revision 6

278-001; RCIC and HPCI Test Valve; Revision 0

CAL-409-J-002; Duration of Operation of HPCI Test Valve CV-2315 Using Accumulator Tanks IT-275A and B; Revision 0

CAL-409-N-002; Spectacle Flange Thicknesses, HPCI Test Line EEB-7 and RCIC Test Line EBB-4; Revision 1

CAL-466-M-003; Emergency Service Water Heat Loads; Revision 2

CAL-466-M-005; Performance Study for RCIC Room Coolers (1V-AC-15A and 1V-AC-15B); Revision 0

CAL-466-M-006; Performance Study for HPCI Room Coolers (1V-AC-14A and 1V-AC-14B); Revision 0

CAL-E92-002; HPCI Analytical Limit for PDIS2244 and PDIS2245; Revision 2

CAL-E92-004; Setpoint Calculations for HPCI High Steam Flow Isolation; Revision 2

CAL-E92-007; 1D1 Battery Load and Margin; Revision 7

CAL-E92-008; 1D2 Battery Load and Margin; Revision 5B

CAL-E92-009; 1D4 Battery Load and Margin; Revision 4

CAL-E92-023; Setpoint Calculation for HPCI Steam Line Low Pressure PS2246A, B, C, D; Revision 1

CAL-E93-023; High Torus Level HPCI Suction Transfer – LS2319, LS2320; Revision 2

CAL-E93-027; Condensate Storage Tank Low Level LS5218 and LS5219; Revision 2

CAL-E95-002; HPCI and RCIC Isolation Time Delay Setpoint Calculation KS2524A, KS2524B, KS2525A, and KS2525B; Revision 1

CAL-E95-015; HPCI Turbine Exhaust High Pressure Trip – PS2233A and PS2233B; Revision 2

CAL-E98-004; Setpoint Calculation High Reactor Vessel Level, HPCI, RCIC, Feedwater, and Turbine Trip in Remote Shutdown – LS4540; Revision 1

CAL-IELP-M-92-32; MEDP, Pressure, Flow, and Temperature Determination for RCIC System Motor Operated Valves (MOVs); Revision 0

CAL-M01-102; CV2410 Setpoint Data; Revision 1

CAL-M01-271; HPCI, FIC-2309 and RCIC FIC-2509 Indicated Flow versus Actual Flow; Revision 1

CAL-M85-036; HPCI Suction Line Expansion Joint Shipping Bars; December 27, 1985

CAL-M86-08; RHR and RCIC Suction Shielding for Spring 1986 Outage; Revision 0

CAL-M91-010; Recommended Discharge Pressure for HPCI Main Pump Test; Revision 0

CAL-M91-011; Recommended Discharge Pressure for RCIC Main Pump Test; Revision 0

CAL-M93-041; Generic Letter 89-10 Maximum Thrust Analysis for MOVs; Revision 2

CAL-M96-010; Relocation of Valve V22-0016 Next to V22-0017; Revision 2

CAL-M97-008; HPCI Net Positive Suction Head Calculation; Revision 1

CAL-M97-009; RCIC Net Positive Suction Head Calculation; Revision 1

CAL-MC-06G; Determination of Hydro Test Pressure for RCIC Piping; Revision 0

CAL-MC-30A; HPCI, RCIC Minimum Flow, Bypass Flow Orifices; Revision 1

CAL-MC-43B; HPCI and RCIC Turbine Exhaust to Torus; May 28, 1970

CAL-MC-43C; RCIC System Resistance Calculations; July 14, 1970

Corrective Action Program Documents Initiated as a Result of Inspection

CAP030567; Inadequate Documentation of HPCI and RCIC Room Cooler Design Basis; dated January 30, 2004

CAP030662; Inconsequential Error in Setpoint Calculation; dated February 9, 2004

CAP030663; HPCI Booster Pump Suction Low Pressure Instrument Pipe Venting; dated February 9, 2004

CAP030673; During HPCI and RCIC NRC Inspection Two Issues Discovered in CAL-M96-010; dated February 10, 2004

CAP030675; HPCI and RCIC Room High Energy Line Break Door Precautions and Limitations in OI-150 and OI-152; dated February 10, 2004

CAP030681; Lack of Clarity in Power Uprate Report for Station Blackout; dated February 10, 2004

CAP030697; Review Agastat Relay Preventive Performance Test Frequency; dated February 11, 2004

CAP030699; RCIC OI-150 Precautions and Limitations for Declaring RCIC Inoperable When Aligned to Torus; dated February 10, 2004

CAP030703; Corrective Action Plans not Written for Conditions Adverse to Quality Discovered During Self Assessment; dated February 12, 2004

CAP030715; Operating Experience (OE) 16542 Evaluation – Venting HPCI Discharge Piping; dated February 13, 2004

Corrective Action Program Documents and Action Requests (AR) Reviewed

AR 18589; Evaluate HPCI and RCIC Electronic Governor Module Box Replacement Frequency; dated February 4, 2000

AR 27453; Evaluate Replacement of FIC2509 with a new Moore Digital Controller; dated September 4, 2001

AR 27456; Revise Commitment from LER 89-007 Rev 1 from 4 Cycles to 10 Years; dated September 4, 2001

AR 27457; Evaluate HPCI and RCIC Control Systems for Replacement Due to Equipment Obsolescence and Plant Life Extension; dated September 4, 2001

AR 27458; Perform Calculation to Evaluate HPCI and RCIC Flow Indicating Controller Offsets; dated September 4, 2001

AR 27529; HPCI Drain Trap Leak Requires HPCI Inoperability; dated September 2, 2001

AR 29123; Review GE SIL-640 “HPCI and RCIC Electronic Governor Module Control Box Electrolytic Capacitor” for Applicability to Duane Arnold; dated December 11, 2001

AR 29336; Revision of Operating Instruction OI-150 Precaution 26 Concerning Flow Indication (FIC2309) During Standby Conditions; dated December 27, 2001

AR 30355; PS2304B Found Out of Specification on Higher AC Voltage Than Allowed; dated February 11, 2004

CAP009529; HPCI CST Test Return Line Isolation Identification Failed to Respond as Expected; dated March 21, 2001

CAP011905; NRC Bulletin 95-02: Unexpected Torus Strainer Clogging; dated October 18, 1995

CAP011988; HPCI High Energy Line Break Environment; dated October 31, 1995

CAP012326; Review Practice of “Bumping” Open HPCI and RCIC Steam Supply Valves; dated October 3, 1995

CAP012506; HPCI Flow Square Root Converter (FY2309) Output Reading Unexpected Value; dated January 16, 2002

CAP012569; HPCI Steam Supply Drain Steam Trap Inadvertently Insulated; dated January 23, 2002

CAP014246; RCIC Lube Oil Unable to be Completely Filled after Maintenance; dated August 21, 2002

CAP019073; Flooding HPCI and RCIC Steam Supply Lines During Reactor Pressure Vessel Flooding; dated February 16, 1999

CAP019186; FS2508 (RCIC Pump 1P-226 Low Discharge Flow) Piping Change; dated August 30, 2001

CAP019199; HPCI Declared Inoperable Due to Oil Leak on Threaded Fitting; dated October 30, 2001

CAP019494; Low Pressure Coolant Injection Limiting Condition for Operation Not Entered for Low Pressure RCIC Surveillance; dated September 9, 2002

CAP025588; RCIC Torus Suction Valve Realigned During CST Level Test; dated February 13, 2003

CAP025736; Engineered Maintenance Action (EMA) A59613 Failed to Eliminate Spurious Annunciator Alarms; dated February 21, 2003

CAP026098; RCIC Coupling and Oil Level Above High Level Mark; dated March 12, 2003

CAP026734; Valve V25-0001 Failed Surveillance; dated April 5, 2003

CAP026976; Five New Breakers Inside Panel 1C136 Not Labeled; dated April 14, 2003

CAP027078; HPCI Response Time During Surveillance Exceeded 25 Seconds; dated April 18, 2003

CAP027109; Seal Water Line to HPCI Pump Cracked at Threaded Connection; dated April 20, 2003

CAP027780; HPCI in Maintenance Rule 10 CFR ro.65 (a)91)[RED]; dated June 10, 2003

CAP027797; Review of Surveillance Requirements for Technical Specification 3.5.1.1; dated June 11, 2003

CAP027866; Handswitches Mistakenly Taken to Override During Surveillance; dated June 18, 2003

CAP028264; Investigate Need for High Energy Line Break Barrier Program at Duane Arnold; dated July 17, 2003

CAP028527; Setpoint Design Control Incomplete for Installed Equipment; dated August 8, 2003

CAP028952; PS2304B (HPCI Booster Pump Low Suction Pressure) found Out of Tolerance; dated September 8, 2003

CAP028953; XT2210A (HPCI Ramp Generator Output Analog Isolator) Appears Broke; dated September 8, 2003

CAP029476; Operability of PS454 and PS4546 Delayed Due to Delays in Procedure Updates; dated October 21, 2003

CAP029773; Revision 5 to Surveillance STP 3.3.6.1-41 Does Not Work as Written; dated November 12, 2003

CAP030507; Snapshot Self Assessment: HPCI and RCIC Systems; dated January 26, 2004

OE001249; OE16542, (Update to OE13640) HPCI Support Failure Due to Lack of Venting; dated November 24, 2003

OPR000210; CST Lo Lo Level Alarms Came in at Approximately 6-ft Rather Than the Required 1-ft; dated February 12, 2003

OTH000294; DBD-A61-007-004: UFSAR 3.9.2.1 Does Not Address Mark I Containment Loads; dated March 6, 1997

OTH001291; RCIC Minimum Flow Line Valve; dated January 12, 1995

OTH002591; Environmental Qualification Program Review for “24 Month Cycle” Impact; dated July 28, 1998

OTH002603; MOV Program Review for 2-year Cycle Impact – MOV Environmental Qualification Tasks; dated September 21, 1998

OTH002609; Impact of 24 Month Operating Cycle on Environmental Qualification Programs; dated September 28, 1998

OTH003242; Impact of 24 Month Operating Cycle on Environmental Qualification Program Follow Up Actions; dated March 4, 1999

OTH006257; HPCI Response Time in Excess of Surveillance Value; dated December 16, 2002

OTH009619; Power Uprate Project Impact on Abnormal Operating Procedure 301.1 “Station Blackout”; dated September 21, 2000

OTH011788; NRC RIS 2001-09: “Control of Hazard Barriers”; dated April 9, 2001

OTH014048; HPCI High Energy Line Break Environment; dated October 31, 1995

OTH015133; Perform Detailed Analysis of HPCI Operability with Water in Turbine Exhaust; dated January 16, 1996

OTH018550; HPCI and RCIC Room Doors 220, 204, and 219 Do Not Meet Pressure Requirement; dated April 3, 1998

OTH018554; "Past Operability" of HPCI Room Wall; dated May 8, 1998

OTH018556; HPCI Corridor Wall Determined to Be Outside of Its Design Basis and Is Reportable; dated June 10, 1998

OTH020273; Flooding HPCI and RCIC Steam Supply Lines During RPV Flooding; dated February 16, 1999

OTH020280; Modification to Remove "Auto Open" Feature From HPCI and RCIC Steam Supply; dated August 27, 1999

OTH028256; Review Industry OE and Best Practices to Evaluate Current Industry Practices; dated June 13, 2003

OTH028872; Rebuild Frequencies for DT2209, DT2408, DT2237, and DT2432 Need to Be Evaluated; dated July 24, 2003

OTH028966; Evaluate 7-day Out-of-Service Requirement for HPCI and RCIC doors; dated August 1, 2003

Correspondence

D. B. Vassallo (NRC) to L. Liu (Iowa Electric); Mark I Containment Long Term Program; dated September 11, 1985

G. B. Kelly (NRC) to L. Liu (IES Industries); Duane Arnold Energy Center (DAEC) – Request for Information on HPCI Turbine Operability Determination; dated December 11, 1997

K. E. Peveler (IES Utilities) to W. T. Russell (NRC); Request for Information on HPCI Turbine Operability Determination; dated February 2, 1998

Design Basis Documents

DBD-A64-001; Environmental Qualification Topical; Revision 5

DBD-E41-001; High Pressure Coolant Injection System; Revision 6

DBD-E51-001; Reactor Core Cooling System; Revision 4

Drawings

1588; Bergen-Paterson: HPCI Steam Exhaust, Mark HBB-6-SS-22; Revision 2

234A9309; Pressure Switch Instrument Data Sheet; Revision 1

73B1130; Heating Coil – Boiler Room Radwaste Building (Example Coil Designation in Upper Left Corner Used); May 16, 1973

7884-M44A-18-6; Condensate Storage Tank (IT-5B) General Plan; Revision 5

APED-B21-017<1>; Elementary Diagram Steam Leak Detection System; Revision 19

APED-B21-017<2>; Elementary Diagram Steam Leak Detection System; Revision 14

APED-E41-006<1>; Elementary Diagram HPCI System; Revision 45

APED-E41-006<2>; Elementary Diagram HPCI System; Revision 28

APED-E41-006<3>; Elementary Diagram HPCI System; Revision 26

APED-E41-006<4>; Elementary Diagram HPCI System; Revision 28

APED-E41-006<5>; Elementary Diagram HPCI System; Revision 20

APED-E41-006<6>; Elementary Diagram HPCI System; Revision 30

APED-E41-006<7>; Elementary Diagram HPCI System; Revision 16

APED-E41-006<8>; Elementary Diagram HPCI System; Revision 25

APED-E51-009<1>; Elementary Diagram RCIC System; Revision 47

APED-E51-009<2>; Elementary Diagram RCIC System; Revision 25

APED-E51-009<3>; Elementary Diagram RCIC System; Revision 28

APED-E51-009<4>; Elementary Diagram RCIC System; Revision 34

APED-E51-009<5>; Elementary Diagram RCIC System; Revision 29

APED-E51-009<6>; Elementary Diagram RCIC System; Revision 28

APED-E51-009<7>; Elementary Diagram RCIC System; Revision 12

BECH-E027; Single Line Meter and Relay Diagram 125V DC System; Revision 24

BECH-E028; Single Line Meter and Relay Diagram 250V DC, 48V DC and 24V DC System; Revision 22

BECH-E074; Schematic and Connection Diagram Startup and Intermediate Radiation Monitor Drive and HPCI and RCIC Instrumentation; Revision 15

BECH-E111<008>; Service Water System; Revision 16

BECH-E113<042>; Heating and Ventilating Systems; Revision 11

BECH-E113<053>; Heating and Ventilating Systems; Revision 10

BECH-E121<014>; Reactor Core Cooling Systems; Revision 15

BECH-E121<015>; Reactor Core Cooling Systems; Revision 12

BECH-E121<016>; Reactor Core Cooling Systems; Revision 14

BECH-E121<016A>; Reactor Core Cooling Systems; Revision 4

BECH-E121<017>; Reactor Core Cooling Systems; Revision 8

BECH-E121<018>; Reactor Core Cooling Systems; Revision 12

BECH-E121<019>; Reactor Core Cooling Systems; Revision 9

BECH-E121<019A>; Reactor Core Cooling Systems; Revision 2

BECH-E121<021>; Reactor Core Cooling Systems; Revision 12

BECH-E121<022>; Reactor Core Cooling Systems; Revision 8

BECH-E121<023>; Reactor Core Cooling Systems; Revision 9

BECH-E121<032A>; Reactor Core Cooling Systems; Revision 5

BECH-E121<032B>; Reactor Core Cooling Systems; Revision 2

BECH-E200<2510>; MOV Data List; Revision 7

BECH-M109; Condensate and Demineralized Water System; Revision 63

BECH-M114; Nuclear Boiler System; Revision 64

BECH-M122; Piping and Instrumentation Diagram (P&ID) HPCI System Steam Side; Revision 56

BECH-M123; P&ID HPCI System Water Side Sheet 2; Revision 40

BECH-M124; P&ID RCIC System Steam Side; Revision 50

BECH-M125; P&ID RCIC System Water Side; Revision 33

BECH-M171; P&ID Reactor Building Ventilation and Cooling Systems; Revision 28

EIP-M-100; SCA100 Single Channel Encapsulated Analog Class 1E Isolation Amplifier; Revision 2

FSK-03221; Condensate Storage Tank IT-5A and IT-5B Piping Underground; Revision 1

FSK-03486; Turbine Bldg. – Area 3, Condensate Return from Heater 1-E-15 to Condensate Storage Tank; Revision 2

FSK-05091; HPCI Room Instrument Line to Connection “A3" Rack 1C-120; Revision 4

FSK-05092; HPCI Room Instrument Line to Connection “A2" Rack 1C-120; Revision 4

FSK-05581; HPCI Steam Piping X-52E (High Pressure); Revision 6

FSK-05582; HPCI Steam Piping X-52F (Low Pressure); Revision 5

FSK-05583; HPCI Steam Piping X-51E (High Pressure); Revision 4

FSK-05584; HPCI Steam Piping X-51F (Low Pressure); Revision 5

HCC-6-2; Condensate and Demineralized Water; Revision 2

HCC-8-2; Condensate and Demineralized Water; Revision 2

ISO-EBB-004-01; RCIC Pump Discharge; Revision 1

ISO-EBB-005-01; HPCI Pump Discharge; Revision 0

ISO-EBB-006-01; HPCI Minimum Flow Line; Revision 1

ISO-EBB-007-01; HPCI Pump Discharge; Revision 2

ISO-HBB-006-02; HPCI Turbine Steam Exhaust; Revision 1

ISO-HBB-008-01; HPCI Pump Suction; Revision 1

ISO-HBB-009-01; HPCI Pump Suction; Revision 0

ISO-HCD-003-01; Underground Condensate; Revision 5

ISO-HCD-003-02; Underground Condensate and Demineralized Water; Revision 3

ISO-HLE-001-01; RCIC Turbine Steam Exhaust; Revision 0

ISO-HLE-001-01; HPCI Pump Suction MO-2321; Revision 0

ISO-HLE-006-01; HPCI Turbine Steam Exhaust; Revision 1

ISO-OLA-001-01; Turbine Building Feedwater System; Revision 5

M073-024; HPCI and RCIC Room Cooling Units; Revision 11

M095-026; Material List for Room Coolers 1V-AC-14A and 1V-AC-14B; Revision 4

M095-027; Material List for Room Coolers 1V-AC-15A and 1V-AC-15B; Revision 2

Engineering Evaluations

NG-85-1822; Review and Evaluation: GE SIL 405; dated April 15, 1985

NG-86-4373; Keep Fill of HPCI and RCIC lines; dated November 25, 1986

NG-89-0700; Steam Leak Detection Time Delay Setpoint Increase; dated March 2, 1989

NG-89-0748; HPCI and RCIC Suction Lineup; dated March 8, 1989

NG-91-2280; Engineering Review of GE SIL 525; dated August 8, 1991

NG-93-0836; Justification for Continued Operation While Implementing DCP-1540, HPCI and RCIC Door Modifications; dated March 23, 1993

NG-95-0909; Air Entrainment in Terry Turbine Lubrication Oil Systems; dated March 6, 1995

NG-96-0168; Bumping Limitorque Operators; dated January 25, 1996

Miscellaneous

Battery Current Summation Software Maintenance File

HPCI Health and Status Report; dated January 2, 2004

I.PS-J073-002; Johnson Pressure Electric Switch P-7210 Calibrations (P/ER 7109A & 7109B); completed on January 15, 2002 and December 12, 2003

Log Entries for Emergency Service Water Initiations Between April 29, 2003 and July 26, 2003; January 30, 2004

RCIC Health and Status Report; dated January 2, 2004

NRC RIS 2001-09; Control of Hazard Barriers; dated January 2, 2001

SA037309; HPCI and RCIC Pre-SSDI Assessment; dated February 2, 2004

Modifications

DCP 1393; Replacement with HPCI Turbine Exhaust Pressure Switches (PS-2215A, PS-2215B, PS-2215C, and PS-2215D); dated September 21, 1987

DCP 1460; MOVs Did Not Develop Rated Torque Because of Original Cable Sizing; dated June 7, 1989

DCP 1461; HPCI and RCIC Steam Trap Drain Lines; dated November 10, 1989

DCP 1482; MOV Thermal Overload Indicating Device; Revision 0

DCP 1513; Degraded RCIC Turbine Insulation Will Be Replaced with New and Better Insulation; dated November 22, 1991

DDC 1708; Modification to RCIC Flow Controller; dated May 4, 1991

DDC 2097; Overspeed Trip Modification; dated January 3, 1986

DDC 4533; Design Document Change – Incorporate Load Changes into Station Battery Calculations; dated October 10, 2003

ECP 1575; Relocation of Valve V22-0016 Next to V22-0017; dated July 12, 1996

ECP 1593; HPCI Keep Fill; dated August 29, 1997

EDCP-1443; Cable Upgrade for MO-2312; Revision 0

EDCP-1460; Replace Motor Operators MO-2238 and MO-2400 with Larger Motors and Increase MO-2312 Electrical Cable Size; Revision 0

EMA A09723; Replace RCIC Obsolete Square D switch PDS2476 with A Class 9012 Type GGW-4; dated August 3, 1992

EMA A40771; Increase Margin Between Degraded Voltage Thrust Capacity and Minimum Thrust to Open/Close Valve MO2512-O; Revision 0

EMA A45566; Modify Sensing Lines from FE2309 to FS2310 and FT2309; Revision 0

EMA A55504; During HPCI Uncoupled Run, Indication on PI2287C Was Unreasonably High. This EMA Will Replace Gauge with New Model; Revision 0

EMA A56901; Installation of Air Operated Valve Test Connections and Test Connection Isolation Valves; dated March 6, 2002

EMA A58568; RCIC Main Lube Oil Pump 1P224 Discharge Pressure Relief; dated August 24, 2002

EMA A06172; Replace RCIC Overspeed Tappet; dated March 10, 1992

EMA A60297; 1S203/RCIC Oil Pipe Vent Routing; dated September 5, 2002

EMA A60308; 1S203 RCIC Turbine Oil Vent Piping; dated August 25, 2002

EMA A60385; Install Junction Box and Splice and Replace Portions of Degraded Cables; dated April 6, 2003

EMA A60432; Increase Size of Oil Return Line from Governor Bearing to 3" Equalizer Pipe; Revision 0

EMA A60499; Install New Model Solenoid Valve SV2436; Revision 0

EMA A63477; HPCI Pump Seal Water Lines (Equivalent Change); dated December 31, 2003

Procedures

ACP 102.14; Software Quality Assurance Program; Revision 20

ACP 1203.23; Engineering Drawings/Documents, Attachment 9, Process for Classification of MDL Documents as Active or Historical; Revision 15

ACP 1408.9; Control of Transient Equipment; Revision 4

AOP 301; Loss of Essential Electrical Power; Revision 38

AOP 301.1; Station Blackout; Revision 23

EOP 2; Primary Containment Control; Revision 11

GMP-INST-05; Calibration of Generic Pressure and Vacuum Switches; Revision 6

I.PS-S382-02; Single-Contact Pressure Switches Calibration; Revision 5

OI 150; Reactor Core Isolation Cooling System; Revision 47

OI 152; High Pressure Coolant Injection System; Revision 57

OMG-7; Outage Risk Management Guidelines; Revision 11

VALVOP-L200-04; Limitorque Valve Operator Type SB-0, SB-1, SB-2, SB-3, and SB-4; Revision 26

VALVOP-L200-08; Limitorque Valve Operator Inspection and Lubrication; Revision 22

VALVOP-L993-01; Liberty Technological Center Inc. MOV Test Equipment, VOTES; Revision 19

General Electric Service Information Letters

31; Warm-up of HPCI and RCIC Steam Supply Lines; Revision 2

336; Surveillance Testing Recommendations for HPCI and RCIC Systems; Revision 1

405; Failures of Anchor Darling Globe Valve Anti-Rotation Devices; dated February 24, 1984

416; Riley Temperature Switches; dated January 14, 1985

475; RCIC and HPCI High Steam Flow Analytic Limit; dated November 7, 1988

525; Improved RCIC Turbine Mechanical Overspeed Trip; dated November 27, 1990

Standards, Guides, and Codes

ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Subsection NC: Class 2 Components; 1977 Edition through Summer 1978 Addenda

ASME Code, Section III, Subsection NF: Component Supports; 1977 Edition through Summer 1978 Addenda

ASME Code, Section III, Appendix F: Rules for Evaluation of Level D Service Limits; 1977 Edition through Summer 1978 Addenda

Surveillances

ETP WO#A50996; Performance Discharge Test of Batteries 1D1; dated April 30, 2002

ETP WO#A53415; Performance Discharge Test of Batteries 1D2; dated April 30, 2002

STP 3.3.5.1-30; HPCI System Logic System Functional Test; dated April 12, 2003

STP 3.5.1-05; HPCI System Operability Test; completed on March 26, 2002, September 11, 2002, December 4, 2002, March 6, 2003, May 29, 2003, September 11, 2003, and December 10, 2003

STP 3.5.1-06; HPCI System Low Pressure Operability Test; completed on October 22, 2001 and April 18, 2003

STP 3.5.1-07; HPCI System Simulated Automatic Actuation; completed on October 9, 2003

STP 3.5.1-09; HPCI System Post-Startup Operability Test; completed on October 23, 2001 and April 20, 2003

STP 3.5.3-02; RCIC System Operability Test; completed on February 20, 2002, May 17, 2002, August 21, 2002, November 15, 2002, February 21, 2003, May 16, 2003, August 20, 2003, and November 12, 2003

STP 3.5.3-03; Low Pressure RCIC System Flow Rate Test; completed on May 24, 2001, September 1, 2002, September 8, 2002, and April 17, 2003

STP 3.5.3-04; RCIC Simulated Automatic Actuation Test; completed on October 11, 2001 and September 19, 2003

STP 3.5.3-05; HPCI and RCIC Suction Transfer Interlock; completed on October 8, 2003

STP 3.5.3-06; RCIC System Post Startup Operability Test; completed on September 2, 2002, September 9, 2002, and April 20, 2003

STP 3.8.4-08; Performance Discharge Test of 250 VDC Battery 1D4; completed on April 5, 2003

STP 19; Special Test to Demonstrate HPCI Performance; Revision 1

System Descriptions

SD-150; RCIC System; Revision 4

SD-152; HPCI System; Revision 5

Technical Specifications

3.3.5.1; Emergency Core Cooling System Instrumentation; Amendment 223

3.3.5.2; Reactor Core Isolation Cooling System Instrumentation; Amendment 223

3.3.6.1; Primary Containment Isolation Instrumentation; Amendment 223

3.5; Emergency Core Cooling Systems and RCIC System; Amendment 223

Work Requests

1107498; Torus Cleaning and Desludging; dated October 26, 1999

1113837; Inspect, Desludge and Minor Repair Coating of Torus; dated April 16, 2001

1118614; Calibrate FIC2509; dated February 19, 2002

1118618; Calibrate FT2509; dated February 18, 2002

1118977; Calibrate PS2304B; dated March 25, 2003

1121267; Desludge Torus; dated March 21, 2003

1123087; Calibrate FIC2509; dated February 18, 2003

1123090; Calibrate FT2509; dated February 18, 2003

1123095; Calibrate FY2509; dated February 18, 2003

1124896; Calibrate PS2304B; dated September 8, 2003

1125308; Calibrate XT2210A; dated September 9, 2003

A48659; Add Vent to Oil Return Line from Governor Bearings; dated August 30, 2002

A54821; Replace Damaged Insulation Blankets in HPCI Room; dated February 14, 2002

A56405; Turbine Gland Seal (Main Pump End) Has Small Steam Leak; dated February 21, 2002

A56534; FI 2309 (1C03 PNL) Does Not Indicate Zero; dated December 27, 2001

A57488; Brackets Supporting Conduit B829 Loose And Need Tightening; dated January 21, 2002

A58045; Open FT2309 Equalizing Valve to Check for Air Entrainment in Instrument Sensing Lines; dated January 14, 2002

A59497; Run RCIC Turbine, Troubleshoot and Repair as Needed for Operability; dated September 10, 2002

A60297; Install Vents in RCIC Turbine Lube Oil System; dated September 6, 2002

A60307; Perform Modifications per EMA Recommendations; dated August 26, 2002

A60308; Oil Backing Up In RCIC Bearing Oil System; dated August 23, 2002

A60318; Change Out Inboard RCIC Turbine Bearings; dated September 13, 2002

A60432; Increase Drain Line at Outboard Bearing Housing to Minimize Restrictions from Oil Flow and Increase Size of Path to Allow Air to Vent to Atmosphere; dated September 5, 2002

A60906; Reading with RCIC Not Running Approximately 15 gpm; dated November 15, 2002

A61126; Replace XT2210A; dated September 29, 2003

A63477; Replace ½ Inch (HPCI Booster Pump) Piping with 3/3 Tubing and Add Supports per EMA:A63477; dated February 4, 2004

A63478; Take Vibration Reading of New Seal Water Lines After Performing WO/A63477; dated February 5, 2004

A64693; Shutdown Flow Indication High Out of Specification; dated November 5, 2003

C000630; Remove Old Insulation on HPCI Turbine and Replace with New Insulation Pads; dated September 19,2001

Z01980; Replace Relay E41A-K059; dated July 8, 1999

Z17236; Replace 250VDC 1D4 Battery

Z17240; Replace 125VDC Division 1 Battery

Z17241; Replace 125VDC Division 2 Battery

Updated Final Safety Analysis Report Sections

5.4.6; RCIC System; Revision 15

6.2.1.6; Mark I Containment Program; Revision 17

6.3; Emergency Core Cooling Systems; Revision 15

7.3; Engineered Safety Feature Systems; Revision 15

Table 9.2-1; Emergency Service Water Flow Requirements; Revision 16

LIST OF ACRONYMS USED

AC	Alternating Current
ACP	Administrative Control Procedures
ADAMS	NRC’s Document System
AOP	Abnormal Operating Procedure
AR	Action Request
ASME	American Society of Mechanical Engineers
CAP	Corrective Action Plan
CFR	Code of Federal Regulations
CST	Condensate Storage Tank
DAEC	Duane Arnold Energy Center
DCP	Design Change Package
DDC	Design Document Change
DRS	Division of Reactor Safety
ECP	Engineering Change Package
EDCP	Engineering Design Change Package
EMA	Engineered Maintenance Action
EOP	Emergency Operating Procedures
GMP	General Maintenance Procedure
GPM	Gallons Per Minute
HCTL	Heat Capacity Temperature Limit
HPCI	High Pressure Coolant Injection
LER	Licensee Event Report
LOCA	Loss of Coolant Accident
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OE	Operating Experience
OMG	Outage Management Guidelines
OI	Operating Instruction
PARS	Publicly Available Records
P&ID	Piping and Instrumentation Diagram
RCIC	Reactor Core Isolation Cooling
SBO	Station Black Out
SDP	Significance Determination Process
SRV	Safety-Relief Valve
STP	Surveillance Test Procedure
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item