June 29, 2004

Mr. Christopher M. Crane
President and Chief Nuclear Officer
Exelon Nuclear
Exelon Generation Company, LLC
Quad Cities Nuclear Power Station
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2
NRC SAFETY SYSTEM DESIGN AND PERFORMANCE CAPABILITY
INSPECTION 05000254/2004004(DRS); 05000265/2004004(DRS)

Dear Mr. Crane:

On May 28, 2004, the U.S. Nuclear Regulatory Commission (NRC) completed a baseline inspection at your Quad Cities Nuclear Power Station. The enclosed report documents the inspection findings which were discussed on May 28, 2004, with Mr. T. Tulon 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 safe shutdown makeup pump and reactor core isolation cooling systems.

Based on the results of this inspection, there was one finding concerning the reactor core isolation cooling system torus suction isolation valve control logic, which would prevent the control room operator from isolating non-seismically qualified reactor core isolation cooling system discharge piping under certain design basis conditions. This finding did present an immediate safety concern. However, compensatory measures are in place while long-term corrective measures are being implemented. This issue is unresolved pending your staff's review of the seismic qualification of the reactor core isolation cooling system discharge piping. The safety significance of this finding will be determined once the NRC evaluates the results of these reviews in accordance with the agency's Significance Determination Process (Phase 3). In addition, one NRC-identified finding of very low safety significance was identified.

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Sincerely,

/RA/

Julio Lara, Chief
Electrical Engineering Branch
Division of Reactor Safety

Docket Nos. 50-254; 50-265
License Nos. DPR-29; DPR-30

Enclosure: Inspection Report 05000254/2004004(DRS);
05000265/2004004(DRS)

cc w/encl: Site Vice President - Quad Cities Nuclear Power Station
Plant Manager - Quad Cities Nuclear Power Station
Regulatory Assurance Manager - Quad Cities Nuclear Power Station
Chief Operating Officer
Senior Vice President - Nuclear Services
Senior Vice President - Mid-West Regional
Operating Group
Vice President - Mid-West Operations Support
Vice President - Licensing and Regulatory Affairs
Director Licensing - Mid-West Regional
Operating Group
Manager Licensing - Dresden and Quad Cities
Senior Counsel, Nuclear, Mid-West Regional
Operating Group
Document Control Desk - Licensing
Vice President - Law and Regulatory Affairs
Mid American Energy Company
Assistant Attorney General
Illinois Department of Nuclear Safety
State Liaison Officer, State of Illinois
State Liaison Officer, State of Iowa
Chairman, Illinois Commerce Commission
D. Tubbs, Manager of Nuclear
MidAmerican Energy Company

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Director Licensing - Mid-West Regional
Operating Group
Manager Licensing - Dresden and Quad Cities
Senior Counsel, Nuclear, Mid-West Regional
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Vice President - Law and Regulatory Affairs
Mid American Energy Company
Assistant Attorney General
Illinois Department of Nuclear Safety
State Liaison Officer, State of Illinois
State Liaison Officer, State of Iowa
Chairman, Illinois Commerce Commission
D. Tubbs, Manager of Nuclear
MidAmerican Energy Company

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-254; 50-265
License Nos:	DPR-29; DPR-30
Report No:	05000254/2004004(DRS); 05000265/2004004(DRS)
Licensee:	Exelon Generation Co., LLC
Facility:	Quad Cities Nuclear Power Station, Units 1 and 2
Location:	22710 206th Avenue North Cordova, IL 61242
Dates:	May 10 through 28, 2004
Inspectors:	A. Dunlop, Senior Engineering Inspector D. Jones, Engineering Inspector G. O'Dwyer, Engineering Inspector S. Sheldon, Engineering Inspector C. Baron, Mechanical Contractor
Approved by:	J. Lara, Chief Electrical Engineering Branch Division of Reactor Safety (DRS)

Enclosure

SUMMARY OF FINDINGS

IR 05000254/2004004(DRS); 05000265/2004004(DRS); 05/10/2004 - 05/28/2004; Quad Cities Nuclear Power Station; Safety System Design and Performance Capability.

The inspection was a three week baseline inspection of the design and performance capability of the shutdown makeup pump and reactor core isolation cooling systems. The inspection was conducted by regional engineering inspectors and a mechanical consultant. One issue of very low safety significance and one unresolved item with the potential safety significance greater than Green were identified. 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. Inspector-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified a finding of very low safety significance involving inadequate design control of the reactor core isolation cooling system. Specifically, the design of the reactor core isolation cooling system and plant operating procedures did not provide adequate minimum flow protection for the reactor core isolation cooling pump. As a result, the reactor core isolation cooling flow could be reduced below the minimum flow requirements for the pump, potentially resulting in pump damage. This finding applies to both units.

  This finding was more than minor since it could have affected the mitigating system cornerstone objective of ensuring the availability of systems required to respond to initiating events. This finding was of low safety significance because it did not represent an actual degradation of the reactor core isolation cooling system. The licensee initiated appropriate corrective actions, including implementing a procedure change and obtaining formal minimum flow information from the pump vendor, to ensure continued operability. No violation of NRC requirements occurred. (Section 1R21.2.b.1)

- TBD. The inspectors identified a violation of 10 CFR Part 50, Appendix B, Criterion III, “Design Control.” Specifically, the design of the reactor core isolation cooling system did not provide adequate capability to isolate the safety-related torus from the non-seismic reactor core isolation cooling system under all conditions. As a result, torus water could potentially drain into the reactor building following a seismic event that could rupture the non-seismically qualified reactor core isolation cooling piping. The loss of torus inventory could potentially affect the safety-related water supply for emergency core cooling systems and primary containment integrity. This finding applies to both units.

  The inspectors considered that this finding could have affected the mitigating system cornerstone objective of ensuring the availability of mitigating systems required to

respond to initiating events, as well as the barrier integrity cornerstone objective of maintaining the functionality of containment. Since this performance deficiency involves seismic qualification issues, the safety significance will be determined following NRC evaluation of the licensee's seismic analysis reviews and in accordance with a phase 3 evaluation. The licensee has initiated appropriate compensatory actions to ensure continued operability by initiating a procedure that could remotely bypass the control logic such that the operators could close the isolation valve when required for containment isolation. (Section 1R21.2.b.12)

B. Licensee-Identified Violations

None.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Mitigating Systems and Barrier Integrity

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 safe shutdown makeup pump (SSMP) and reactor core isolation cooling (RCIC) systems (two samples). These systems were selected for review based upon:

- having high probabilistic risk analysis rankings;
- considered high safety significant maintenance rule systems;
- not having received recent NRC review; and
- being complementary systems.

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

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

The following system and component attributes were reviewed in detail:

System Requirements

Process Medium - water;
Energy Source - electrical power, steam, 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 - seismic and electrical.

.1 System Requirements

a. Inspection Scope

The inspectors reviewed the UFSAR, technical specifications, system notebooks, lesson plans, drawings, and other available design basis information, as listed in the attached List of Documents, to determine the performance requirements of SSMP, RCIC, and their associated support systems. The reviewed system attributes included process medium, energy sources, control systems, operator actions, and heat removal. The rationale for reviewing each of the attributes was:

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

Energy Sources: This attribute needed to be reviewed to ensure that the SSMP 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 RCIC system 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 emergency operating procedures permitted the operators to manually control RCIC operation to maintain desired reactor water level. The SSMP was a manually initiated system, which included several operator actions that were identified by the licensee as risk significant. Therefore, operator actions played an important role in the ability of the SSMP and RCIC systems to achieve their functions.

Heat Removal: This attribute was reviewed to ensure that the room coolers provided sufficient heat removal capability for the SSMP and RCIC systems.

b. Findings

No findings of significance were identified.

.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 UFSAR 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 SSMP 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 a procedure walk-through 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 SSMP and RCIC systems to verify that the systems and subsystems would function as required under design conditions. This 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 setpoints 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 Reactor Core Isolation Cooling Minimum Flow Valve

Introduction: The inspectors identified a finding of very low safety significance (Green) involving inadequate design control of the RCIC system. Specifically, the design of the RCIC system did not provide adequate minimum flow protection for the RCIC pump. The minimum flow valve, 1(2)-1301-60, would only automatically open on a low flow condition if a RCIC initiation signal was present. The RCIC system is not classified as safety-related, such that the finding was not considered a violation of regulatory requirements. This finding applies to both units.

Description: The inspectors reviewed the control logic for the RCIC minimum flow valve, 1(2)-1301-60. The design of the control logic included automatically opening the valve at a RCIC low flow setpoint of approximately 40 gpm and closing the valve at a setpoint of approximately 80 gpm. However, the inspectors determined that the valve would only automatically open if a RCIC initiation signal was present. Once the reactor vessel level was recovered after a transient, this valve would no longer function as an automatic minimum flow valve. This control logic was consistent with notes in RCIC operator training document LN-1300, "Reactor Core Isolation Cooling System." Discussions with Quad Cities engineering personnel verified this operational feature as original design.

The inspectors were concerned that this design would not provide adequate minimum flow protection for the RCIC pump. If the operators reduced RCIC flow, as allowed by operating procedures, to prevent overfilling of the reactor vessel during a transient, this design would not provide automatic minimum flow protection. This could potentially result in pump damage due to pump deadheading. In response to this concern, the licensee reviewed plant operating procedures and did not identify any specific operator actions to either manually open the minimum flow valve or stop the RCIC pump under low flow conditions.

The licensee initiated Condition Report 221967, to address this issue. The condition report stated that the severity of the RCIC pump degradation due to deadhead operation was still being evaluated by the vendor, and that the operators had been made aware of this scenario in training and could manually control the system. The condition report also stated that procedure QCAN 901(2)-4 E-16, "RCIC Pump Flow Low," was being revised to ensure the operators would immediately trip the RCIC pump in the event of a low flow alarm (40 gpm) during surveillance testing activities. The condition report concluded that the RCIC system remained operable.

During the review of this issue, Quad Cities engineering personnel discovered a related design control issue. A letter from the RCIC pump vendor was being erroneously used as a reference for minimum flow requirements (40 gpm). A June 5, 1974, letter from Bingham-Willamette Company was thought to be applicable to the Quad Cities RCIC pump and had been used as a reference for several engineering issues. However, the system engineer determined that the letter actually applied to the Clinton Station RCIC pump, which was larger than the Quad Cities pump. Condition Report 224355, was initiated to address this issue. The condition report included actions to obtain formal minimum flow guidance from the pump vendor, verify the minimum allowable flow for

sustained RCIC pump operation, verify the minimum flow line orifice sizing, and verify the minimum flow setpoint values. Based on this information, the condition report included actions to initiate any required procedure, design, or plant changes. The vendor information had not been received during the period of the inspection.

Another issue related to the minimum flow valve identified by the inspectors concerned statements in test procedures QCOS 1300-01, "Periodic RCIC Pump Operability Test," and QCOS 1300-05, "Quarterly RCIC Pump Operability Test." The procedures stated that the RCIC system would not be considered inoperable due to minimum flow valve failing in either the open or closed position. However, the inspectors noted that the RCIC net positive suction head (NPSH) analyses did not account for the increased pump flow (~80 gpm) associated with an open minimum flow valve. Condition Report 224127 was initiated to address this concern. This condition report questioned whether it was appropriate to proceduralize the operability of the RCIC system in a condition outside of its design, because compensatory measures (such as modified allowable NPSH curves) may need to be implemented. The condition report concluded that the NPSH analyses included sufficient margin to ensure RCIC operability.

Analysis: The inspectors determined that failing to provide adequate minimum flow protection for the RCIC pump was a performance deficiency warranting a significance evaluation in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Disposition Screening," issued on April 29, 2002. The inspectors determined that the finding was more than minor because it could have affected the mitigating system cornerstone objective of ensuring the availability of systems required to respond to initiating events. Operation of the RCIC pump under low flow conditions could result in pump damage and render the system inoperable. The control logic for the RCIC minimum flow valve was not designed to provide automatic minimum flow protection, and the plant operating procedures did not provide specific directions to control room operators to protect the pump under low flow conditions.

The inspectors completed a significance determination of this issue using IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." The inspectors answered "yes" to question 1 in the Phase 1 Screening Worksheet under the Mitigating Systems column, because it did not represent an actual degradation of the RCIC system. The specific low flow conditions that could have degraded the pump have not existed. The inspectors reviewed plant data during a past plant transient requiring prolonged RCIC operation and observed that the operators conservatively maintained a minimum RCIC flow of approximately 200 gpm. The inspectors determined that this was a design inadequacy that did not render the system inoperable per Generic Letter 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability." As a result, this issue was determined to be of very low safety significance. The licensee also initiated appropriate corrective actions to ensure continued operability and initiated several condition reports to address long-term issues and related concerns.

Enforcement: The RCIC system is classified as a non-safety-related system, and not subject to the design control requirements of 10 CFR Part 50, Appendix B. Therefore, no violation of regulatory requirements occurred. This issue was considered a finding of

very low safety significance (FIN 05000254/2004004-01; 05000265/2004004-01). The licensee entered the issue into its corrective action system as Condition Reports 221967, 224355, and 224127.

.2 Reactor Core Isolation Cooling Torus Suction Valve

Introduction: The inspectors identified a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the design of the RCIC system did not provide adequate capability to isolate the safety-related torus from the non-safety-related/non-seismic portions of the RCIC system under all conditions. This issue will be classified as an unresolved item pending completion of the licensee's analysis. This finding applies to both units.

Description: The inspectors reviewed the control logic for the RCIC torus suction valves, 1(2)-1301-25 and 1(2)-1301-26. These motor-operated valves normally provide isolation of the flow path from the torus to the RCIC pump suction header. The RCIC normal water supply was from the contaminated condensate storage tank (CCST). These valves were designed to open in the event of either low CCST level or high torus level, providing automatic transfer of the RCIC pump suction source from the CCST to the torus. This automatic transfer was designed to occur whether the RCIC pump was operating or not. The inspectors noted that the installed design would not allow the operators to override the automatic transfer signal and manually close these valves from the control room. If the operators attempted to manually close the valves, they would automatically reopen based on the valves' control logic.

Valve 1(2)-1301-25 was identified as a primary containment isolation valve in UFSAR Table 6.2-7, and the RCIC piping and components downstream of 1(2)-1301-25 were classified as non-safety-related and non-seismic. The inspectors also noted that the CCST and related level instruments were classified as non-safety-related and non-seismically qualified.

The inspectors were concerned that this design could result in a scenario in which the safety-related torus could not be readily isolated from the non-safety-related/non-seismic portions of the RCIC system. Specifically, a seismic event could potentially result in an actual (or indicated) loss of CCST water level. As a result, valves 1(2)-1301-25 and 1(2)-1301-26 would automatically open as designed. If the seismic event also caused a failure in the non-seismically qualified portion of the RCIC system, water from the torus could potentially drain, or be pumped, into the reactor building RCIC room. Based on the valves' control logic, the operators could not manually close these valves from the control room thereby resulting in a potential significant loss of torus inventory. The loss of torus inventory could potentially degrade the safety-related water supply for emergency core cooling systems (ECCS) required to mitigate the transient. In addition, the operator's inability to close these valves could adversely affect primary containment integrity. The inspectors noted that this concern had been previously identified by a vendor in the Component Classification Report for the RCIC system (CED-055559, dated January 20, 1998). The issue, however, was not entered into the corrective action program at that time, nor adequately resolved.

In response to these concerns, licensee engineering personnel investigated the design and determined that the control logic for these valves was changed in 1981 under modification M-4-1(2)-81-008. The modification added the automatic transfer feature to the RCIC design in response to a Three Mile Island (TMI) Action Item (NUREG-0737, Item II.K.3.22). The acceptance criteria for this action item stated, in part, "...the capability of remote manual containment isolation shall be retained." An NRC letter, dated August 5, 1982, requested verification from the licensee that the acceptance criteria for this action item had been satisfied. In response, a Commonwealth Edison letter, dated September 7, 1982, stated, "All manual RCIC functions have been retained." Based on this information, the NRC determined that the Quad Cities design satisfied the requirements of NUREG-0737, Item II.K.3.22 and issued a safety evaluation on December 29, 1983. The results of this inspection indicated that the licensee lacked sufficient technical reviews to ensure that the remote manual containment isolation function was retained after installation of the RCIC automatic suction transfer modification in 1981.

Subsequent reviews by licensee engineering personnel determined that the RCIC pump suction piping had previously been analyzed and found to be seismically qualified. However, the RCIC pump discharge piping did not appear to have been designed for seismic loads.

The licensee initiated Condition Report 223815 to address this issue. In addition, Operability Evaluation 223815-08 was performed to address continued system operability. The operability evaluation included an action item to revise operating procedures to provide guidance to the operator to override the automatic transfer signal and close these valves if required. This action would require the operators to place finger blocks in relays in the auxiliary electrical equipment room. The action item was completed on May 28, 2004. The operability evaluation also concluded that based on engineering judgement, and by performing a hanger analysis using operability criteria, the RCIC discharge piping would not fail in a seismic event. The operability evaluation concluded that both the primary containment and RCIC system were operable. The licensee stated that additional evaluations were required to determine past operability for the period between 1981 and May 28, 2004, and provide a basis for the final resolution of the issue.

Analysis: The inspectors determined that the failure to maintain remote manual capability for the torus suction isolation valve was a performance deficiency. The loss of torus inventory could have potentially degraded safety-related ECCS systems required to mitigate the transient in that the torus was their safety-related water supply. In addition, the design could have prevented the operators from performing remote manual primary containment isolation, as required by the NUREG-0737, Item II.K.3.22 acceptance criteria. Because the finding affected the reactor safety mitigating system cornerstone objective, the finding is more than minor. The finding was also determined to have potential safety significance greater than very low significance because it could have affected the availability of ECCS systems required to respond to initiating events, as well as the barrier integrity cornerstone objective of maintaining the functionality of containment. The licensee has initiated appropriate compensatory actions to ensure continued operability by initiating an operating procedure to provide adequate guidance

to the operator to override the automatic transfer signal and close these valves if required.

Enforcement: Criterion III of 10 CFR Part 50, Appendix B,"Design Control," states, in part, that measures shall be established to assure that the design basis is correctly translated into specifications, procedures, and instructions. Contrary to the above, the modification to the control logic for valves 1(2)-1301-25 did not correctly implement the design basis requirement to maintain remote manual containment isolation capability. This design basis requirement was documented in the NUREG-0737, Item II.K.3.22 safety evaluation, dated December 29, 1983. After the identification of this issue by the inspectors, the licensee implemented appropriate compensatory actions to ensure continued operability. This performance deficiency is considered an unresolved item (URI 05000254/2004004-02; 05000265/2004004-02), pending completion of the licensee's analysis on the seismic qualification of the RCIC system discharge piping. Since this performance deficiency involves seismic qualification issues, the safety significance will be determined following NRC evaluation of the licensee's review and in accordance with an SDP Phase 3 evaluation.

.3 Components

a. Inspection Scope

The inspectors examined the SSMP and RCIC systems to ensure that component level attributes were satisfied. Specifically, the following attributes of the SSMP 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 SSMP 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 SSMP 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 SSMP and RCIC systems were adequately protected from those hazards identified in the UFSAR 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 SSMP 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

Section 1R21 describes that a vendor had identified the issue with the RCIC torus suction valve in 1998, but the licensee had not entered the issue in the corrective action program. Consequently, the concern was never fully evaluated or corrected.

4OA6 Meetings, Including Exits

.1 Exit Meeting

The inspectors presented the inspection results to Mr. T. Tulon and other members of licensee management at the conclusion of the inspection on May 28, 2004. The inspectors determined that proprietary information was reviewed during the inspection. The inspectors confirmed that the proprietary material had been returned to the licensee or indicated it would be handled in accordance with NRC policy on proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
T. Tulon, Site Vice President
R. Gideon, Plant Manager
W. Beck, Regulatory Assurance Manager
D. Bolyes, Operations Support Manager
D. Dauzat, Design Engineering/I&C
B. Davenport, Corporate Licensing Engineer
S. Eldridge, Corporate Engineering
A. Fuhs, Regulatory Assurance
A. Lewis, SSMP System Engineer
B. Porter, Senior Engineering Manager
M. Perito, Operations Manager
T. Rush, RCIC System Engineer
T. Scott, Shift Operations Superintendent
P. Simpson, Corporate Licensing Manager
B. Strub, Engineering

Nuclear Regulatory Commission
J. Lara, Chief, Electrical Engineering Branch, Division of Reactor Safety
K. Stoedter, Senior Resident Inspector
M. Kurth, Resident Inspector

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000254/2004004-01 05000265/2004004-01	FIN	Failure to Provide Adequate Minimum Flow Protection for the RCIC Pump (Section 1R21.2.b.1)
05000254/2004004-02 05000265/2004004-02	URI	Failure to Provide Adequate Capability to Isolate the Safety-Related Torus from the Non-Seismic Portions of the RCIC system (Section 1R21.2.b.2)

Closed

05000254/2004004-01 05000265/2004004-01	FIN	Failure to Provide Adequate Minimum Flow Protection for the RCIC Pump (Section 1R21.2.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

Calculations

Number	Title	Revision or Date
004-E-005-1301	Quad 2 - MOV Terminal Voltage Calculations (MO 2-1301-62)	Revision 5A
055559(CMED)	Reactor Core Isolation Cooling Component Classification Document (RCIC) CC-QC012	Revision 1
3C3-0382-001	RPV Liquid Level Following Fire Protection Safe Shutdown	Revision 0
3C3-1084-001	RCIC Pump Cubicle Temperature Transient During LOOP and Loss of Cubicle Cooler	Revision 0
8549-93-19-0	Evaluation of the Effects the Failure of RCIC Components due to HELB have on Class 1E DC Power Supply	Revision 0
8622-01-19-5	Documenting the List of All RCIC Equipment, Instruments and Devices	Revision 0
BSA-Q-95-09	Effects of a RCIC Steamline Break on the HPCI Room	Revision 0
DC-TOL-1	Thermal Overload Heater Selection for DC Continuous Duty Motors	Revision 0
DCR 990234	Hydraulic Evaluation of the Safe Shutdown Makeup Pump Unit 2 Discharge Piping Reroute	8/30/1999
DCR 990351	Evaluated Impact of DCP 9900060 on Pressure Drop Through System	12/1/1999
HSB-0-03	RCIC Room Average Temperature Following Station Blackout	Revision 0
NED-I-EIC-139	Units 1 & 2 - Reactor Core Isolation Cooling (RCIC) System Pump Discharge Flow Setpoint Error Analysis at Normal Operating Conditions	Revision 1

Calculations

Number	Title	Revision or Date
PMED-891377-01	Development of a Duty Cycle Based on a More Conservative Application of Coincident Starting Currents for the 250-VDC Battery System	Revision 13C
QC-030-M-001	Pressure/Temperature Transient Analysis for HPCI Steam Line Break in Torus Compartment	Revision 2
QC-429-M-007	Flow Evaluation for Safe Shutdown Makeup Pump Room Cooler Piping	Revision 0
QC 442-E-003	Terminal Voltage Calculation for MOVs 1-1301-16 and 2-1301-16	Revision 0
QC 442-E-001	Thermal Overload Heater Sizing for Valves 1-1301-16 and 2-1301-16	Revision 0
QC 442-E-002	Circuit Breaker Sizing for MOV Replacement Motors	Revision 6
QC-469-P-016	Engineering Judgement - Pipe Support Number M-1024D-7 for 3” RCIC Line in Unit 2 MSIV Room	Revision 0
QC-716-M-001	Subject Maximum Room Temperature For Core Spray And RHR Corner Pump Rooms Following a Postulated Event Outside These Rooms And Verification of Adequacy of Room Coolers in These Rooms	Revision 3
QDC-1000-M-0627	Safe Shutdown NPSH Evaluation for RCIC and RHR Pumps	Revision 000A
QDC-1300-E-021	Environmental Qualification Review of Reactor Core Isolation Cooling (RCIC) with Hydrogen Addition in Operation at 50 SCFM	Revision 0
QDC-1300-M-0079	Pressure Locking Calculation for RCIC System Valve MOV 1-1301-49	Revision 0
QDC-1300-M-0501	Adequacy of RCIC Barometric Condenser Relief Valves RV-1(2)-1399-151	Revision 0
QDC-1300-M-0589	RCIC NPSH Limits for EOPs	Revision 1
QDC-1300-M-0715	Static Head Calculation for the RCIC Discharge Line (2-1305-4”-B)	Revision 0
QDC-1300-M-0800	Pressure Drop through RCIC Discharge Piping to Reactor Vessel	Revision 0

Calculations

Number	Title	Revision or Date
QDC-1300-M-0977	Overpressure Analysis of RCIC Pump Discharge for Postulated Turbine Control System Failure During Surveillance Testing (GE SIL 623)	Revision 0
QDC-1400-M-1170	Determination of Acceptance Criteria for RCIC and Core Spray System Monthly Vent Verifications	Revision 2A
QDC-2300-I-0937	HPCI/RCIC Steam Line Flow Timer Setpoint Error Analysis	Revision 0
QDC-2300-I-0940	HPCI/RCIC Suppression Pool Level Switch Error Analysis	Revision 0
QDC-2900-I-0329	Safe Shutdown Makeup Pump Discharge Flow Indication Error Analysis	Revision 0
QDC-2900-M-0073	Evaluation of Safe Shutdown Makeup Pump (SSMP) MOV 1/2-2901-6 to Operate Under Design Conditions	Revision 0
QDC-2900-M-0472	Determination of Pressure Required at PI-1/2-2941-8 for Safe Shutdown Makeup Pump System Injection Under Safe Shutdown Conditions	Revisions 0, 000A
QDC-2900-M-0721	NPSH Analysis for SSMP	Revision 0
QDC-3300-M-0489	Useable Water Volume of Contaminated Condensate Storage Tanks for HPCI and RCIC, Including Vortexing Considerations	Revision 2
QDC-3300-M-0542	Determination of Usable Volume in CCSTs for SSMP or RCIC Following an Appendix R Fire Event	Revision 2
QDC-5700-M-0806	Emergency Core Cooling System Room Cooler Performance Calculation Under Design Basis And Degraded Conditions	Revision 001
QDC-8350-E-0521	Voltages at Loads Fed From the Safety-Related 250VDC Batteries	Revision 001B
QDC-8350-E-0717	DC MOV Voltage Drop Calculation	Revision 1
QUA-1-1301-49	DC MOV Calculation	Revision 3
QUA-2-1301-61	DC MOV Calculation	Revision 2

Calculations

Number	Title	Revision or Date
VT-03	Safe Shutdown Pump Room Cooling Load Calculation for Sizing Room Cooler	Revision 2

Condition Reports Generated Due to the Inspection

Number	Title	Date
CR220284	Drawing Note Error	5/11/2004
CR220295	QCOA 1300-02 Has Error for Maintaining RCIC	5/11/2004
CR220460	SSDI Walkdown Identified Incorrect TOL Setting	5/12/2004
CR220546	Operations Procedure Lists Old ITS Limits for Rx Lo-Lo Lvl	5/12/2004
CR220587	QCOA 1300-01 Needs Step Corrected	5/12/2004
CR220748	Calculation QDC-1300-E-021 Apparent Omission	5/13/2004
CR221087	IST Program Needs RCIC Valve Info Updated	5/14/2004
CR221221	Inadequate Documents - Permanent Scaffolds - RCIC Rooms	5/14/2004
CR221967	RCIC Pump Min Flow Logic Doesn't Auto Open for One Scenario	5/18/2004
CR222543	SSMP Motor Start Limitations	5/19/2004
CR222617	GE Cannot Locate Requested Document in Their File	5/20/2004
CR222713	RCIC Operation During App R Fire	5/21/2004
CR223217	Scaffold Control Procedure Does Not Get 50.59 Screening	5/24/2004
CR223386	RCIC Miniflow Description in TS Basis	5/25/2004
CR223440	RCIC/CS Vent Verification Acceptance Criteria	5/25/2004
CR223579	Incorrect Revision of Calculation in FPR Change Package	5/24/2004
CR223638	RCIC/CS Room Temp Switch Locations Do Not Match UFSAR	5/25/2004
CR223658	Spring Hanger Identified as Deficient Not Evaluated	5/25/2004
CR223774	Outdate Guidance on RCIC Min Flow Valve in QCOP 1300-03	5/26/2004
CR223815	Potential to Drain Torus on Failure of RCIC Line	5/26/2004
CR224127	Procedures State RCIC Operable with -60 Failed Open	5/27/2004
CR224355	Wrong Vendor Letter Used for Engineering Reference	5/28/2004
CR224536	Compliance with NUREG 0737 Acceptance Criteria	5/28/2004

Condition Reports Reviewed During the Inspection

Number	Title	Date
PIF 94-0248	Request Engineering Evaluation for Operation of RCIC with Seal Ring Leak on Minimum Flow Valve MO 2-1301-60	2/4/1994
PIF 96-2298	RCIC Containment Isolation Circuit	7/11/1996
CR106044	Actions Required by the Safe Shutdown Report Not in QCARPs	4/30/2002
CR118724	MO 2-2301-6 Not Evaluated Correctly for App. R Functions	8/9/2002
CR125580	Required Pressure Gage Not Used During QCOS 2900-01	10/19/2002
CR127679	SSMP Room Was Warm and the Room Cooler Not Running	10/16/2002
CR128377	RCIC Pump High Suction Pressure	10/22/2002
CR129518	1A Core Spray / RCIC Room Cooler Bad Bearing	10/30/2002
CR142442	1-1301-26 Handwheel Fell Off	2/1/2003
CR144978	Lack of Info: TS Bases/UFSAR Regarding SSMP Room Cooler	2/18/2003
CR145428	CR130543 Was Closed but Had Insufficient Corrective Actions	12/03/2002
CR149587	RCIC Overspeed Trip	3/18/2003
CR156465	Acceptance Criteria for 1-1301-54 Trim Seal Not Available	4/30/2003
CR156968	Time Critical Evolutions Not Supported	5/2/2003
CR163287	QCTS 0600-08 Failed Due to Excessive Packing Leakage	6/14/2003
CR165215	Leak Discovered on 2-1301-16	6/27/2003
CR170249	NRC Discovered SSMP Local Panel Switch Mispositioned	8/4/2003
CR175485	Apparent Errors in QCARP 0030-04	9/12/2003
CR183802	Replacement of 1-1301-42 was Delayed	10/30/2003
CR189433	Valve 2-1301-25 Stroked Too Quickly During IST	12/7/2003
CR190916	MO 2-1301-61 Stem Factor Higher than Expected	12/8/2003
CR191445	SSMP Room Cooler Mod Test Revision	12/17/2003
CR204719	2-1301-55 Stop Check LLRT Failure	2/27/2004
CR217299	RCIC Governor Control Power Supply Resistor in 2201-97	4/27/2004
CR217435	Discrepancies in RCIC Turb. Exh. Trip Instrumentation Docs	4/28/2004
CR217696	Calculation Assumptions on Loss Room Clr-temp Fan Available	5/05/2004

Condition Reports Reviewed During the Inspection

Number	Title	Date
CR217732	Calculation Should Have Been Superseded	4/29/2004
CR218454	Minor Vibration on U1 SSMP Discharge Line	4/30/2004

Drawings

Number	Title	Revision
CID-50	Control and Instrumentation Diagram of RCIC System	Revision D
CID-89	Control and Instrumentation Diagram of RCIC System	Revision B
F-372	Appendix R Safe Shutdown 250V DC Power Distribution	Revision A
M-50, Sheet 1	Reactor Core Isolation Cooling (RCIC) System Piping	Revision BI
M-50, Sheet 2	RCIC Turbine Lubrication and Pump Seal Cooler Piping	Revision B
M-69, Sheet 1	Service Water Piping	Revision CX
M-70	Safe Shutdown Makeup Pump System	Revision W
M-89, Sheet 1	Reactor Core Isolation Cooling (RCIC) System Piping	Revision AS
M-89, Sheet 2	RCIC Turbine Lubrication and Pump Seal Cooler Piping	Revision A
M-992A	Reactor Core Isolation Cooling System	Revision G
M-1024A	Reactor Core Isolation Cooling System	Revision F
4E-387B	Front Elevation Sup, Cont MA Sta PNL 912-8, PT 3 Safe Shutdown System	Revision D
4E-1303	Key Diagram 4160V Switchgear 11, 12, 13 14	Revision T
4E-1307A	Key Diagram Safe Shutdown System	Revision E
4E-1310	Key Diagram Turbine Building Essential Service MCC's 18-2, 19-2, & 19-3	Revision AL
4E-1317, Sheet 1	Key Diagram 250 V DC Motor Control Centers	Revision AT
4E-1317, Sheet 2	Key Diagram 250 V DC Motor Control Centers	Revision AK
4E-1317, Sheet 3	Key Diagram 250 V DC Motor Control Centers	Revision U
4E-1318B	Overall Key Diagram 125 V DC Distribution Centers	Revision J
4E-1346A	Schematic Diagram Safe Shutdown System 4KV ACB 152-3101 & GCB 152-1425	Revision G
4E-1484A	Schematic Diagram RCIC System Part 1	Revision AB

Drawings

Number	Title	Revision
4E-1484B	Schematic Diagram RCIC System Part 2	Revision AU
4E-1484C	Schematic Diagram RCIC System Part 3	Revision AJ
4E-1484D, Sheet 1	Schematic Diagram RCIC System Part 4	Revision AL
4E-1484D, Sheet 2	Schematic Diagram RCIC System Part 4	Revision AF
4E-1484E, Sheet 1	Schematic Diagram RCIC System Valves MO 1-1301-16, 1-1301-22 & 1-1301-48	Revision AC
4E-1484E, Sheet 2	Schematic Diagram RCIC System Valves MO 1-1301-17 & 49	Revision Z
4E-1484F, Sheet 1	Schematic Diagram RCIC System Valves MO 1-1301-25, MO 1-1301-53 & MO 1-1301-60	Revision AA
4E-1484F, Sheet 2	Schematic Diagram RCIC System Valves MO 1-1301-26, 61 & 62	Revision AA
4E-1484G	Schematic Diagram RCIC System Part 7	Revision U
4E-1528, Sheet 1	Schematic Control Diagram, High Pressure Coolant Injection System	Revision AR
4E-2317, Sheet 1	Key Diagram 250 V DC Motor Control Centers	Revision AL
4E-2317, Sheet 2	Key Diagram 250 V DC Motor Control Centers	Revision AF
4E-2317, Sheet 3	Key Diagram 250 V DC Motor Control Centers	Revision P
4E-2346A	Schematic Diagram 4160V Bus 24-1 & 31 Safe Shutdown System	Revision C
4E-6613A	Schematic Diagram MOVs ½-2901-6 & 7 Safe Shutdown System	Revision F
4E-6613B	Schematic Diagram MOVs 1-2901-8 & 2-2901-8 Safe Shutdown System	Revision F

Engineering Changes

Number	Title	Date
19510	Install a New Fire Protection Safe Shutdown Make-up Pump and its Associated Piping and Controls	4/30/1990
20023	Remove RCIC Electrical Overspeed Trip	1/25/1989
20178	Replacement of RCIC Pump Discharge Check Valve and Air Operator	4/15/1991

Engineering Changes

Number	Title	Date
21804	Safe Shutdown Makeup Pump Room Cooler Service Water Supply/Return Piping Upgrade	3/23/1993
21912	Upgrade Rupture Disk Design for the RCIC System	1/19/1994
22546	Change Gearing in MOV 1/2-2901-6	4/29/1999
23391	RCIC Min Flow Line Change Due to Appendix R	3/13/1998
23408	Install a Relief Valve on the RCIC Barometric Condenser	8/25/1998
23670	Temporary Alteration of the RCIC Pump Discharge Valve Alignment	6/9/1998
23825	Reroute Unit 1 SSMP Injection Point Downstream of 1-2301-7 Check Valve	3/19/1999
23826	Revise Injection Point Downstream of 2-2301-7 Valve	3/19/1999
23843	Temporary Alteration of the RCIC Pump Discharge Valve Alignment	4/15/1999
23863	Motor Control Logic Changed to Allow SSMP Motor to Run While Rotating Element Is Removed.	5/26/1999
24187	Margin Improvement Plan for MO 1-1301-60	7/10/2000
331679	SSMP Discharge Piping Reroute	10/30/2001
339305	Evaluation of Heise Gauge for Use in Performing QCOS 2900-1 on 9/19/02	11/27/2002
339474	Evaluate HPCI/RCIC Discharge Piping for Feedwater Isolation Valve Backleakage	2/28/2003
342429	OWA SSMP Room Cooler Modification for HVAC Trouble Alarm	1/15/2004
9900067	Alternate Power Supply for FIC 1/2-2940-07	3/19/1999
9900629	Setpoint Change for RCIC High Steam Line Flow and RCIC Time Delay Relay	11/17/2000
9800029	RCIC 16 Valve Alternate Power Appendix R Requirement	9/29/1998
990539	Change NED-I-EIC-0031 to Derive AV & ET for 24-Month/ITS Project	5/22/2000

GE Nuclear Energy, Licensing Topical Report

Number	Title	Date
NEDC-32424P-A	Generic Guidelines for General Electric Boiling Water Reactor Extended Power Uprate	2/1999
NEDC-32523P-A	Generic Evaluations of General Electric Boiling Water Reactor Extended Power Uprate	2/2000

GE Nuclear Energy, Project Task Reports

Number	Title	Revision
GE-NE-A22-00103-10-01	Dresden and Quad Cities Extended Power Uprate - Task T0900 - Transient Analysis	Revision 0
GE-NE-A22-00103-25-01	Dresden and Quad Cities Extended Power Uprate - Task T0309 - Reactor Core Isolation Cooling System Quad Cities Station	Revision 0
GE-NE-A22-00103-56-01-Q	Dresden and Quad Cities Extended Power Uprate - Task T0611 - Appendix R Fire Protection (Quad Cities Station)	Revision 1
GE-NE-A22-00103-57-02	Dresden/Quad Cities Asset Enhancement Program - Task 612 - Systems Not Impacted by Power Uprate (Quad Cities)	Revision 0

Lesson Plans

Number	Title	Revision
LIC-2900	Safe Shutdown Makeup Pump System	Revision 7
LN-1300	Reactor Core Isolation Cooling System	Revision 1

Letters

Number	Title	Date
Bingham-Willamette Letter	GE RCIC Pumps, Minimum Flow and Closed Discharge Operation	6/5/1974
ComEd Letter	NUREG-0737 Item II.K.3.22 Additional Information	9/7/1982
ComEd Letter	NUREG-0737 Item II.K.3.22 Additional Information Concerning the Use of HPCI Level Switches	10/7/1983
ComEd Letter	Response to NRC Bulletin No. 88-04	7/11/1988
ComEd Letter	Supplemental Response to NRC Bulletin No. 88-04	2/27/1989
ComEd Letter	Supplemental Response to NRC Bulletin No. 88-04	1/8/1990

Letters

Number	Title	Date
Impell Letter 0590-442-004	Quad Cities Units 1 and 2, RCIC Pump Discharge Check Valves Replacement	6/7/1989
USNRC Letter	Item II.K.3.22 of TMI Action Plan (NUREG-0737)	9/1/1981
USNRC Letter	NUREG-0737, Item II.K.3.22, “Automatic Switchover of Reactor Core Isolation Cooling System Suction”	8/5/1982
USNRC Letter	Automatic Switchover of Reactor Core Isolation Cooling (RCIC) System, NUREG-0737 Action Item II.K.3.22	12/29/1983

Miscellaneous Documents

Number	Title	Revision or Date
Bingham International Telecopy	Illinois Power - Clinton Nuclear Power Station, Bingham Pump Serial Nos. 16210287/88	6/22/1987
Curve 48984	Sulzer Bingham Pump Curve 4x6x9B MSD 5 Stage	9/29/1992
DRF A22-00103-25	GE Nuclear Energy Memorandum, R.T. Earle to Weimin Dai, RCIC System Operation Under Degraded Plant Conditions with Elevated Suction Water Temperatures	12/13/2000
EOPR 99-02-1300-030	Engineering Operational Problem Response - The U2 Turbine Tripped on Overspeed during Performance of QCOS 1300-05 on Aug, 25, 1999	8/26/1999
ITT Inquiry 938060	Quad City Power Station - Pressure Drop	5/14/2004
JPM LP-041-I	Local Manual Start of RCIC IAW QCARP 0050-02	Revision 0
MPR-2093	Predicting Capability and Stroke Time in DC Motor-Operated Valves	Revision 0
Op. Eval. 223815-08	Potential to Drain Torus on Failure of RCIC Line	Revision 0
QC-S-2004-0127	10CFR50.59 Review/Screening for Procedure Nos. MA-AA-716-025 and MA-AA-796-024	5/28/2004
RCIC Data	RCIC Data During Loss of T-2 from 8/1-3/2002	5/25/2004
RCIC Data	RCIC Discharge Header Temperature Plot from 6/2003 through 5/2004	5/11/2004
SE-97-096	10CFR50.59 Safety Evaluation for DCP 960007	9/24/1996
SS-F-00-0115	10CFR50.59 Safety Screening for DCP 960007	5/22/1999

Miscellaneous Documents

Number	Title	Revision or Date
SIL No. 336	Surveillance Test Recommendations for HPCI and RCIC Systems	Revision 1
SWUB-10M-1	Trane Equipment Data Sheets for SSMP Room Cooler Model SWUB-C104-A	2/1983
System Notebook	RX Core Isol Cooling (1300)	4/6/2004
System Notebook	Safe Shutdown (2900)	4/6/2004
System Health Overview Report	RX Core Isol Cooling (1300)	3/2004
System Health Overview Report	Safe Shutdown (2900)	3/2004
211533	FASA: RCIC and Safe Shutdown Makeup Pump System Design and Performance Capability	5/3/2004
	BWR Owners' Group Emergency Procedure and Severe Accident Guidelines Appendix B: Technical Basis, Volume 1	Revision 2
	VOTES Test Data for MOV2-2901-8	1/21/2000
	Inservice Testing Program Third Ten Year Interval	Revision 2
	Heat Exchanger Inspection Report for 2B Core Spray Room	12/08/2003
	Unit 1 and 2 Room Cooler Trending Reports	04/17/2004
	Portion of Operator Log from 8/2-3/2001	5/25/2004
	Licensee Response to SIL No. 336	6/19/1990

Procedures

Number	Title	Revision
CC-AA-103-2001	Setpoint Change Control	Revision 0
MA-AA-716-025	Scaffold Installation, Modification, and Removal Request Process	Revision 0
QCAN 901(2)-4 A-14	RCIC Pump High Suction Pressure	Revision 2
QCAN 901(2)-4 A-15	High RCIC Steamline Flow	Revision 8
QCAN 901(2)-4 A-16	High RCIC Turbine Exhaust Diaphragm Pressure	Revision 1

Procedures

Number	Title	Revision
QCAN 901(2)-4 B-14	RCIC Pump Low Suction Pressure	Revision 0
QCAN 901(2)-4 B-15	RCIC Steamline Isolation	Revision 11
QCAN 901(2)-4 C-14	High RCIC Turbine Exhaust Discharge Pressure	Revision 1
QCAN 901(2)-4 D-15	RCIC Turbine Trip	Revision 4
QCAN 901(2)-4 D-16	RCIC System Initiation	Revision 7
QCAN 901(2)-4 E-14	RCIC Barometric Condenser Vacuum Tank High Pressure	Revision 3
QCAN 901(2)-4 E-15	RCIC Turbine Governor End Bearing High Temperature	Revision 3
QCAN 901(2)-4 E-16	RCIC Pump Low Flow	Revision 1
QCAN 901(2)-4 F-14	RCIC Turbine Coupler End Bearing High Temperature	Revision 3
QCAN 901(2)-4 F-15	RCIC Turbine Bearing Oil Pressure Low	Revision 1
QCAN 901(2)-4 F-16	High Level in RCIC Steam Line Drain Pot	Revision 1
QCAN 901(2)-4 G-15	RCIC Turbine Trip Throttle Valve Closed	Revision 1
QCAN 901(2)-4 H-14	RCIC Barometric Condenser Condensate Pmp/Vacuum Pmp Motor Overload (Tripped)	Revision 1
QCAN 901(2)-4 H-15	RCIC Barometric Condenser Vacuum Tank High Level	Revision 4
QCAN 901(2)-4 H-16	RCIC Turbine in Test Mode of Operation	Revision 0
QCAN 912-8 A-8	Safe Shutdown Makeup Pump System Trouble	Revision 3
QCAP 0200-10	Emergency Operating Procedure (QGA) Execution Standards	Revision 33
QCAP 1500-02	Administrative Technical Requirements for Inoperable Safe Shutdown Equipment	Revision 20
QCARP-0010-01	RB-1S Injection with SSMP and Bringing the Unit to Cold Shutdown	Revision 3
QCARP-0020-01	RB-1N Injection with SSMP and Bringing the Unit to Cold Shutdown	Revision 4
QCARP-0030-01	TB-III Injection with RCIC and Bringing the Unit to Cold Shutdown	Revision 6
QCARP-0030-02	TB-I Injection with RCIC and Bringing the Unit to Cold Shutdown	Revision 5

Procedures

Number	Title	Revision
QCARP-0030-04	Injection with RCIC and Bringing the Unit to Cold Shutdown	Revision 6
QCARP-0040-01	13-1 Injection with SSMP and Bringing the Unit to Cold Shutdown	Revision 5
QCARP-0050-01	SB 1-1 Injection with SSMP and Bringing the Unit to Cold Shutdown	Revision 7
QCARP-0060-01	CT-1 Injection with SSMP and Bringing the Unit to Cold Shutdown	Revision 4
QCARP-0070-01	BC-1 Injection with SSMP and Bringing the Unit to Cold Shutdown	Revision 4
QCMPM 2900-01	U-1/2 Safe Shut Down Pump Room AHU Cooling Service Water Strainer PM	Revision 7
QCOA 0010-09	Earthquake	Revision 6
QCOA 0010-12	Fire/Explosion	Revision 24
QCOA 1300-01	RCIC Turbine Trip/Isolation Recovery	Revision 12
QCOA 1300-02	RCIC Automatic Initiation	Revision 11
QCOA 1300-04	RCIC Turbine Bearing Oil Low Pressure or Oil High Temperature	Revision 8
QCOA 1300-06	RCIC System Trouble Following an Auto-Start	Revision 12
QCOP 1300-01	RCIC System Preparation for Standby Operation	Revision 26
QCOP 1300-02	RCIC System Manual Startup (Injection/Pressure Control)	Revision 23
QCOP 1300-03	Filling Torus From CCST Through RCIC Minimum Flow Line	Revision 7
QCOP 1300-04	Draining the RCIC Main Steam Line	Revision 4
QCOP 1300-05	RCIC System Shutdown	Revision 10
QCOP 1300-06	Defeating RCIC Suction Automatic Transfer to Torus	Revision 0
QCOP 1300-09	RCIC Local Manual Operation	Revision 16
QCOP 1300-10	Bypassing RCIC Isolations: Low RPV Pressure or High Area Temperature	Revision 5

Procedures

Number	Title	Revision
QCOP 1300-11	Venting Reactor Pressure Vessel via RCIC Steam Line Drains	Revision 1
QCOP 1300-12	Defeating Low Reactor Pressure Isolation for RCIC During Unit Outage	Revision 8
QCOP 2300-09	Bypassing HPCI and RCIC High Torus Level Automatic Suction Transfer	Revision 4
QCOP 2900-01	Safe Shutdown Makeup Pump System Preparation for Standby Operation	Revision 21
QCOP 2900-02	Safe Shutdown Makeup Pump System Start up	Revision 17
QCOP 2900-04	Safe Shutdown Makeup Pump System Shutdown	Revision 7
QCOS 1300-01	Periodic RCIC Pump Operability Test	Revision 30
QCOS 1300-04	RCIC System Turbine Overspeed Test	Revision 25
QCOS 1300-05	Quarterly RCIC Pump Operability Test	Revision 36
QCOS 1300-06	RCIC System Power Operated Valve Test	Revision 21
QCOS 1300-07	RCIC Manual Initiation Test	Revision 24
QCOS 1300-08	RCIC Inboard Steam Supply Isolation Valve Operability Test	Revision 8
QCOS 1300-10	RCIC Vent Verification	Revision 18
QCOS 1300-11	RCIC Valve Position Verification	Revision 9
QCOS 1300-13	RCIC Motor Operated Valve Local Controller Test	Revision 16
QCOS 1300-17	RCIC Pump Operability Test Slow Roll after Maintenance	Revision 16
QCOS 1300-18	RCIC Drain Pot Level Switch and Drain valve Operability Test	Revision 10
QCOS 1300-19	RCIC Torus Suction Check Valve Closure Test	Revision 8
QCOS 1300-20	Unit 2 RCIC Turbine Vacuum Pump And Barometric Condenser Condensate Pump Alternate Power Feed Test for Appendix R	Revision 0
QCOS 1300-21	RCIC Keep Fill Valve Lineup Verification	Revision 2
QCOS 1300-22	RCIC CCST Suction Check Valve Closure Test	Revision 11

Procedures

Number	Title	Revision
QCOS 1300-23	U-1 RCIC Logic Functional Test	Revision 9
QCOS 1300-24	RCIC System Air Operated Valves Testing	Revision 0
QCOS 1300-25	U-2 RCIC Logic Functional Test	Revision 3
QCOS 2900-01	Safe Shutdown Makeup Pump Flow Rate Test	Revision 20
QCOS 2900-03	Safe Shutdown Makeup System Power Operated Valve Test	Revision 14
QCOS 2900-04	Safe Shutdown Makeup Pump Reactor Vessel Injection Test at Cold Shutdown	Revision 13
QCOS 2900-08	Safe Shutdown Makeup Pump Performance Test	Revision 3
QCOS 2900-09	Cycling of Fire Water Valves to Safe Shutdown Makeup Pump	Revision 4
QCTP 0820-10	Heat Exchanger And Room Cooler Inspection	Revision 4
QGA-100	RPV Control	Revision 7
QGA-101	RPV Control (ATWS)	Revision 10
QGA-500-1	RPV Blowdown	Revision 11
QGA-500-2	Steam Cooling	Revision 9
QGA-500-4	RPV Flooding	Revision 12

Surveillances (completed)

Number	Title	Date performed
QCOS 1300-10	RCIC Vent Verification	5/14/2004, 5/19/2004
QCOS 2900-01	Safe Shutdown Makeup Pump Flow Rate Test	12/17/2003, 3/15/2004
QCOS 2900-03	Safe Shutdown Makeup System Power Operated Valve Test	12/4/2003, 3/23/2004
QCOS 2900-04	Safe Shutdown Makeup Pump Reactor Vessel Injection Test at Cold Shutdown	5/20/2003, 6/12/2003, 12/20/2003, 3/25/2004
QCOS 2900-06	Safe Shutdown Makeup Pump Valve Position Verification	4/8/2004, 5/6/2004
QCOS 2900-07	Safe Shutdown to HPCI Injection Check Valve Closure Test	10/15/2000

Surveillances (completed)

Number	Title	Date performed
QCOS 2900-08	Safe Shutdown Makeup Pump Performance Test	11/22/1999, 9/19/2002
QCOS 2900-09	Cycling of Fire Water Valves to Safe Shutdown Makeup Pump	4/10/2001, 12/15/2003
QCOS 3200-04	Reactor Feedwater Check Valve 1(2)-220-59A/B and Safe Shutdown Injection Check Valve Closure Test	2/15/2002, 11/22/2002

Technical Specifications

Number	Title	Revision
3.3.5.2	Reactor Core Isolation Cooling (RCIC) System Instrumentation	Revision 199/195
3.5.3	RCIC System	Revision 199/195
3.7.9	Safe Shutdown Makeup Pump (SSMP) System	Revision 199/195
B 3.3.5.2	Reactor Core Isolation Cooling (RCIC) System Instrumentation	Revision 0
B 3.5.3	RCIC System	Revision 0
B 3.7.9	Safe Shutdown Makeup Pump (SSMP) System	Revision 0

Updated Final Safety Analysis Report Sections

Number	Title	Revision
Section 3.6	Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping	Revision 7
Section 5.4.6	Reactor Core Isolation Cooling System	Revision 7
Section 5.4.6.5	Safe Shutdown Makeup Pump System	Revision 7
Section 6.2.4	Containment Isolation System	Revision 7
Table 6.2-7	Penetrations of Primary Containment and Associated Isolation Valves	Revision 7
Section 15.2.7	Loss of Normal Feedwater Flow	Revision 7

Work Orders

Number	Title	Date
5687016	RCIC Turbine 1-1303 Discharge High Press	5/26/1998
5687017	RCIC Turbine 1-1303 Discharge High Press	5/26/1998

Work Orders

Number	Title	Date
00395661	RCIC Turbine 1-1303 Discharge High Press	1/19/2002
00395670	RCIC Turbine 1-1303 Discharge High Press	1/22/2002
00456342	Relocate Inboard and Outboard Oilers to Correct Side of SSMP	12/19/2002
00508022	SSMP to U1 HPCI Disch Ck Valve Failed QCOS 3200-04	11/19/2002
00624410	RCIC Steam Line High Flow Cal/Func Test	10/28/2003
00631449	RCIC Steam Line High Flow Cal/Func Test	1/27/2004
00660213	RCIC Steam Line High Flow Cal/Func Test	4/28/2004
00692401 01	RCIC Vent Verification (Unit 1)	5/14/2004
00693994 01	RCIC Vent Verification (Unit 2)	5/19/2004

LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
AOP	Abnormal Operating Procedure
CFR	Code of Federal Regulations
CCST	Contaminated Condensate Storage Tank
CR	Condition Request
DRS	Division of Reactor Safety
EC	Engineering Change
ECCS	Emergency Core Cooling System
FIN	Finding
gpm	Gallons Per Minute
IMC	Inspection Manual Chapter
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records
RCIC	Reactor Core Isolation Cooling
SSMP	Safe Shutdown Makeup Pump
TMI	Three Mile Island
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item