March 6, 2006

Mr. Christopher M. Crane
President and Chief Nuclear Officer
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555-4012

SUBJECT: CLINTON POWER STATION, NRC SAFETY SYSTEM DESIGN AND PERFORMANCE CAPABILITY, INSPECTION REPORT 05000461/2005002(DRS)

Dear Mr. Crane:

On January 20, 2006, the U. S. Nuclear Regulatory Commission (NRC) completed a safety system design and performance capability inspection at your Clinton Power Station. The enclosed inspection report documents the inspection results, which were discussed at an interim exit meeting held on December 2, 2005, and during an exit meeting held by telephone on January 20, 2006, with Mr. R. Bement 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 core spray system and its support systems to ensure that they were capable of performing their required safety related functions.

Based on the results of this inspection, two NRC identified findings of very low safety significance, all of which involved violations of NRC requirements were identified. However, because these violations were of very low safety significance, and because the findings were entered into the licensee's corrective action program, the NRC is treating these findings 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 the basis for your denial, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U. S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Clinton Power Station facility.

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Sincerely,

/RA/

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

Docket No. 50-461
License No. NPF-62

Enclosure: Inspection Report 05000461/2005002(DRS)
w/Attachment: Supplemental Information

cc w/encl: Site Vice President - Clinton Power Station
Plant Manager - Clinton Power Station
Regulatory Assurance Manager - Clinton Power Station
Chief Operating Officer
Senior Vice President - Nuclear Services
Vice President - Operations Support
Vice President - Licensing and Regulatory Affairs
Manager Licensing - Clinton Power Station
Senior Counsel, Nuclear, Mid-West Regional Operating Group
Document Control Desk - Licensing

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-461
License Nos:	NPF-62
Report No:	05000461/2005002(DRS)
Licensee:	Exelon Generation Company, LLC
Facility:	Clinton Power Station
Location:	Clinton, Illinois
Dates:	November 14, 2005 through January 20, 2006
Inspectors:	Thomas J. Bilik, Reactor Inspector George M. Hausman, Senior Reactor Inspector, Lead John M. Jacobson, Senior Reactor Inspector Stuart N. Sheldon, Reactor Inspector William C. Sherbin, Mechanical Engineering Contractor Douglas E. Tharp, Clinton Resident Inspector
Approved by:	Ann Marie Stone, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

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SUMMARY OF FINDINGS

IR 05000461/2005002(DRS); 11/14/2005 - 01/20/2006; Clinton Power Station; Safety System Design and Performance Capability Inspection.

This report covers a 3 week period of announced baseline inspection on the design and performance capability of the high pressure core spray (HPCS) system and support systems. The inspection was conducted by Region III inspectors, the resident inspector and a mechanical engineering consultant. Two Green findings associated with two non-cited violations were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, “Significance Determination Process” (SDP). 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. A finding of very low safety significance was identified by the inspectors for a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" requirements. Specifically, the licensee failed to incorporate the most restrictive hydraulic conditions into the calculation which established the acceptance criteria for a technical specification surveillance test. This resulted in a HPCS system hydraulic calculation that was non-conservative when determining the pump’s minimum acceptance criteria. Once identified, the licensee evaluated operability and entered the finding into their corrective action program to revise the affected documents.

  The finding was more than minor because the failure to account for all modes of HPCS system operation in the surveillance test’s acceptance criteria could result in unacceptable degradation and could have affected the mitigating systems cornerstone objective. The finding was of very low safety significance because the licensee’s analysis showed that adequate design margin existed for the HPCS system and did not represent an actual loss of a safety function. (Section 1R21.2b)

- Green. A finding of very low safety significance was identified by the inspectors for a violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control" requirements. Specifically, in 2000, 2002 and 2003, the licensee failed to recognize that the calculated value for the diesel generator (DG) jacket-water (JW) flow rate, as determined from test data obtained during thermal performance testing of the division III DG JW cooler heat exchanger (HX), was significantly higher than the flow rate that could be attained by the engine-driven water pump. Once identified, the licensee entered the finding into their corrective action program as Condition Report (CR) 426459, “NRC SSD&PC Is the Calculated Process Flow Rate Reasonable,” dated November 21, 2005, and CR429726, “Discrepancies Not Identified in Corrective Action Process,” dated December 2, 2005, to evaluate and/or revise the affected test procedures.

The finding was more than minor because the failure to account for flow rates that were significantly greater than that identified by the equipment's design specification produced equipment performance data that did not accurately demonstrate the HX's availability and reliability. The finding was of very low safety significance because the licensee's evaluation showed that the Division III DG's JW Cooler HX would have performed its safety function and did not represent an actual loss of a safety function. A contributing cause of the finding was related to the cross-cutting element of problem identification and resolution. Specifically, a similar issue was identified during another NRC inspection in 2001; however, the licensee did not properly evaluate and take actions. As a result, testing done in 2002 and 2003 showed the same discrepant flow rates. (Section 1R21.3b)

B. Licensee-Identified Violations

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's risk assessment model was 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 was 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 system and components selected were from the high pressure core spray (HPCS) system. This system was 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:

- applicable technical specifications (TS);
- applicable updated safety analysis report (USAR) sections; and
- the systems' design documents.

.1 System Requirements

a. Inspection Scope

The inspectors reviewed the USAR, TS, system descriptions, drawings and available design basis information to determine the performance requirements of the HPCS system. 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 HPCS flow paths would be available and unimpeded during and/or following design basis events. To achieve this function, the inspectors verified that the system(s) would be aligned and maintained in an operable condition as described in the plant's USAR, TS and design bases. In addition, the inspectors reviewed and verified for adequacy the:

- design basis calculations for flow rates, levels, pressures and temperatures,
- total dynamic head and net positive suction head (NPSH),
- alternate water source(s) capacity and
- pipe stress analysis results.

Energy Sources: This attribute required review to ensure that the HPCS motive/electrical source would be available/adequate and unimpeded during/following design basis events, that appropriate valves and system control functions would have sufficient power to change state when required. To achieve this function, the inspectors verified that interactions between HPCS and its support system(s) were appropriate, such that, all components would operate properly when required. To complete this attribute, the inspectors reviewed and verified for adequacy the:

- 125Vdc battery capacity,
- 4.16kV system capacity,
- breaker coordination,
- fuse coordination,
- voltage drop calculations,
- undervoltage (UV) calculations,
- degraded voltage calculations,
- air reservoir capacity (for air operated equipment),
- instrument air availability was as needed and that
- power was available to support operation of the HPCS system and support system(s).

Controls: This attribute required review to ensure that the automatic controls for operating HPCS and associated systems were properly established and maintained. Additionally, review of alarms and indicators were necessary to ensure that operator actions would be accomplished in accordance with design requirements. To complete this attribute, the inspectors reviewed and verified for adequacy:

- setpoints established to ensure sufficient water inventory and prevent loss of required NPSH,
- instrument uncertainty & loop error calculations,
- relay setting calculations,
- setpoint calculations and
- controls' functionality.

Operations: This attribute was reviewed because the operators perform a number of actions during normal, abnormal and emergency operating conditions that have the potential to affect HPCS operation. In addition, the emergency operating procedures (EOPs) require the operators to manually realign the systems flow paths during and following design basis events. Therefore, operator actions play an important

role in the ability of the selected systems to achieve their safety related functions. To complete this attribute, the inspectors reviewed and verified for adequacy the following:

- Operating procedures (normal, abnormal, or emergency) to ensure they were consistent with operator actions for accident and/or event conditions.
- Operating procedure timing for manual actions were initiated within the assumed time periods and that testing was performed to validate the procedures consistent with design basis assumptions.
- Instrumentation and alarms were available to operators for making necessary decisions.
- Alarms and level instrumentation provided operators with sufficient information to perform the task and operability determinations supported calculations.

Heat Removal: This attribute was reviewed to ensure that there was adequate and sufficient heat removal capability for HPCS. To complete this attribute, the inspectors reviewed and verified:

- heat exchanger (HX) heat removal design calculations (e.g. lube oil cooler, room cooler) and
- HVAC calculations.

b. Finding

Vortex Analysis Methodology Not Appropriate

Introduction: The inspectors identified an unresolved item (URI) concerning the reactor core isolation cooling (RCIC) water storage tank volume's design analysis. Specifically, the inspectors identified that the licensee did not select an appropriate method for calculating the onset of vortexing at the intake of the HPCS and RCIC pumps' suction lines from the RCIC water storage tank.

Description: The inspectors reviewed Calculation IP-M-0384, "Evaluation of Vortex in the RCIC [Water] Storage Tank," Revision 1. The purpose of the calculation was to determine the appropriate analytical level (i.e., elevation of water) where vortexing would occur above the HPCS and RCIC pumps' suction lines. The analytical level was then used as a design input to calculate the automatic RCIC water storage tank to suppression pool low level switchover setpoint for the HPCS and RCIC pumps.

The inspectors noted that the methodology used in Calculation IP-M-0384 to determine the minimum height of water above the HPCS and RCIC pump's intake lines to preclude vortex formation was not appropriate. The calculation's methodology did not account for the actual fluid configuration where air ingestion into the HPCS and RCIC pumps' suction lines would potentially occur. The onset of vortexing was calculated using a methodology extrapolated from test data contained in NUREG/CR-2772, Hydraulic Performance of Pump Suction Inlets for Emergency Core Cooling Systems in Boiling Water Reactors, June, 1982. The extrapolated test data used in Calculation IP-M-0384 was that of a straight line drawn between two points on a graph of void fraction versus

Froude Number selected from the subject NUREG. The graph was generated from test data where the minimum water submergence from the centerline of the suction pipe was at least 2-feet and with uniform approach flow (i.e., no water swirl at the suction line).

The inspectors requested the licensee to provide justification for their use of the test data from the subject NUREG to predict the onset of vortexing. In particular, the inspectors requested the licensee to justify why the minimum submergence of 2-feet of water and with no water swirling at the pump inlet, as evaluated in the subject NUREG, would be similar to the piping configuration in the licensee's RCIC water storage tank. The RCIC water storage tank had no design feature to prevent swirling of the water and the calculated submergence from Calculation IP-M-0384 was 9.36-inches from the centerline of the HPCS suction line (i.e., 1.93-inches from the top of the HPCS suction line), compared to at least 2-feet as described in the subject NUREG.

The licensee was unable to provide adequate technical justification for the methodology used and stated they would consider other methods applicable to this configuration that were more readily accepted by the industry. The licensee entered the finding into their corrective action program as Condition Report (CR) 429583, "NRC SSD&PC RCIC [Water] Tank Vortex Issue," dated December 1, 2005, to evaluate (i.e., perform an operability evaluation) and revise the affected documentation.

On December 1, 2005, the licensee shifted the HPCS and RCIC inventory source to the suppression pool as a conservative measure since the inspectors' concern was specifically link to the RCIC water storage tank. The use of the suppression pool as a qualified inventory source was allowed per Clinton's USAR and TS. Vortexing from the suppression pool should not occur due to the depth of the HPCS and RCIC suction lines.

Subsequent to the NRC's Interim Exit on December 2, 2005, the licensee completed Minor Revision 1/A to Calculation IP-M-0384 dated December 9, 2005, which used a different approach to determine the onset of vortexing for the RCIC pump. The revised calculation indicated that the RCIC pump suction line would have adequate submergence with the current low level switchover setpoint. However, a preliminary calculation for the HPCS pump indicated that an additional 9-inches of water over the top of the suction line would be required. The inspectors questioned the preliminary calculation's value used for HPCS pump runout flow (5010 gpm versus 5650 gpm analyzed runout flow) and why there was no allowance for tank level change in the calculation for stroking of suction valves during realignment of pump suction sources.

On December 19, 2005, the licensee completed Minor Revision 1/B to Calculation IP-M-0384, which used a similar approach to determine the onset of vortexing for the HPCS pump. The results of this calculation determined that air entrainment was possible with the plant's existing vortex limit (i.e., historical low level switchover setpoint). As a result, the licensee developed a RELAP5 Mod 3.3 model of the HPCS suction piping from the RCIC water storage tank to the suppression pool to evaluate the introduction and transport of air in the HPCS suction piping. A number of scenarios were analyzed to evaluate the affects of air entrainment on the HPCS pump's

performance. Based on the RELAP5 model, the licensee concluded that the HPCS system would have been operable with the historical low level switchover setpoint. However, the model did not support the historical low level switchover setpoint as an acceptable design setpoint for future operation. As a result, the licensee entered this finding into their corrective action program as CR 435174, "Need to Recover RCIC and HPCS Vortex Margin," dated December 19, 2005.

The inspectors had not completed a review of the licensee's re-analysis by the end of the inspection. Therefore, this issue is considered an unresolved item (URI) 05000461/2005002-01(DRS) pending completion of this review.

.2 System Condition and Capability

a. Inspection Scope

The inspectors reviewed design basis documents and plant drawings, abnormal and EOP, requirements, and commitments identified in the USAR and TS. 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: To complete this attribute, the inspectors reviewed and verified that the installed configuration of the HPCS system 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: To complete this attribute, 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; operation and system alignments were consistent with design and licensing basis assumptions and; emergency operating procedure changes had not impacted design assumptions and requirements.

Design: To complete this attribute, the inspectors reviewed the mechanical, electrical and instrumentation design of the HPCS system 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 setpoints based on the required equipment function. In addition, the inspectors performed limited analyses in several areas to verify the appropriateness of the design values used for:

- pressure transient/water hammer evaluations,
- relief valve sizing calculations,
- tank sizing calculations,
- tank over-pressurization calculations and
- motor operated valve (MOV) - air operated valve calculations.

Testing: To complete this attribute, 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. Finding

Non-Conservative Acceptance Criteria

Introduction: The inspectors identified a Non-Cited Violation (NCV) of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" having very low safety significance (Green) involving the HPCS system's hydraulic design analysis. Specifically, the inspectors identified that the licensee failed to correctly specify the minimum pump operability limits to be used in HPCS system surveillance testing.

Description: The inspectors reviewed Calculation 01HP09, "TS Surveillance Requirement for HPCS Pump Differential Pressure at Rated Flow (EC336808)," Revision 6. The purpose of this calculation was to develop HPCS pump curves to be used in IST procedures when testing the HPCS pump. The inspectors also reviewed Calculation 01HP15, "Development of HPCS Pump Curves (1E22C001) & Comparison with System Resistance Curves for Operating Modes A, B, C, CC, E, F, G, & H," Revision 2. The purpose of Calculation 01HP15 was to develop pump curves for the HPCS pump and compare the pump curves to the system resistance curves for Operating Modes A, B, C, CC, E, F, G, and H. The inspectors' review of Calculation 01HP15, identified that Calculation 01HP09, which established the HPCS pump's minimum acceptance criteria, to be used during testing, did not evaluate the most limiting hydraulic system resistance in which the HPCS pump was required to operate. In particular, the HPCS system had the following modes of operation:

Mode	Description ([1] Accident / [2] System Test)
A	Reactor at High Pressure - Suction from the RCIC Water Storage Tank[1]
B	Reactor at High Pressure - Suction from the Suppression Pool[1]

Mode	Description ([1] Accident / [2] System Test)
C	System Injection at Rated Core Spray Flow - Suction from the Suppression Pool[1]
CC	Reactor at High Pressure, Split Flow - Suction from the Suppression Pool[1]
E	System Injection at Rated Core Spray Flow - Suction from the RCIC Water Storage Tank[1]
F	System at Runout - Suction from the Suppression Pool to the Reactor Vessel[1]
G	Suction from the Suppression Pool - Discharging Back to the Suppression Pool[2]
H	Suction from the RCIC Water Storage Tank - Discharging Back to the RCIC Water Storage Tank[2]

The inspectors noted that the results of Calculation 01HP15 indicated that the hydraulic requirements of Modes F, G and H were less restrictive than the test basis. However, the hydraulic requirements for Modes A, B and CC were more restrictive than the test basis. Because of this, the inspectors concluded that it was possible for pump degradation to be acceptable using the test basis, but may not be acceptable in Modes A, B, and CC. By not accounting for the higher head and lower flow requirements of Modes A, B and CC, Calculation 01HP09 was non-conservative when calculating the allowable degradation of the pump curve.

The licensee agreed that the pump's minimum acceptance criteria for the test basis based on Modes C and E was non-conservative when compared to the requirements based on Modes A, B, and CC. The inspectors reviewed the most recent pump tests and determined that adequate design margin remained between the higher minimum test points and current operating points. As a result, the inspectors concluded the HPCS system was operable.

The licensee determined that Calculation 01HP09 required revision to include the hydraulic evaluation of all modes of HPCS system operation that were evaluated in Calculation 01HP15. In addition, because Calculation 01HP09 determined the minimum acceptance criteria for HPCS system surveillance testing, the associated procedures would require revision if the acceptance criteria changed.

Analysis: The inspectors determined that failure to correctly specify the minimum pump operability limits to be used in HPCS system surveillance testing was a performance deficiency warranting a significance evaluation. The inspectors concluded that the finding was greater than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening," issued on September 30, 2005. The finding involved the attribute of design control, where failure to account for all modes of HPCS system operation in the surveillance test's acceptance criteria could result in not identifying unacceptable degradation and could have affected the mitigating systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage).

The inspectors completed a significance determination of this finding using IMC 0609, Appendix A, “Significance Determination of Reactor Inspection Findings for At - Power Situations.” The inspectors answered “no” to all five screening questions in the Phase 1 Screening Worksheet under the Mitigating Systems column. The inspectors agreed with the licensee's position that despite the loss of design margin in the HPCS flow delivery for the high head and low flow mode of operation, the HPCS system would have performed its safety function. Therefore, the inspectors concluded that the finding was a design deficiency that did not represent an actual loss of a safety function and the finding screened out as having very low safety significance or Green.

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

Contrary to the above, as of December 2, 2005, the licensee failed to assure that the minimum pump operability limits as defined by design calculations were correctly translated into specifications, drawings, procedures, and instructions. Specifically, the hydraulic requirements for the HPCS pump under high head and low flow conditions, as was determined in Calculation 01HP15, were not translated into Calculation 01HP09, “TS Surveillance Requirement for HPCS Pump Differential Pressure at Rated Flow (EC336808),” Revision 6, or subsequently into the routine testing surveillance. Once identified, the licensee entered the finding into their corrective action program as CR429366, “SSD&PC - HPCS Pump Surveillance Acceptance Criteria Concern,” dated December 1, 2005, to revise the affected documents. Because this violation was of very low safety significance and it was entered into the licensee’s corrective action program, this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000461/2005002-02(DRS)).

.3 Components

a. Inspection Scope

The inspectors examined the HPCS system and support systems’ associated pumps, HXs and instrumentation to ensure that component level attributes were satisfied.

Component Degradation: To complete this attribute, the inspectors reviewed and verified that potential degradation was monitored or prevented and component replacement was consistent with inservice and/or equipment qualification life. The inspectors examined existing system programs to ensure that components were adequately maintained.

Equipment/Environmental Qualification: To complete this attribute, the inspectors reviewed and verified that equipment was qualified to operate under the environment in which it was expected to be subjected to under normal and accident conditions. The inspectors reviewed design information, specifications, and documentation to ensure that the HPCS system and support systems were qualified to operate within the environmental conditions specified in the environmental qualification documentation.

Equipment Protection: To complete this attribute, the inspectors reviewed and verified that the HPCS system and subsystems were adequately protected from natural phenomenon and other hazards, such as HELBs, floods or missiles. The inspectors reviewed design information, specifications, and documentation to ensure that the systems were adequately protected from those hazards identified in the USAR, which could impact the systems ability to perform their safety function.

Component Inputs/Outputs: To complete this attribute, the inspectors reviewed and verified that the HPCS system and subsystems' component inputs and outputs were suitable for the application and would be acceptable under accident and/or event conditions; that required inputs to components, such as coolant flow, electrical voltage, and control air necessary for proper component operation were provided and; that components (e.g., valve, circuit breakers, etc.) failed in the safe configuration.

Operating Experience: To complete this attribute, the inspectors reviewed and verified that the licensee was appropriately tracking and applying operating experience.

b. Finding

Inadequate Heat Exchanger Thermal Performance Testing

Introduction: The inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control" having very low safety significance (Green) involving the division III diesel generator (DG) jacket-water (JW) cooler HX's thermal performance testing. Specifically, the licensee failed to recognize that the calculated value for the DG JW flow rate, as determined from test data obtained during thermal performance testing, was significantly higher than the flow rate that could be attained by the engine-driven water pump.

Description: The inspectors reviewed test procedure CPS 2700.19, "Div III DG (16 Cyl) JW Cooler (1DG13A) HX Performance Covered by GL89-13," Revision 3A. The purpose of the test procedure was to confirm the heat removal capability of the division III DG JW cooler HX. The DG rejects engine heat to the service water via the JW cooler HX. The licensee committed to perform HX thermal performance testing in response to Generic Letter (GL) 89-13, as described in procedure CPS 1003.10, "CPS Program for NRC GL89-13 (SW Problems Affecting Safety-Related Equipment)," Revision 5A. The testing consisted of measuring service water flow rate, inlet and outlet service water temperatures, as well as measurements of JW inlet and outlet temperatures across the HX. By using a heat balance method (i.e., JW heat rejection equals heat added to service water), the mass flow rate of the JW was calculated.

The inspectors noted that there was a bypass around the HX for heat up of the JW. The licensee stated that there would be no bypass of cooling water around the JW cooler HX because thermal equilibrium of the engine was maintained during the testing and that the engine was fully loaded. Therefore, the JW flow rate should be fully

developed through the HX with a flow rate close to the value stated in the vendor's design specification.

On November 18, 2005, the inspectors reviewed the 2002, 2003 and 2004 thermal performance tests for the division III DG JW cooler HX. The inspectors questioned the licensee's test results because reduction of the test data indicated that the JW mass flow rate was significantly greater than the mass flow rate specified by the vendor's design specification. In particular, the calculated JW flow rates were 1866 gallons per minute (gpm), 1471 gpm and 1165 gpm for the 2002, 2003 and 2004 year tests, respectively. The maximum JW flow rate specified by the vendor's design specification was 850 gpm.

The inspectors questioned how a fixed speed JW pump could provide such a wide variation in cooling water flow rates, especially during the 2002 test that calculated a flow rate of 1866 gpm, which was over twice as much as the 850 gpm specified by the vendor. The licensee subsequently evaluated the 2002, 2003 and 2004 test results and determined that the 2002 and 2003 test results were invalid. The licensee determined that there was no impact on operability of the DG because the 2004 test results indicated a JW flow rate of 1165 gpm, which was considered valid by the licensee. The inspectors were not convinced that the 2004 tests were valid, but concluded that with the licensee's HX inspection and cleaning effort performed in 2005, the HX would remove the heat generated by the engine. The licensee determined that test procedure CPS 2700.19 needed to be evaluated and/or revised. Condition Report 426459, "NRC SSD&PC Is the Calculated Process Flow Rate Reasonable," and CR 429726, "Discrepancies Not Identified in Corrective Action Process," dated November 21 and December 2, 2005, respectively, were issued.

The inspectors noted that during the NRC Heat Sink Inspection in 2001, questions regarding the 2000 test results were raised. The licensee initiated three condition reports to address the issue. In particular condition report, CR-2-01-03-180, "Unstable Testing Conditions Invalidated Div III DG HX Test Performed in November 2000," dated March 21, 2001, reported that due to anomalies in the test data, the performance tests were invalid. Therefore, the SSDPC inspectors concluded that the licensee was aware of the testing discrepancies but did not properly evaluate and correct the concerns.

Analysis: The inspectors determined that the licensee's failure to recognize that the calculated value for the DG JW flow rate was significantly greater than the capability of the vendor's design specification and that the test results did not represent actual HX performance was a performance deficiency warranting a significance evaluation. The inspectors concluded that the finding was greater than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening," issued on September 30, 2005. The finding involved the attribute of equipment performance, where the licensee's failure to obtain accurate and reliable test data did not provide the information needed to demonstrate the functional capability of the HX and could have affected the mitigating systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage).

The inspectors completed a significance determination of this finding using IMC 0609, Appendix A, “Significance Determination of Reactor Inspection Findings for At - Power Situations.” The inspectors answered “no” to all five screening questions in the Phase 1 Screening Worksheet under the Mitigating Systems column. The inspectors agreed with the licensee's position that, despite the failure to adequately test the heat transfer capability of the HX, the division III DG’s JW cooler HX would have performed its safety function. Therefore, the inspectors concluded that the finding was a test control deficiency that did not represent an actual loss of a safety function and the finding screened out as having very low safety significance or Green. A contributing cause of the finding was related to the cross-cutting element of problem identification and resolution. Concern with this performance test was previously identified in 2000; however, the licensee did not properly evaluate the adverse condition. In addition, the licensee did not recognize the condition during testing in 2002 and 2003.

Enforcement: 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and that test results shall be evaluated to assure that test requirements have been satisfied.

Contrary to the above, for 2000, 2002 and 2003, the licensee failed to assure that the division III DG’s JW cooler HX thermal performance test results were adequately evaluated to assure that test requirements had been satisfied. This resulted in HX test results that did not represent actual HX thermal performance. Once identified, the licensee entered the finding into their corrective action program as CR 426459 and CR 429726 to evaluate and/or revise the affected test procedures. Because this violation was of very low safety significance and it was entered into the licensee’s corrective action program, this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000461/2005002-03(DRS)).

4. OTHER ACTIVITIES (OA)

4OA2 Identification and Resolution of Problems (71152)

.1 Routine Review of Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed a sample of problems associated with the HPCS system that were identified and entered into the corrective action program by the licensee. 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

No findings of significance were identified.

4OA6 Meetings

.1 Exit Meeting

The inspectors presented the inspection results to Mr. R. Bement and other members of licensee management at the conclusion of the inspection on January 20, 2006. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

.2 Interim Exit Meetings

An interim exit was conducted for the safety system design and performance capability inspection with Mr. R. Bement on December 2, 2005.

ATTACHMENT: SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
A. Bailey, Operations Training Manager
R. Bement, Site Vice President
W. Carsky, Shift Operations Superintendent
B. Corley, Reactor Operator
J. Cunningham, Work Management Director
T. Danley, Design Engineering Response Support
R. Davis, Radiation Protection Manager
R. Frantz, Regulatory Assurance
M. Gandhi, Mechanical/Structural Design Support
G. Hughes, Design Engineering
J. Hunsicker, Electrical/Instrumentation and Control Design Support
W. Iliff, Regulatory Assurance Manager (Response Team Lead)
B. Kerestes, Design Engineering
S. Lakebrink, Mechanical/Structural Design Manager
D. Lillyman, Balance of Plant Support
J. Lindsey, Training Director
T. Marini, Nuclear Oversight Manager
M. McDowell, Plant Manager
T. Parrent, Balance of Plant Support
C. Patel, High Pressure Core Spray System Manager
R. Peak, Site Engineering Director
D. Schavey, Operations Director
E. Schweitzer, Design Engineering
K. Scott, Senior Manager Plant Engineering
D. Smith, Diesel Generator System Manager
M. Smith, Electrical Systems Support
E. Tiedemann, Regulatory Assurance
D. Tucker, Electrical/Instrumentation and Control Design Support
C. Williamson, Security Manager

Nuclear Regulatory Commission
B. Dickson, Senior Resident Inspector
J. Lara, Chief, Engineering Branch 3
A.M. Stone, Chief, Engineering Branch 2

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000416/2005002-01(DRS)	URI	Vortex Analysis Methodology Not Appropriate (Section 1R21.1b)
05000461/2005002-02(DRS)	NCV	Non-Conservative Acceptance Criteria (Section 1R21.2b)
05000461/2005002-03(DRS)	NCV	Inadequate Heat Exchanger Thermal Performance Testing (Section 1R21.3b)

Closed

05000461/2005002-02(DRS)	NCV	Non-Conservative Acceptance Criteria (Section 1R21.2b)
05000461/2005002-03(DRS)	NCV	Inadequate Heat Exchanger Thermal Performance Testing (Section 1R21.3b)

Discussed

NONE

LIST OF DOCUMENTS REVIEWED

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

CALCULATIONS

Number	Description/Title	Date/Revision
00-143	Establish Limits for Debris in Containment	0
01DO05	Sizing of Relief Valves	0
01DO06	Diesel Fuel Oil Storage Requirements	6
01DG11	DG HX Tube Plugging	5
01HP02	HPCS Piping	7
01HP04	HPCS Piping H_2O Leg Pump Flow/Head Requirements & Min Flow Eval	2
01HP08	Determine NPSH for HPCS Pump at Source Switchover	0
01HP09	TS Surv Requirement for HPCS Pump D/P at Rated Flow (EC 33680)	6
01HP10	HPCS Sys Flow Element 1E22-N007 Flow Coefficient Determination & Eval of Flow Element Accuracy	1
01HP11	HPCS Pump D/P & Flow Criteria for Surv/IST	2
01HP13	NPSH - HPCS Suction from Suppression Pool	1
01HP15	Develop HPCS Pump Curves & Compare w/Resistance Curves for OP Modes A, B, C, CC, E, F, G, & H	2
01HP18	Eval of HPCS Pump Performance Test Data	0
1E22F004	MOV Results	3
1E22F012	MOV Results	0
1E22F015	MOV Results	2
19-AN-04	480V ESF SWGR BKR & Assoc Upstream Relay Settings	12
19-AN-9	4160V Div III ESF Bus 1C1 Motor Relay Settings	1
19-AN-19	Functional Requirements for 2nd Level UV Relays at 4kV 1A1, 1B1, 1C1	2
19-AN-21	DG & 138kV Sys	0
19-AN-28	Eval of Isolating Div III DC Control Power in 1E22S001B & 1E22S001C from an Annunciator/Alarm C Panel Failure	0
19-D-27	Review Div III DC Sys 1C (CCFS CCF-00-085, 094, 278)	9
3C10-0284-003	Rev to SBO Analysis 3C10-0284-003 for Power Uprate	2
3C10-1088-001	Justification of Suppression Pool as HPCS H_2O Source	1
CI-CPS-140	Setpoint Calc for RCIC H_20 Storage TK - Low Level (superseded)	3
CI-CPS-205	TDR Setpoint Error Band for Div III DG Relay K-54X-TOR	0
CPS9080.23	DG 1C-ECCS Integrated	March 27, 2002

CALCULATIONS

Number	Description/Title	Date/Revision
EPU-T0400	EPU Task T0400: Containment Sys Response	0
EPU-T0404	EPU Task T0404: HPCS Sys (EC 334814)	0
EPU-T0406	EPU Task T0406: ECCS NPSH	0
EPU-T0407	EPU Task T0407: ECCS-LOCA SAFER / GESTR	1
EPU-T0900	EPU Task T0900: Transient Analysis	1
EPU-T0902	EPU Task T0902: ATWS	0
EPU-T0903	EPU Task T0903: SBO	0
IP-C-0006	DG Fuel Oil Storage TKs Div I, II & III TK Volume	0
IP-C-0054	DG Voltage Limits Measured with M&TE	0A
IP-C-0060	Setpoint for High Drywell Press - Scram & ECCS Initiation	0A
IP-C-0061	Setpoint for RCIC H_20 Storage TK - Low Level	0A
IP-C-0087	Setpoint for Suppression Pool High - HPCS XMTRs	0B
IP-C-0094	Setpoint for RPV Level 2 & Level 8 (WR) XMTRs	0A
IP-C-0097	Setpoint for HPCS Pump Discharge Press - High Bypass (EC 335443)	0A
IP-C-0100	Setpoint for HPCS Min Flow Bypass (EC 335443)	0A
IP-I-0008	HPCS Flow Vs RPV Press	0
IP-M-0001	Bounding D/P for Selected HP Sys Mov's	1
IP-M-133	Vortexing in Fuel Oil Storage TKs	0
IP-M-0233	Sys Response Time Eval - LPCS, HPCS & LPCI Injection	2
IP-M-0384	Eval of Vortex in the RCIC H_20 Storage TK	1 and 1B
IP-M-0464	Suppression Pool Strainer Surface Area & Approach Velocity Determination	July 9, 1998
IP-M-0465	ECCS Suppression Pool Suction Strainer Hydraulic Head Losses Determination	November 12, 1999
IP-M-0466	Perforated Plate Press Drops	0
IP-M-0486	SSW Sys Hydraulic Network Analysis Model & Flow Balance Acceptance Criteria	6F
IP-M-0605	Flow Velocities in U1 SX Pump Bay	0
IP-M-0722	ECCS Pump Suction Line Flashing & Cavitation Indices Analysis (EC 338499)	0
IP-O-0049	TS Indicator Loop Uncertainty Eval of Suppression Pool or RCIC H_20 Storage TK Level	1 & 1A
IP-Q-0396	OE of Equipment at Elevated Temp in DG Rm	1
VH-01	SSW Pump Rm Cooling Loads	0
VH-31	Performance Analysis of SSW Pump Rms Cooling Coils	0
VY-01	ECCS Equip Rm HVAC Sys Cooling Loads (ECCS/MSIV Post-LOCA, Shutdown, & Normal Modes)	9
VY-40	ECCS Cubicle Min Temp	0
VY-43	HPCS Pump Rm Temp with One Cooler OOS	0

CALCULATIONS

Number	Description/Title	Date/Revision
VY-45	Performance Eval of VY Sys Cooling Coils under SX Flow Acceptance Limits	4A
VX-01	SWGR Heat Removal Sys Cooling Loads	1

CORRECTIVE ACTION PROGRAM DOCUMENTS ISSUED DURING INSPECTION

Number	Description/Title	Date/Revision
00074887	Lost Design Input Document for Safety-Related Calc	September 11, 2001
00385599	2005 SSDPC FSA - Response to NRC Bulletin 88-04	October 13, 2005
00388872	Clinton Response to NRC IEB (Bulletin) 80-25 Not Found	October 21, 2005
00399935	2005 SSDPC FSA Wkdn - Rod Contacts Pipe Insulation	November 17, 2005
00425137	Enhancement to VTD K2801-0024 - DWG Information	November 17, 2005
00425388	Calc Minor Rev Numbers Exceed Recommended Level	November 18, 2005
00425438	EQ Analysis Item Not Linked to Package Documentation	November 18, 2005
00425536	Discrepancy on 1E22-F035 Nameplate Information	November 18, 2005
00426309	Div III DG Tripped During 9080.03	November 21, 2005
00426459	NRC SSDPC Is the Calc Process Flow Rate Reasonable	November 21, 2005
00428153	2005 SSDPC - Drawing Discrepancy	November 28, 2005
00428521	2005 SSDPC - Found Calc 3C10-1088-001 Superceded	November 29, 2005
00429044	RCIC H_20 TK Suction Elev Transcribed Incorrectly to Calc	November 30, 2005
00429366	SSD&PC-HPCS Pump Surv Acceptance Criteria Concern	December 1, 2005
00429583	NRC SSDPC RCIC H_20 Storage TK Vortex Issue	December 1, 2005
00429726	Discrepancies Not Identified in Corrective Action Process	December 2, 2005
00435174	Need to Recover RCIC and HPCS Vortex Margin	December 19, 2005

CORRECTIVE ACTION PROGRAM DOCUMENTS ISSUED PRIOR TO INSPECTION

Number	Description/Title	Date/Revision
1-96-11-039	Div III DG Failed to Start in Required Time	November 2, 1996
2-01-03-167	Excel Spreadsheet Cell Calculated Different Uncertain Allowance For HX Test Results	March 21, 2001
2-01-03-178	Proceduralized Temp Limit Was Exceeded During The Performance of Several DG HX Performance Tests	March 21, 2001
2-01-03-180	Unstable Testing Conditions Invalidated Div III DG HX Test Performed in November 2000	March 21, 2001
2-01-03-193	Test Results from 1VY08SA Dated January 24, 2000 Are Not Consistent with What Is Expected	March 22, 2001
00197833	Div III Degraded Voltage Time Delay TS Allowable Value	January 27, 2004
00199320	Degrading Lugs Noticed on Relays 27SY & 27SX	February 4, 2004
00200534	Seismic Recorder Activated When HPCS Started	February 9, 2004
00200632	Loud Noise During HPCS Start During CPS 9080.23	February 9, 2004
00200659	1E22F036 Hdwhl Freewheels - Unable to Open Valve	February 10, 2004

CORRECTIVE ACTION PROGRAM DOCUMENTS ISSUED PRIOR TO INSPECTION

Number	Description/Title	Date/Revision
00201144	HPCS Sys Experienced Unusually High Press Spike	February 9, 2004
00201749	1E22F004 As-Found Open Force - Higher Than Expected	February 6, 2004
00202645	Div III Battery Charger Shows Signs of Degradation	February19, 2004
00239952	1E22F012 HPCS Min Flow Green Light Did Not Go out	July 29, 2004
00319089	1E22S004103 BKR for Div III DG FDR Failed Gap Check	March 30, 2005
00375921	1E22BK06 2005 SSDPC FSA - SIL#230 R/2 Missed	September 21, 2005
00329505	Lost Fill & Vent of HPCS Causes Risk Condition Orange	April 27, 2005
00378846	New Flex Connections Oversized-1DG19T Coolant Pump	September 12, 2005
00378868	1DG19T-Div III EDG Coolant Flex Coupling Replacement	September 26, 2005
00380664	2005 SSDPC FSA - Valve Setup Calc for 1E22-F004	October 1, 2005
00385599	2005 SSDPC FSA - Response to NRC Bulletin 88-04	October 13, 2005
00398724	2005 SSDPC FSA - OPX Perry- HPCS Suction Swap OE	November14, 2005

DRAWINGS

Number	Description/Title	Date/Revision
93-14589	10"-900 Weld Ends, Carbon Steel Flex Wedge Gate Valve with 6:1 Bevel Gear Operator	C
762E454AC	GE Process Diagram - HPCS Sys	5
E02-1HP99, Sht 5	HPCS Sys	F
E02-1HP99, Sht 6	HPCS Sys	D
E02-1HP99, Sht 7	HPCS Sys	K
E02-1HP99, Sht 104	HPCS Sys	P
E02-1HP99, Sht 105	HPCS Sys	K
E02-1HP99, Sht 202	HPCS Sys	L
E02-1HP99, Sht 203	HPCS Sys	G
E02-1HP99, Sht 501	HPCS Suction & Pump Discharge Valves (F01&F04)	J
E02-1HP99, Sht 503	HPCS Suction & Min-Flow Valves (F015 & F012)	H
E02-1HP99, Sht 504	HPCS Test Bypass Valve (1E22-F023)	K
HP-2	HPCS Sys Isometric Piping Layout	10L
HP-4	HPCS Sys Isometric Piping Layout	August 5, 1985
HP-906	HPCS Sys Isometric Piping Layout (Fuel Building)	2
JN-D-51749, Sht 1	Nooter Corp DWG RCIC H_20 Storage TK (1R101T)	December 17, 1976
JN-D-51753, Sht 5	Nooter Corp DWG RCIC H_20 Storage TK (1R101T)	December 29, 1976
JN-D-51754, Sht 6	Nooter Corp DWG RCIC H_20 Storage TK (1R101T)	December 30, 1976
JN-D-51755, Sht 7	Nooter Corp DWG RCIC H_20 Storage TK (1R101T)	January 3, 1977
M05-1035	DG Starting Air, Exhaust & Combustion Sys, Sht 3	AC
M05-1052	SSW	AH
M05-1054 Sht 40	DG Building Floor Drain	J
M05-1054 Sht 41	DG Building Floor Drain	J
M05-1074	HPCS Sys	AG

DRAWINGS

Number	Description/Title	Date/Revision
M10-9074, Sht 4	HPCS Sys	C
M10-9079, Sht 6	HPCS Sys	A
N768856 #1	HPCS H_2O Leg Pump	3
N768856 #2	Model 3196ST6	2
RI-902	RCIC Sys Isometric Piping Layout (Fuel Building)	2

MODIFICATIONS

Number	Description/Title	Date/Revision
ECN-28094	Document Changes Related to HPCS Sys	0
ECN-31050	HX Div III DG Spec Sheet	None
ECN-30739	R & R Strainers - Remove RHR-A/B/C, LPCS, HPCS, & RCIC; New Strainer	September 28, 1998

OPERABILITY RECOMMENDATIONS

Number	Description/Title	Date/Revision
7264	Bearing Failure & Motorizing of the Div III DG	May 4, 1995
201144-02	HPCS Sys [Pump Discharge to Valve 1E22-F036]	0
ECR-363628	HPCS Sys Wkdn	February 9, 2004

PROCEDURES

Number	Description/Title	Date/Revision
CPS 1003.10	CPS Program for NRC GL89-13 (SW Problems Affecting Safety-Related Equipment)	5A
CPS 2700.19	Div III DG JW Cooler Performance Covered by GL89-13	3A
CPS 3211.01	SSW	24A
CPS 3309.01	HPCS Operating Procedure	15A
CPS 3503.01	Battery & DC Distribution	16C
CPS 4200.01	Loss of Alternating Current Power	16
CPS 4401.01	EOP - 1 RPV Control	26
CPS 4402.01	EOP - 6 Primary Containment Control	26
CPS 4403.01	EOP - 2 RPV Flooding	26
CPS 4404.01	EOP - 1A ATWS RPV Control	26
CPS 4405.01	EOP - 7 Hydrogen Control	26
CPS 4406.01	EOP - 8 Secondary Containment Control	26
CPS 4406.01	EOP - 9 Radioactive Release Control	26
CPS 4407.01	EOP - 3 Emergency RPV Depressurization (Blowdown)	26
CPS 4410.00	Defeating HPCS Interlocks	4

PROCEDURES

Number	Description/Title	Date/Revision
CPS 4701.01	SAG-1 Primary Containment Flooding	2
CPS 4702.01	SAG-2 RPV, Containment & Radioactive Release Control	2
CPS 5062.01	Alarm Panel Annunciators - Row 1	30
CPS 5062.02	Alarm Panel Annunciators - Row 2	28
CPS 5062.03	Alarm Panel Annunciators - Row 3	29A
CPS 5062.04	Alarm Panel Annunciators - Row 4	27
CPS 5062.05	Alarm Panel Annunciators - Row 5	28
CPS 5062.06	Alarm Panel Annunciators - Row 6	27
CPS 5062.07	Alarm Panel Annunciators - Row 7	29
CPS 5062.08	Alarm Panel Annunciators - Row 8	26A
CPS 8130.01	HX Maint/Repairs	1A
CPS 9051.01	HPCS Pump & H_2O Leg Pump Operability	41A
CPS 9051.02	HPCS Valve Operability Test	38C
CPS 9051.05	HPCS Discharge Header Filled & Flow Path Verification	27

REFERENCES

Number	Description/Title	Date/Revision
----------	Vortices at Intakes in Conventional Sumps by Dr. Y. R. Reddy & J. A. Pickford (H_2O Power)	March 1972
----------	Clinton Field Wkdn Plan for Containment Coatings	August 19, 1998
----------	Small Scale ECCS Suction Strainer Performance Testing Final Test Report	June 4, 1999
----------	Alternate Computation of CPS RCIC Vortex Limits Using VYC-184 Methods (Preliminary)	December 6, 2005
1^{ST}-CPS-BDOC-V-10	Clinton IST Bases Document; HPCS Suction Check Valve from RCIC H_20 Storage TK	September 20, 2004
8020 VMT 1F-7564 (218 HPCS)	Technical Manual for Vertical HPCS Pump	March 15, 1979
EC-341456	Div III DG JW Cooler Data Performance Eval 2002	0
EC-344412	Div III DG JW Cooler Data Performance Eval 2003	0
EC-351018	Div III DG JW Cooler Data Performance Eval 2004	0
Fail-0998	HPCS H_2O Leg Pump	April 12, 1977
GE NEDC 31322	BWROG Report on Design Basis of Safety-Related MOVs, Paragraph 2.1	0
K2801-0024	Vertical HPCS Pump	4
K-2905B	Performance Data Sht For 1VX06CC	Amendment 3
K-2902	Performance Data Sht For 1VX02SC	Amendment 3
LER91-003-00	Jarring Div III DG BKR Cubicle Panel Door by Utility Maint Personnel Resulted in Auto Start of Div III DG	March 20, 1991
Letter Y-108397	Unqualified Coatings List - Quantity Coatings Debris	October 14, 1998

SURVEILLANCES

Number	Description/Title	Date/Revision
9051.02	HPCS Pump Discharge Valve Operability Test	February 22, 2004
9051.02	HPCS Pump Discharge Valve Operability Test	February 23, 2005
9080.23	Div III Integrated Test	April 16, 2002
9080.23	Div III Integrated Test	December 10, 2004

WORK DOCUMENTS

WO Number	Description/Title	Date/Revision
019006	Clean DG3 HX	May 31, 2001
130497	Degrading Lugs Noticed on Relays 27SY & 27SX	February 4, 2004
173433	BKR for Div III DG Feed Failed Gap Check	March 30, 2005
192234	Retube HX	June 16, 1998
397073	ECCS HPCS RCIC H_20 Storage TK Level Calibration	April 30, 2003
397074	HPCS Suppression Pool H_2O Level Calibration	April 30, 2003
397804	EM Replace Output Filter Caps & Control Boards A & B	February 21, 2004
397928	HPCS Pump Discharge Min Flow D/P XMTR Calibration	April 29, 2003
448092	U1 Suppression Pool Inspections/Desludge	February 15, 2004
517983	Clean DG3 HX	October 26, 2003
573235	ECCS HPCS RCIC H_20 Storage TK Level Calibration	October 29, 2004
573237	HPCS Suppression Pool H_2O Level Calibration	November 1, 2004
574477	HPCS Pump Discharge Pressure XMTR Calibration	October 26, 2004
669291	HPCS Suppression Pool H_2O Level Calibration	April 17, 2004
675898	HPCS Pump Discharge Min Flow D/P XMTR Calibration	October 27, 2004
684896	Perform Trip-Point Calibration	September 27, 2005
715892	HPCS Suppression Pool H_2O Level Calibration	October 26, 2005
751160 01	9051.01R22 OP HPCS Pump & H_2O Leg Pump Oper (Recirc Storage TK)	January 24, 2005
775923 01	9051.01R22 OP HPCS Pump & H_2O Leg Pump Oper (Recirc Storage TK)	April 27, 2005
794782	Clean DG3 HX	October 24, 2005
796603	BKR for Div III DG Feed Failed Gap Check	April 4, 2005
806192 01	9051.01R22 OP HPCS Pump & H_2O Leg Pump Oper (Recirc Storage TK)	July 25, 2005
833099 01	9051.01R22 OP HPCS Pump & H_2O Leg Pump Oper (Recirc Storage TK)	October 25, 2005

LIST OF ACRONYMS USED

ADAMS	Agency-wide Document Access and Management System
AOV	Air Operated Valve
App	Appendix
Assoc	Associated
ATTN	Attention
BKR	Breaker
BWROG	Boiling Water Reactors Owners Group
CFR	Code of Federal Regulations
Corp	Corporation
CPS	Clinton Power Station
CR	Condition Report
D/P	Differential Press
DC or dc	Direct Current
DG	Diesel Generator
Div	Division
DPR	Demonstration Power Reactor
DWG	Drawing
DRS	Division of Reactor Safety
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EOP	Emergency Operating Procedure
EPU	Extended Power Up-rate
EQ	Environmental Qualification
Eval	Evaluation
FSA	Focused Self Assessment
FDR	Feeder
Flex	Flexible
gov	Goverment
Hdwhl	Handwheel
HELB	High Energy Line Break
HPCS	High Pressure Core Spray
html	Hypertext Markup Language
H_2O	Water
http	Hypertext Transfer Protocol
HVAC	Heating, Ventilation and Air Conditioning
HX	Heat Exchanger
IMC	Inspection Manual Chapter
IR	Inspection Report
IST	In-service Testing
JW	Jacket-Water
LLC	Limited Liability Company
Maint	Maintenance

LIST OF ACRONYMS USED

MSIV	Main Steam Isolation Valve
NCV	Non-Cited Violation
MOV	Motor Operated Valve
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
NUREG	NRC Technical Report Designation
OE	Operability Evaluation
OOS	Out-of-Service
OP	Operating
Oper	Operation
OPX	Operating Experience
PARS	Publically Available Records System
Press	Pressure
RCIC	Reactor Core Isolation Cooling
Rev	Revision
RHR	Residual Heat Removal System
Rm	Room
RPV	Reactor Pressure Vessel
SBO	Station Blackout
SDP	Significance Determination Process
Spec	Specification
SSW	Shutdown Service Water
TDR	Time Delay Relay
Surv	Surveillance
SWGR	Switchgear
Sys	System
Temp	Temperature
TS	Technical Specifications
U	Unit
URI	Unresolved Item
USAR	Updated Safety Analysis Report
UV	Undervoltage
V	Volt
Wkdn	Walkdown
WO	Work Order
wpd	WordPerfect Document
www	World Wide Web
XMTR	Transmitter
XMTRs	Transmitters