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

January 15, 2015

Mr. Michael J. Pacilio
Senior VP, Exelon Generation Co., LLC
President and CNO, Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2, COMPONENT DESIGN BASES INSPECTION 05000254/2014008; 05000265/2014008

Dear Mr. Pacilio:

On December 5, 2014, the U.S. Nuclear Regulatory Commission (NRC) completed a Component Design Bases Inspection (CDBI) at your Quad Cities Nuclear Power Station, Units 1 and 2. The enclosed report documents the results of this inspection, which were discussed on December 5, 2014, with Mr. S. Darin, and other members of your staff.

Based on the results of this inspection, one NRC-identified finding of very low safety significance was identified. The finding involved a violation of NRC requirements. However, because of its very low safety significance, and because the issue was entered into your corrective action program, the NRC is treating the issue as a Non-Cited Violation (NCV) in accordance with Section 2.3.2 of the NRC Enforcement Policy

If you contest the subject or severity of this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Quad Cities Nuclear Power Station. In addition, if you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region III, and the NRC Resident Inspector at the Quad Cities Nuclear Power Station.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, “Public Inspections, Exemptions, Requests for Withholding,” of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC’s Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

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

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

Enclosure:
Inspection Report 05000254/2014008; 05000265/2014008
w/Attachment: Supplemental Information

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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:	05000254/2014008; 05000265/2014008
Licensee:	Exelon Generation Company, LLC
Facility:	Quad Cities Nuclear Power Station, Units 1 and 2
Location:	Cordova, IL
Dates:	November 3 – 7, 2014; November 17 – 21, 2014; and December 1 – 5, 2014
Inspectors:	A. Dunlop, Senior Engineering Inspector, Lead B. Jose, Senior Engineering Inspector, Electrical G. O'Dwyer, Engineering Inspector, Mechanical R. Walton, Operations Inspector S. Kobylarz, Electrical Contractor C. Baron, Mechanical Contractor
Observer:	M. Jeffers, Engineering Inspector, Electrical
Approved by:	Ann Marie Stone, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY

Inspection Report 05000254/2014008, 05000265/2014008; 11/03/2014 – 12/05/2014; Quad Cities Nuclear Power Station, Units 1 and 2; Component Design Bases Inspection (CDBI).

The inspection was a 3-week onsite baseline inspection that focused on the design of components. The inspection was conducted by regional engineering inspectors and two consultants. One Green finding was identified by the inspectors. The finding was considered a Non-Cited Violation (NCV) of NRC regulations. The significance of inspection findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using IMC 0609, "Significance Determination Process" dated June 2, 2011. Cross-cutting aspects are determined using IMC 0310, "Aspects Within the Cross-Cutting Areas" effective date December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated July 9, 2013. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process" Revision 5, dated February 2014.

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified a finding of very low safety significance and associated NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the licensee's failure to effectively identify, evaluate, and document aging effects on plant equipment and structures as part of the licensee's Aging Management Programs for a plant within its period of extended operation. The inspectors identified two corroded pipe supports and associated base plates in the Unit 1 high pressure coolant injection (HPCI) room as well as a severely corroded nut and stud on the 1/2 diesel generator cooling water pump outboard mechanical seal. These conditions had not been previously identified, evaluated, or documented. The licensee entered this finding into their Corrective Action Program.

  The performance deficiency was determined to be more than minor and a finding in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening," because if left uncorrected, the performance deficiency would have the potential to lead to a more significant safety concern. The finding screened as very low safety significance (Green) because the inspectors were able to answer "No" to each screening question, because the conditions had not yet affected structural integrity or operability of the systems. Specifically, the licensee confirmed the HPCI supports would be capable to perform their function and the remaining bolts on the mechanical seal were sufficient to prevent excessive leakage. The inspectors identified a cross-cutting aspect associated with this finding in the area of Human Performance, Resources component, because the licensee did not ensure that personnel, equipment, procedures, and other resources are adequate to assure nuclear safety by maintaining long term plant safety. [H.1] (Section 1R21.3.b.(1))

B. Licensee-Identified Violations

No violations were identified.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Introduction

The objective of the component design bases inspection is to verify that design bases have been correctly implemented for the selected risk significant components and that operating procedures and operator actions are consistent with design and licensing bases. As plants age, their design bases may be difficult to determine and an important design feature may be altered or disabled during a modification. The Probabilistic Risk-Assessment (PRA) model assumes the capability of safety systems and components to perform their intended safety function successfully. This inspectable area verifies aspects of the Initiating Events, Mitigating Systems, and Barrier Integrity cornerstones for which there are no indicators to measure performance.

Specific documents reviewed during the inspection are listed in the Attachment to the report.

.2 Inspection Sample Selection Process

The inspectors used information contained in the licensee's PRA and the Quad Cities Nuclear Power Station, Units 1 and 2, Standardized Plant Analysis Risk Model to identify a scenario to use as the basis for component selection. The scenario selected was an Anticipated Transient without Scram (ATWS). Based on this scenario, a number of risk significant components, including those with Large Early Release Frequency (LERF) implications, were selected for the inspection.

The inspectors also used additional component information such as a margin assessment in the selection process. This design margin assessment considered original design reductions caused by design modification, power uprates, or reductions due to degraded material condition. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as performance test results, significant corrective actions, repeated maintenance activities, Maintenance Rule (a)(1) status, components requiring an operability evaluation, NRC resident inspector input of problem areas/equipment, and system health reports. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in depth margins. A summary of the reviews performed and the specific inspection findings identified are included in the following sections of the report.

The inspectors also identified procedures and modifications for review that were associated with the selected components. In addition, the inspectors selected operating experience issues associated with the selected components.

This inspection constituted 17 samples as defined in Inspection Procedure 71111.21-05. [12 Non-LERF components, 2 LERF components, and 3 operating experience]

.3 Component Design

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TS), design basis documents, drawings, calculations and other available design basis information, to determine the performance requirements of the selected components. The inspectors used applicable industry standards, such as the American Society of Mechanical Engineers (ASME) Code, Institute of Electrical and Electronics Engineers (IEEE) Standards, and the National Electric Code, to evaluate acceptability of the systems' design. The NRC also evaluated licensee actions, if any, taken in response to NRC issued operating experience, such as Bulletins, Generic Letters (GLs), Regulatory Issue Summaries (RISs), and Information Notices (INs). The review was to verify that the selected components would function as designed when required and support proper operation of the associated systems. The attributes that were needed for a component to perform its required function included process medium, energy sources, control systems, operator actions, and heat removal. The attributes to verify that the component condition and tested capability was consistent with the design bases and was appropriate may include installed configuration, system operation, detailed design, system testing, equipment and environmental qualification, equipment protection, component inputs and outputs, operating experience, and component degradation.

For each of the components selected, the inspectors reviewed the maintenance history, preventive maintenance activities, system health reports, operating experience-related information, vendor manuals, electrical and mechanical drawings, and licensee Corrective Action Program documents. Field walkdowns were conducted for all accessible components to assess material condition, including age-related degradation and to verify that the as-built condition was consistent with the design. Other attributes reviewed are included as part of the scope for each individual component.

The following 14 components, including 2 with LERF implications, were reviewed:

- High Pressure Coolant Injection (HPCI) Pump/Turbine Driver (1-2302/1-2303): The inspectors reviewed the design basis of the pump and turbine driver including performance requirements, net positive suction head (NPSH) requirements, and temperature limits. The inspectors reviewed normal, test, and emergency procedures as well as the potential for system water hammer during pump shutdown. The inspectors reviewed the function of the HPCI pump during a postulated ATWS event. The inspectors reviewed surveillance test procedures and recent test results to verify acceptance criteria were met and performance degradation would be identified.

- Contaminated Condensate Storage Tanks (CCSTs) (0-3303A/B): The inspectors reviewed the design basis of the tanks to verify their capability to supply the required inventory to the HPCI and reactor core isolation cooling systems during postulated transient and accident conditions. The CCST level setpoint analyses were reviewed to verify the transfer from the CCSTs to the torus would automatically occur prior to significant vortexing, which could result in air reaching the pump suctions. The inspectors reviewed the operator actions

required to maintain the tanks above the minimum allowable temperature limit. The inspectors also reviewed the criteria for transferring the HPCI pump suction from the torus to the CCST during a postulated ATWS event.

- HPCI Turbine Exhaust Check Valve (1-2301-45): The inspectors reviewed the design basis of the check valve, located in the steam exhaust line from the HPCI pump turbine driver. The inspectors reviewed normal, test, and emergency procedures associated with HPCI system operation. The inspectors also reviewed the pressure drop analysis prepared for the replacement check valve.

- HPCI Minimum Flow Valve (1-2301-14): The inspectors reviewed the motor-operated valve (MOV) calculations, including required thrust, weak link, and maximum differential pressure, to ensure the valve was capable of functioning under design and licensing bases conditions. Diagnostic and Inservice test (IST) results were reviewed to verify acceptance criteria were met and performance degradation would be identified. The inspectors reviewed the control logic and opening/closing setpoints to ensure the valve functions as designed to meet HPCI system requirements.

- Safety Relief Valve (1-0203-3A): The inspectors reviewed the design basis of the air-operated safety relief valve (SRV) including requirements for the valve to operate under postulated transient and accident conditions. This review included the capacity of the safety-related pneumatic supply system to open the valve under the most limiting conditions. The inspectors reviewed surveillance test procedures as well as the results of recent tests to verify acceptance criteria were met and performance degradation would be identified. The inspectors also reviewed the capability of the valve to operate multiple times under the most limiting temperature and pressure conditions. The inspectors reviewed elementary diagrams to confirm that the SRV solenoid valve operation conformed to the design requirements. The inspectors reviewed 125Vdc voltage drop analysis to confirm that the SRV solenoid valve received adequate voltage to operate during the most limiting battery conditions, during normal and accident environmental conditions, and for the most limiting operating service conditions. The inspectors confirmed that the cabling to the solenoid valve was adequately sized. The inspectors also reviewed preventive maintenance performed to confirm that the solenoid coils were installed and maintained as required by the equipment qualification.

- Main Steam Isolation Valve (1-202-001A): The inspectors reviewed the design basis of the main steam isolation valve (MSIV), the basis for its closure time requirements, and the associated control logic. The inspectors reviewed normal, test, and emergency procedures. The inspectors reviewed air accumulator leakage limits, leak test procedures, and recent results to verify acceptance criteria were met and performance degradation would be identified. The inspectors reviewed closure time surveillance procedures and recent results to verify that the test results were representative of the most limiting postulated accident conditions. The inspectors reviewed the testing of the control circuits required to close the MSIVs to ensure that the testing was comprehensive and the valves would close as required in the event of a single failure of the control circuit. The inspectors also reviewed photographs of the valve to verify its material condition. The inspectors reviewed elementary diagrams to confirm that the SRV solenoid valve operation conformed to the design requirements. The

inspectors reviewed the testing performed for the primary containment isolation system logic to confirm proper operation for the control circuit that removed power from the solenoid valve(s). The inspectors also reviewed preventive maintenance performed to confirm that the solenoid coils were installed and maintained as required by the equipment qualification.

- Reserve Auxiliary Transformer 12 (T12): The inspectors reviewed one-line diagram and protective relaying schematic diagrams to determine the overcurrent protection requirements. The inspectors reviewed the load flow analysis, the short circuit current calculation, and the coordination calculation to confirm proper coordination for transformer protection and the downstream bus incoming circuit breakers. The breaker calibration test results were reviewed to confirm the main incoming bus breaker settings were in conformance with the coordination analysis. The inspectors also verified the preventive maintenance performed on the transformer and transformer auxiliaries was in accordance with vendor recommendations.

- Turbine Building 125Vdc Main Bus 1A: The inspectors reviewed 125Vdc short circuit calculations and verified the interrupting ratings of the fuses and the molded-case circuit breakers were well above the calculated short circuit currents. The 125Vdc voltage drop calculations were reviewed to determine if adequate voltage would be available for the breakers' open and close coils and spring charging motors. The inspectors reviewed the motor control logic diagrams and the 125Vdc voltage drop calculation to ensure adequate voltage would be available for the control circuit components under all design basis conditions. The inspectors also reviewed the 125Vdc short circuit and coordination calculations to assure coordination between the motor feed breaker open and close control circuit fuses, and 125Vdc supply breakers and to verify the interrupting ratings of the control circuit fuses and the 125Vdc control power feed breaker.

- Reactor Building 125Vdc Distribution Panel 1: The inspectors reviewed 125Vdc short circuit calculations and verified the interrupting ratings of the fuses and the molded-case circuit breakers were well above the calculated short circuit currents. The 125Vdc voltage calculations were reviewed to determine if adequate voltage would be available for the 4 kV breaker control components. The inspectors reviewed the panel feeder and branch circuit power cable sizes and ampacities and verified those cables are adequately sized. The inspectors also reviewed the 125Vdc short circuit and coordination calculations to assure coordination between the motor feed breaker open and close control circuit fuses, and 125Vdc supply breakers and to verify the interrupting ratings of the control circuit fuses and the 125Vdc control power feed breaker.

- 4160Vac Essential Switchgear Bus 13-1: The inspectors reviewed vendor specifications, name plate data, one-line diagrams, design basis descriptions, drawings, calculations of short circuit, voltage drop, protective relay trip setpoints, and the Essential Bus 13-1 loading requirements to evaluate the capability of the 4 kV Bus to supply the voltage and current requirements to one train of essential loads. The inspectors reviewed the short circuit, voltage drop, bus, and feeder protective relay trip settings to verify they were not exceeded and the bus undervoltage and overcurrent relays were appropriately coordinated for fault conditions. The inspectors reviewed the licensee's evaluation and subsequent

corrective actions for the degraded grease in Merlin Gerin circuit breakers. Records of system voltage profiles were reviewed from the load flow calculations to verify they were consistent with the design basis assumptions. The inspectors verified the feeder cable size and ampacity was adequate to carry the maximum load current. The inspectors also verified the maximum short circuit current available at the bus was within the interrupting capacity of the feeder breaker. The inspectors reviewed the 125Vdc voltage drop calculations to verify the control components for the 4 kV breakers had sufficient voltage to operate. Also, the inspectors reviewed the 4 kV breaker setpoints to verify the coordination of the load breakers and the Bus feeder breaker. The inspectors also reviewed the licensee's practice for periodic replacement of Agastat relays used in various control circuits. The inspectors performed walkdowns of the 4 kV Essential Bus 13-1 to verify circuit breaker control switches and breaker position indicating lights were consistent with design drawings.

- Standby Liquid Control (SBLC) System Pump (1-1102-A): The inspectors reviewed system hydraulic calculations such as NPSH and minimum flow required to ensure the pump was capable of providing its accident mitigating function. Design change history, corrective actions, surveillance results, and trending data were reviewed to assess potential component degradation and impact on design margins. The inspectors reviewed the modification to increase the sodium pentaborate tank Boron 10 enrichment thereby requiring only one SBLC pump. The inspectors ensured the pump testing met the requirements of Unit 1 License Amendment 235, design calculations, and TS surveillance requirements. The inspectors reviewed control and schematic diagrams to confirm that the operation of pump conformed to the design requirements and operating procedures. The inspectors also reviewed the instrumentation used for the operation of the pump, power supply, and setpoint calculations. The review also verified that the pump motor was adequately protected and that adequate control voltage was available for the operation of the control components. The inspectors reviewed voltage drop calculations to determine whether the pump motor had adequate voltage for running and starting and that the power and control cables had adequate ampacity for the operating conditions.

- Recirculation Pump Trip (RPT)/Alternate Rod Insertion (ARI): The inspectors reviewed control, schematic, and logic diagrams associated with RPT/ARI in response to an ATWS scenario to verify their operation conformed to the design requirements and operating procedures. The testing procedures for RPT/ARI logic were reviewed to verify the logic was adequately tested. The inspectors reviewed the voltage drop calculations to verify the control components in the RPT/ARI circuits have adequate voltage to operate properly. The inspectors also reviewed the operations procedures for manually initiating ARI system and verified the procedures can be performed as written.

- Diesel Generator Cooling Water (DGCW) Pump (DGCWP 1-3903): The inspectors reviewed DGCW pump parts material changes when modified during the 2008 through 2011 timeframe to verify the material was acceptable for the environmental conditions and pump performance was adequately reflected in the DGCW system flow balance, design calculations, and surveillance test acceptance criteria. Calculations for normal and design basis accident conditions were reviewed to verify that sufficient DGCW system flow and NPSH were available for worst case conditions including minimum screenhouse intake

bay level and maximum temperature. System operating procedures were reviewed to determine whether design basis conditions were reflected in procedures. Test results were reviewed to ensure pump performance was consistent with the IST acceptance criteria and results were monitored for signs of pump degradation. The inspectors reviewed elementary diagrams to confirm that the pump operation conformed to the design requirements. The inspectors reviewed the one-line diagram and the motor overload protection calculation to confirm proper selection of the motor circuit and motor overload protection. The voltage drop calculations were reviewed to determine whether the motors had adequate voltage for starting and running under degraded voltage conditions and that the motor circuit cabling had adequate ampacity. The inspectors also reviewed control voltage to verify it was adequate for operation of the motor starter contactor. The inspectors reviewed the adequacy of the motor size based on worse case design conditions affecting pump break horsepower. The inspectors reviewed the certified pump vendor performance data to confirm that the analyzed value for pump motor load in the load flow analysis was consistent with the vendor data for the pump break horsepower requirement.

- 480Vac Reactor Building Essential Service Motor Control Center (MCC 18-1A): The inspectors reviewed the one-line diagram, the load flow analysis, the short circuit current calculation, and the coordination calculation to confirm the short circuit duty and the proper coordination between the MCC breakers with the upstream protective device. The inspectors reviewed the breaker calibration test results to confirm the main incoming breaker settings were in conformance with the coordination analysis. The inspectors also reviewed the load flow and short circuit duty requirement to confirm the adequacy of the motor control center bus and circuit breaker interrupting ratings.

b. Findings

(1) Failure to Identify Aging Effects on Plant Equipment and Structures

Introduction: The inspectors identified a finding of very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” for the licensee’s failure to effectively identify, evaluate, and document aging effects on plant equipment and structures as part of the licensee’s Aging Management Programs (AMPs) for a plant within its period of extended operation. The inspectors identified two corroded pipe supports and associated base plates in the Unit 1 HPCI room as well as a severely corroded nut and stud on the 1/2 DGCW pump outboard mechanical seal. These conditions had not been previously documented in the licensee’s Corrective Action Program.

Description: The inspectors performed limited walkdowns of plant equipment and structures as part of the inspection activities for the selected components. These walkdowns included the Unit 1 HPCI pump and associated equipment, as well as the 1/2 DGCW pump and associated equipment. These walkdowns were performed to verify the material condition of plant equipment and structures. During two separate walkdowns, the inspectors identified adverse conditions that had not been previously documented by plant personnel.

- The inspectors identified two pipe support base plates in the Unit 1 HPCI room that were corroded due to apparent ground water intrusion through the south wall. One

support was associated with line 1-2342-12”-C (HPCI pump test line), and the other was associated with line 1-2315-4”-LX (HPCI cooling water line). The licensee stated that this condition had not been previously identified, evaluated, and documented.

The inspectors questioned why this condition had not been previously identified and documented by the licensee’s AMP for Structures Monitoring to facilitate monitoring of age-related degradation. The licensee stated that the subject pipe supports were not within the sample set of structural components specifically monitored by ER-AA-450, “Structures Monitoring Program.” The licensee also stated that the Unit 1 HPCI room was subject to a structural examination on a 5-year frequency and that one pipe support in the room was within the sample set of the program; this pipe support was not located on the exterior wall affected by ground water intrusion. The inspectors reviewed the most recent Structures Monitoring report for the Unit 1 HPCI room, completed on July 13, 2012; the report stated that, “All component supports were found to be acceptable,” with only minor water seepage noted on the exterior wall.

The licensee stated that the Structures Monitoring Program also relied on routine walkdowns for the identification of degraded conditions. The inspectors reviewed the most recent system engineer’s walkdown checklist for the Unit 1 HPCI system, completed on November 20, 2014, which was performed after the inspectors’ walkdown. The checklist stated that, “Material condition of components, supports, hangers are acceptable.”

In response to the inspectors’ identification of this condition, the licensee initiated Action Request (AR)02407265 on November 4, 2014. The licensee stated that the supports were evaluated utilizing the criteria from the Structures Monitoring Program, ER-AA-450, and found to be capable of performing their structural functions. Based on a structural engineering review, the licensee determined that the supports were “acceptable with deficiencies.”

- On November 20, 2014, the inspectors identified a severely corroded nut and stud on the 1/2 DGCW pump outboard mechanical seal. This corrosion appeared to have significantly reduced the mechanical integrity of the lowest nut and stud affixing the outboard gland seal plate to pump. In addition, the inspectors found the other three nuts and studs on the seal plate to be moderately corroded. The licensee stated that this condition had not been previously identified and documented.

  The inspectors questioned why this condition had not been previously identified and documented by the licensee’s AMP for Bolting Integrity or Open-Cycle Cooling Water to facilitate monitoring of age-related degradation. The licensee stated the AMPs rely on routine walkdowns, including system engineers’ quarterly walkdowns, for the identification of degraded conditions. The licensee did not identify the corrosion issue during routine system walkdowns. The inspectors noted that there was a deficiency tag on the DGCW pump, but it only addressed the pump casing, which needed to be cleaned (2012). However, the degradation on the seal nuts and bolts was not identified even though they were in close proximately to the identified condition. The inspectors also noted that licensee personnel had performed QCOS-06, “Diesel Generator Cooling Water Pump flow Rate Test”, on the 1/2 DGCW pump on September 29, 2014. Steps H.3.b and H.3.p.(1) of QCOS-06 required a visual inspection of the DGCW pump, and associated piping and valves

for leakage. Licensee personnel did not identify the corrosion on the mechanical seal during performance of this test.

In response to the inspectors' identification of this condition, the licensee initiated AR02415422. The licensee assessed the condition of the pump and determined that it was operable because the corroded nuts and studs were still capable of maintaining the seal intact and there was no visible seal leakage. In addition, the pump had passed all recent surveillance tests and the gland seal plate only had to resist low system pressure. The AR stated that the nuts and studs would be inspected and replaced as required.

Because the inspectors identified several adverse conditions not previously identified and documented by plant personnel, the inspectors questioned the effectiveness of the AMPs to identify age-related degradation to ensure they were adequately monitored, assessed for functional capability, and corrected as needed. The inspectors questioned how degraded conditions were being monitored, and observed that neither the Structures Monitoring reports nor the system engineer's walkdown checklist included descriptions or other documentation of age-related degradation that was determined to be acceptable. The inspectors determined that the licensee had not effectively identified, documented, or monitored these degraded conditions. In response to these concerns, the licensee initiated AR02420743 on December 4, 2014.

The licensee provided the inspectors a number of recent ARs that identified corrosion issues. The inspectors' review determined the issues that were identified appeared to be adequately addressed by the programs such that the inspectors' concern was related to the thoroughness of the inspections/walkdowns in identifying issues that need to be either monitored or corrected.

Analysis: The inspectors determined that the failure of licensee personnel to effectively identify, and evaluate aging effects on structures and plant equipment was a performance deficiency that warranted a significance evaluation. The performance deficiency was determined to be more than minor and a finding in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening," because if left uncorrected, the performance deficiency would have the potential to lead to a more significant safety concern. Specifically, the failure of licensee personnel to effectively identify and evaluate aging effects on plant equipment and structures could allow equipment to continue to degrade to failure. For example, with additional degradation, DGCW pump seal plate may begin to leak and eventually fail. Failure of the 1/2 DGCW pump would result in the loss of the 1/2 emergency diesel generator (EDG). Therefore, this condition, if left uncorrected, could lead to undetected corrosion failures in carbon steel components affecting the reliability and capability of the DGCW system. Similarly, the continued corrosion on HPCI pipe supports could lead to a loss of structural integrity of safety-related pipe supports and affect the capability of the HPCI system to perform its safety function.

The inspectors determined the finding could be evaluated using the Significance Determination Process (SDP) in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I-Initial Screening and Characterization of Findings," Table 4a for the Mitigating System cornerstone. The finding screened as very low safety significance (Green) because the inspectors were able to answer "No" to each screening question, because the conditions had not yet affected structural integrity or operability of the systems. Specifically, the licensee confirmed the HPCI supports would

be capable to perform their function and the remaining bolts on the mechanical seal were sufficient to prevent excessive leakage.

The inspectors identified a cross-cutting aspect associated with this finding in the area of Human Performance, Resources component, because the licensee did not ensure that personnel, equipment, procedures, and other resources are adequate to assure nuclear safety by maintaining long term plant safety. [H.1]

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

Contrary to the above, as of November 4, 2014, and November 20, 2014, respectively, the licensee failed to identify conditions adverse to quality. Specifically, the inspectors identified aging effects on plant equipment and structures that were not previously identified by the licensee's Aging Management Programs. This included two corroded pipe supports and associated base plates in the Unit 1 HPCI room as well as a severely corroded nut and stud on the 1/2 DGCW pump outboard mechanical seal.

Because this violation was of very low safety significance, and it was entered into the licensee's Corrective Action Program as AR02415422, AR02407265, and AR02420743, which concluded the deficient equipment could perform their intended function, this violation is being treated as a non-cited violation (NCV), consistent with Section 2.3.2 of the NRC Enforcement Policy. [NCV 05000254/2014008-01; 05000265/2014008-01, Failure to Identify Aging Effects on Plant Equipment and Structures.]

(2) Non-Conservative DGCW Pump Break Horsepower Assumed in EDG Loading Analysis

Introduction: The inspectors identified an unresolved item (URI) regarding the motor load measured by the licensee for the Unit 1 DGCW pump that was determined to be less than the vendor certified pump performance data and pump load break horsepower (BHP) requirement at maximum flow conditions. Field measured pump motor load data was evaluated by the licensee and utilized as a design input in the Electrical Transient Analysis Program (ETAP) analysis for the emergency bus loading on offsite power and for the bus loading when powered by the EDG.

Description: The licensee did not fully evaluate and reconcile the effects on electrical bus and EDG loading analyses for the required pump BHP for the expected pump flow conditions, when the Unit 1 DGCW pump impeller was replaced in 2011 under work order (WO) 01301062 and evaluated under engineering change (EC) 369825. This condition was entered into the corrective action program as AR2420101 and AR2420905.

The inspectors noted the licensee did not use vendor certified pump performance data when they evaluated the effects of the pump impeller replacement on the motor load. Instead, the licensee used field measured electrical load data as a design input to the ETAP electrical calculations for bus load flow and EDG loading, which the inspectors determined resulted in the bus and EDG loading being non-conservative. Technical Specification surveillance requirement (SR) 3.8.1.15 required loading the EDG between ≥ 2340 and ≤ 2600 kW for 22 hours and between ≥ 2730 and ≤ 2860 kW for 2 hours. The inspectors determined for the 1/2 EDG (which the licensee identified had the worst

case loading), the margin between the actual EDG accident loading and the 2-hour minimum surveillance limit of 2730 kW was further reduced as a result of the increase in required pump brake horsepower from 90 to 101 BHP based on vendor certified pump performance data. The licensee concluded the pump brake horsepower increased only 5 HP, from 90 to 95 BHP, based on their field measurements of voltage and line current, but failed to reconcile the 5 HP load increase with vendor certified pump performance curve, which required approximately 101 BHP, or an 11 HP increase, at the established flow condition (1650 gpm). The licensee determined the additional increase in pump horsepower, when considering the vendor certified BHP for the pump at maximum flow conditions, remained within the minimum 2-hr load capability requirement established for TS SR 3.8.1.15.

The inspectors determined the vendor's pump load requirement derived from the certified pump performance curve of 101 BHP was approximately 6 HP more than the load determined by the licensee by field measurement of motor current and voltage. Field measurement of motor current and voltage was a licensee approved method in standard NES-EIC-11.01, "Use of Analytical Software for AC Auxiliary Power System Analysis," to determine pump horsepower load for input to the ETAP analysis. The inspectors were concerned that if other load inputs to ETAP, derived from the measurement of voltage and current conditions, were also found to be less than actual maximum design basis load conditions, the EDG load could be adversely impacted. Resolution of this issue will be based on a licensee evaluation for the extent of condition for any additional impact on the subject bus loading conditions. Pending resolution, this item will be tracked as an unresolved item. [URI 05000254/2014008-02; 05000265/2014008-02, Non-Conservative DGCW Pump Break Horsepower Assumed in EDG Loading Analysis.]

(3) Testing of MSIVs with Instrument Air or Drywell Pneumatic System Aligned to Actuators

Introduction: The inspectors identified an unresolved issue (URI) regarding the testing of the MSIVs. Specifically, the inspectors identified the MSIV closure timing surveillance tests were performed with non-safety related instrument air or the drywell pneumatic system aligned to the actuators. The inspectors were concerned that the surveillance test acceptance criteria could be non-conservative.

Description: The inspectors reviewed surveillance test Procedure QCOS 0250-04, "MSIV Closure Timing," and noted the MSIV fast closure testing (required by TS surveillance requirement (SR) 3.6.1.3.6 and the IST Program) was performed with non-safety-related instrument air or the drywell pneumatic system aligned to the actuators. The MSIVs were designed with safety-related accumulators to provide pressure to assist in closing the valves; however these air accumulators would be expected to provide less pressure than the non-safety-related instrument air or drywell pneumatic systems. Technical Specification SR 3.6.1.3.6 required verification that the isolation time of each MSIV will be ≥ 3 seconds and ≤ 5 seconds. The inspectors observed test Procedure QCOS 0250-04 included separate closure time acceptance criteria for hot and cold conditions, but did not include any acceptance criteria adjustments for the use of non-safety-related instrument air or the drywell pneumatic system. The inspectors were concerned the surveillance test maximum closing time acceptance criteria (≤ 5 seconds for cold valves) could be non-conservative. This concern was previously addressed by NRC IN 85-84, "Inadequate Inservice Testing of Main Steam Isolation Valves." At that time, the licensee's review of IN 85-84 stated the MSIV air supply isolation valve was closed during testing. On February 22, 1989,

General Electric Nuclear Services Information Letter (SIL) No. 482 was issued to address the effect of non-safety related air on the closure time testing of some MSIVs. The SIL indicated that testing of two Boiling Water Reactor MSIVs equipped with hydraulic self-compensation mechanisms resulted in a time increase of about 0.1 seconds when the non-safety-related air supply was disconnected. The installed MSIVs were also equipped with hydraulic self-compensation mechanisms. The SIL No. 482 also recommended testing to verify the effect of removing non-safety related air supplies. The SIL stated that if the closure time with the air disconnected increased less than 0.3 seconds, it would be acceptable to leave the non-safety-related air connected during closure time testing. The 0.3 second criterion was based on a typical "total allowable variation" of 0.5 seconds. This 0.5 margin was based on an historical practice of setting MSIV closure times between 3.5 and 4.5 seconds (light to light). In addition, the historical accident analyses were based on the MSIVs closing in less than 10 seconds (plus an additional 0.5 second allowance for instrument/control response). The current alternate source term accident analysis was based on the MSIVs closing within 5 seconds (plus an additional 0.5 second allowance for instrument/control response) under accident conditions (UFSAR Section 15.6.4.5.1). Based on the current alternate source term analysis, there was no allowance for margin between the as-found surveillance test acceptance criterion, the TS limit, and the analytical limit. It was unclear to the inspectors whether the licensee's basis to revise the test methodology to having non-safety air un-isolated was based on the SIL.

The licensee's evaluation of SIL No. 482, dated June 27, 1989, stated the MSIVs were tested with the non-safety-related instrument air or drywell pneumatic system aligned to the actuators. The evaluation also stated a special test was required to determine the effect of air pressure on MSIV closure time. The licensee determined the special test was performed with acceptable results to justify continued closure time testing with the non-safety related instrument air or the drywell pneumatic system aligned to the actuators. However, the actual test results were lost in the late 1980s due to a computer records failure. The licensee initiated AR02420923 on December 4, 2014, to address this issue.

The licensee was able to obtain MSIV closure time special test results for eight similar MSIVs from Dresden Station, performed in May 1992. The results indicated an average closure time increase of less than 0.1 seconds with non-safety related air disconnected. However, there was considerable variation in the individual MSIV test results. Based on the Dresden special test results, the records indicating that a special test was performed successfully, the most recent as-left MSIV closure time test results, and documentation from General Electric, the licensee determined the MSIVs remained operable.

Resolution of this issue will be based on additional analysis and/or testing by the licensee. This analysis/testing will determine if additional surveillance test acceptance criteria margin and/or a change in testing methodology will be required to ensure the MSIVs will close in the required time under the most limiting conditions. Specifically, the inspectors were concerned the current testing methodology (with the non-safety-related instrument air or drywell pneumatic system aligned to the actuators) could result in the MSIVs stroking faster than the most limiting accident conditions, with only safety-related accumulators available, which appeared to be a change from the testing methodology prior to IN 85-84. The inspectors were also concerned the recommendations of SIL No. 482 were not applicable to the current licensing/design basis because those recommendations were based on an assumed "total allowable variation" of 0.5 seconds. As discussed above, the alternate source term analysis

(performed after the SIL was issued) did not include any closure time margin beyond the as-found surveillance test acceptance criterion and the upper TS time limit. It appeared that any non-conservatism in the test methodology would be unacceptable unless the test acceptance criteria included explicit allowances for the difference between the test conditions and the most limiting accident conditions. Pending resolution, this item will be tracked as an unresolved item. [URI 05000254/2014008-03; 05000265/2014008-03, Testing of MSIVs with Instrument Air or Drywell Pneumatic System Aligned to Actuators.]

.4 Operating Experience

a. Inspection Scope

The inspectors reviewed three operating experience issues to ensure that NRC generic concerns had been adequately evaluated and addressed by the licensee. The operating experience issues listed below were reviewed as part of this inspection:

- IN 84-20, "Service Life of Relays in Safety-Related Systems,"
- IN 2009-09, "Improper Flow Controller Settings Renders Injection Systems Inoperable and Surveillance Did Not Identify"; and
- IN 2009-10, "Transformer Failures – Recent Operating Experience."

b. Findings

No findings of significance were identified.

.5 Modifications

a. Inspection Scope

The inspectors reviewed four permanent plant modifications related to selected risk significant components to verify that the design bases, licensing bases, and performance capability of the components had not been degraded through modifications. The modifications listed below were reviewed as part of this inspection effort:

- EC 351280, Replacement of Reserve Auxiliary Transformer;
- EC 349585, Increased the Sodium Pentaborate Tank Boron 10 Enrichment to Greater than or Equal to 45 Atomic Percent from 30 Atomic Percent thereby Requiring only one SBLC Pump;
- EC 365401, SBLC System Operation change from 2 Pumps to 1 Pump; and
- EC 355357, Replace Unit 1 DGCW Pump with Low NPSH Impeller.

b. Findings

No findings of significance were identified.

.6 Operating Procedure Accident Scenarios

a. Inspection Scope

The inspectors verified the licensed operators could perform risk significant, time critical operator actions associated with anticipated transient without scram (ATWS) events within the time assumed per design document OPTIMA2-TR026QC-ATWS.

These actions were selected from the licensee's PRA rankings of human action importance based on risk-achievement worth values. Where possible, margins were determined by the review of the assumed design basis and UFSAR response times and performance times documented by job performance measures and simulator scenario results. For the selected operator actions, the inspectors performed a detailed review and walk through of associated procedures, including observing the performance of simulated manual actions in the plant. Additionally, a licensed operator crew was evaluated for time critical actions using the station's simulator. The inspectors evaluated the manual actions both in-plant and in the simulator to assess operator knowledge level, and adequacy of procedures used and human actions performed as a result of an ATWS event. The procedures were compared to UFSAR, design assumptions, and training materials to verify consistency.

The following Time Critical Actions (TCAs) were evaluated:

- TCA12, Initiate SBLC during an ATWS with 110°F torus temperature;
- TCA13 , Initiate drywell sprays during an ATWS with >2.5 psig drywell pressure or drywell temperature >281°F;
- TCA14, Isolate feedwater during an ATWS; and
- TCA16 , Initiate suppression pool cooling during an ATWS.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

.1 Review of Items Entered Into the Corrective Action Program

a. Inspection Scope

The inspectors reviewed a sample of the selected component problems 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, corrective action documents written on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the corrective action program. The specific corrective action documents sampled and reviewed by the inspectors are listed in the Attachment to this report.

The inspectors also selected three issues identified during previous CDBIs to verify that the concern was adequately evaluated and corrective actions were identified and implemented to resolve the concern, as necessary. The following issues were reviewed:

- NCV 5000254/265/2011009-03; Safety-Related Battery Charger Testing and Maintenance Procedures Did Not Include Steps for Electrolytic Capacitor Replacement;

- NCV05000254/265/2008007-01; Use of Non-Conservative Inputs and Methodologies in Calculating Terminal Voltages to Safety-Related MOV Motors During Design Basis Events; and

- URI 05000254/265/2011009-05 and NCV 05000254/265/2012005-01; Diesel Generator Technical Specification Frequency and Voltage Variation not Considered in Loading Calculations.

b. Findings

No findings of significance were identified.

4OA6 Management Meetings

.1 Exit Meeting Summary

On December 5, 2014, the inspectors presented the inspection results to Mr. S. Darin, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. Several documents reviewed by the inspectors were considered proprietary information and were either returned to the licensee or handled in accordance with NRC policy on proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

S. Darin, Site Vice President
K. O'Shea, Plant Manager
R. Alkan, Electrical Design Engineer
W. Beck, Regulatory Assurance Manager
B. Brewer, System Engineer
H. Dodd, Site Maintenance Director
M. Dunlay, Mechanical Design Engineer
Y. Fedorov, Electrical Design Engineer
M. Fritch, Operations
J. Friedrichsen, Acting Nuclear Oversight Manager
S. Gundlach, Operations
M. MacLennan, Operations
K. Ohr, Site Engineering Director
T. Petersen, Regulatory Assurance
B. Stedman, Senior Engineering Manager
R. Swart, Design Engineering Manager
M. Uhrich, Mechanical Design Engineer
B. Wake, Shift Operations Superintendent

Nuclear Regulatory Commission

R. Murray, Senior Resident Inspector
K. Carrington, Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000254/2014008-01; 05000265/2014008-01	NCV	Failure to Identify Aging Effects on Plant Equipment and Structures (Section 1R21.3.b.(1))
05000254/2014008-02; 05000265/2014008-02	URI	Non-Conservative DGCW Pump Break Horsepower Assumed in EDG Loading Analysis (Section 1R21.3.b.(2))
05000254/2014008-03; 05000265/2014008-03	URI	Testing of MSIVs with Instrument Air or Drywell Pneumatic System Aligned to Actuators (Section 1R21.3.b.(3))

Closed

05000254/2014008-01; 05000265/2014008-01	NCV	Failure to Identify Aging Effects on Plant Equipment and Structures (Section 1R21.3.b.(1))

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 or Title	Revision
002N3585	MSIV Calculation Bases for Minimum Air Supply Pressure	0
01094-C-001	Fractional Area Evaluation of 20" Main Steam Isolation Valves for Dresden and Quad Cities Stations	1
01094-C-002	Stroke Time Evaluation of 20" Main Steam Isolation Valves for Dresden and Quad Cities Stations	1
01094-C-005	Sensitivity Study of Stroke Time Evaluation of 20" Main Steam Isolation Valves for Dresden and Quad Cities Stations	0
01094-L-003	Crane Main Steam Isolation Valve Flow Area Verse Time	0
0591-544-03	MSIV Accumulator 1-220-82A Capacity Check	0
0591-544-07	MSIV Accumulator 1-220-83A Capacity Check	0
5570-31-19-1	125 Vdc Fault Currents	2
7923-36-19-1	Safe Shutdown AC System Coordination	D
9149-20-19-1	125 Vdc Bus Voltage Calculation	10
DCR 990909	New Valve Thrust Limits for MOV 2 -2301-14 Due to Motor Weight Change	0
EC 360620	MSIV Closure Timing Acceptance Criteria	2
EC 365683	HPCI Pump Design Basis Performance Criteria	1
NUC-60	Air Accumulator System Analysis to Ensure Operability in LOCA for 1(2)-0203-3AB at Quad Cities and 2(3)-0203-3A/B at Dresden	2D
QC-019-E-002	4 kV Bus 13-1 (23-1) and 14-1 (24-1) Cross Tie Coordination Study	4
QDC-1000-M-0131	NPSH Availability vs. Requirements for DGCW and RHRSW Pumps	3, 3B
QDC-1100-M-0379	Hydraulic Model of Standby Liquid Control Injection	1
QDC-1100-M-1187	Justification of SBLC System Component Design to Meet EPU ATWS Conditions	0D
QDC-1100-M-1479	Shutdown Boron Capability For the SBLC Systems	1
QDC-1100-M-1650	Determination of Vortexing Levels of the SBLC tanks	0

CALCULATIONS

Number	Description or Title	Revision
QDC-2300-M-0189	Quad Cities HPCI NPSH Evaluation for Units 1 and 2	2
QDC-2300-M-0486	Verification of HPCI Pump Discharge Flow to Reactor	1
QDC-2300-M-0829	Pressure Drop Evaluation of HPCI Turbine Exhaust Check Valve 1(2)-2301-45	0
QDC-2300-M-0889	Evaluation of Pressure Drop in HPCI Turbine Steam Supply Line	0
QDC-2300-M-1323	High Pressure Coolant Injection System Combined DBD and DP Calculation	0, 0a, 0b
QDC-3300-M-0489	Useable Water Volume of Contaminated Condensate Storage Tanks for HPCI and RCIC, including Vortexing Considerations	3
QDC-6400-E-1505	Evaluating of RAT 22 Differential Relay (87T22) and RAT 12 Differential Relay (87T12)	1
QDC-6700-E-1503	AC Auxiliary Analysis	8
QDC-7300-E-0904	Setpoint Calculation for Phase Overcurrent Relays 51ST12 (22), ABB Type CO-7 for RAT 12 (22)	2
QUA-1-2301-14	MIDACALC Results for MOV 1-2301-14	5

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

Number	Description or Title	Date
02405877	Enhancement for Calculation QDC-0203-E-0943	11/03/14
02405944	Calculation Discrepancy for Calculation QC-019-E002	11/03/14
02406493	App R Light Pack Obstructed by Scaffold	11/04/14
02406983	Velcro Strap on Line 1-2398-3/4”	11/05/14
02407265	Pipe Support Base Plate Condition	11/05/14
02407369	1A SBLC Pump Motor Industrial Safety Screens Degraded	11/05/14
02407371	1B SBLC Pump Motor Industrial Safety Screens Degraded	11/05/14
02407373	2A SBLC Pump Motor Industrial Safety Screens Degraded	11/05/14
02407376	2B SBLC Pump Motor Industrial Safety Screens Degraded	11/05/14
02410267	Clarification Needed for UFSAR 7.8.3	11/11/14
02412124	1(2)-0203-3A MIN Operating Volt During LOCA	11/14/14
02413920	Breaker Test Equipment near Switchgear 24-1	11/18/14
02414803	Single Line Diagram 4E-1311 In Error	11/20/14
02415422	Severe Corrosion on Unit 0 DGCW Pump Gland Nuts and Studs	11/21/14
02415535	Procedure Enhancements on Notes	11/21/14
02416814	Light Corrosion on U1 DGCW Pump Flanges And Bolting	11/24/14
02420101	EDGCWP Motor Loading Requires Field Measurement	12/03/14
02420381	CDBI Questioned Control of DGCW Pump Vendor Drawing	12/03/14

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

Number	Description or Title	Date
02420743	NRC Identified Insights – System Walkdown Aging Monitoring	12/04/14
02420905	EDGCWP Measurement Does Not Match Pump Curve	12/04/14
02420923	Missing MSIV Special Test Results	12/04/14
02421106	Enhancement to Procedure ER-AA-321	12/05/14

CORRECTIVE ACTION DOCUMENTS REVIEWED DURING THE INSPECTION

Number	Description or Title	Date
00287784	Inspect/Repair Wiring LTC	11/19/08
00521373	OE23020 Potential for RCIC Water Hammer	08/18/06
00834888	DWG Does Not Match Field	10/22/08
00843846	Unit 2 EDG and EDGCW Pump Declared Inoperable	11/12/08
00843846	RCR for Unexpected Failure of the U2 DGCW Pump	01/09/09
00848297	Oil Leaks	11/21/08
00853024	Alarm 901-8 C2	12/05/08
00853552	Alarm 901-8 C2	12/05/08
00870111	GRN and X-Cutting: MOV Term Voltage During DBA	12/05/08
00900596	Alarm 901-8 C2	03/31/09
00902050	Alarm 901-8-C2	04/02/09
00909103	Alarm 901-8 C2	04/12/09
00935420	OPEX Evaluation – IN 2009-09	07/15/09
00942713	NCV 09-002-05 Closure Package – EDGCW Pump	07/16/09
00953437	Operating Experience Review Performed on IN 2009-10	11/02/09
00972791	New Impeller Not Installed During WO 01210003-01	06/05/09
01021963	4KV Voltage Spikes Trip ASD	01/27/10
01055989	@ Tap 6 Volt Low, Man Tap 9 Selected	04/13/10
01080114	IST Adverse Trend: U1 DGCW Pump DP Decrease	06/14/10
01094488	U1 EDG Cooling Water Low Flow After Start	07/26/10
01095314	EFR ID that CA#4 is Ineffective	07/28/10
01106754	DGCWP FI 1-3941-26 Failed PMT	08/27/10
01116381	U-1 EDGCWP Suction PI 1-3941-45 Degraded	09/22/10
01178951	LTC Oil Analyses PM	02/22/11
01213951	Replace U1 DGCWP Cubicle Cooler	05/10/11
01219903	SRV As-Found Lift Results Not Within Acceptance Criteria	05/24/11
01234687	U1 DGCWP Seal Cool Handle Broken And Valve Leaks	06/29/11
01267218	CDBI: Lack of Formal Calculations for Protective Relays	09/23/11
01279533	CDBI: 4 kV Protective Relay Setting Tolerances	10/21/11
01318490	Capacitor Replacement in SR Charger	01/26/12
01452461	HPCI and RCIC Exhaust Vacuum Breaker Mod Needed	12/14/12
01463907	Technical Specification Limits for EDG Frequency & Voltage	01/17/13
01484571	IST Adverse Trend: Increase in U1 EDGCW DP	03/07/13

CORRECTIVE ACTION DOCUMENTS REVIEWED DURING THE INSPECTION

Number	Description or Title	Date
01485944	QCOS 0250-04 MSIV Closure Time Failed As Found	03/11/13
01511155	Documentation of 10 CFR Part 21 Report – EN 48996	05/07/13
01522809	Boric Acid Crystals In 1-1102-A SBLC Pump Stuffing Box	06/08/13
01533948	3A Relief Valve Temperature Indication Greater Than 195F	07/10/13
01539350	Tie Downs Need To Be Evaluated For Tmod Concerns	07/25/13
01544722	Damaged Insulation On U1 SBLC Piping	08/08/13
01554641	Procedure Error Identified During Logic Test	09/05/13
01557986	SBLC Suction Line Temp Indication Erratic, TI 1-1141-20A	09/13/13
01568585	Boron Crystals Formed In 1A SBLC Pump Stuffing Box	10/07/13
01661539	1A SBLC Pump Has Crystals Forming In The Stuffing Box	05/19/14
01686149	Operating Margin for Main Steam Line High Flow Is Reduced	07/28/14
01690846	1-1102-A SBLC Pump Has Crystal Buildup.	08/09/14
01699234	RV 1-0203-3A Tailpipe Temp Reads High, QCOS 0203-02	09/03/14
02382540	Boron Crystals Forming on 1A SBLC PUMP Packing Glands	09/18/14
02387672	Light Corrosion on U0 DGCW Pump Flanges and Bolting	09/29/14
02397335	HPCI and RCIC AOVs Did Not Fail Safe in Simulator Scenario	10/17/14
02402839	Duane Arnold Torus Coating Delamination OPEX	10/29/14
02414551	MO 1-1001-43D did not Meet As-Found Acceptance Criteria	11/19/14
02414756	U-1 HPCI Manual Valve 1-2399-19B Needs New Valve Tag	11/20/14

DRAWINGS

Number	Description or Title	Revision
4E-100	One Line 345 KV Bus Diagram	R
4E-1301, Sh. 1	Single Line Diagram	AT
4E-1301, Sh. 2	Single Line Diagram	AC
4E-1301, Sh. 6	Bus 13-1 and 14-1 Protective Relay Settings	A
4E-1304	Key Diagram 4160 V Switchgears 13-1 and 14-1	AG
4E-1304	Key Diagram 4160 V Switchgears 13-1 and 14-1	AG
4E-1306	Key Diagram Reactor Building 480V SW Groups 18 and 19	AA
4E-1311	Key Diagram Reactor Building 480V Motor Control Centers 18-1A, 18-3 and 19-1	CB
4E-1318 A	Key Diagram Turbine Building 125 Vdc Main Bus Distribution Panel	W
4E-1318 B	Overall Key Diagram 125 Vdc Distribution Centers	J
4E-1318, Sh. 1	Key Diagram Turbine Building 125 Vdc Reserve Bus Distribution Panel and 125 Vdc Distribution Panel 1	M
4E-1318, Sh. 2	Key Diagram Turbine Building 125 Vdc Reserve Bus Dist. Panel	M
4E-1328	Single Line Diagram Emergency Power System	F
4E-1339	Schematic Diagram Reserve Auxiliary Transformer 12 Tripping Relays	U

DRAWINGS

Number	Description or Title	Revision
4E-1350B, Sh. 1	Schematic Diagram Diesel Generator 1 Auxiliaries & Start Relays	AN
4E-1377A	Schematic Diagram Reserve Auxiliary Transformer 12	F
4E-1377F	Schematic Diagram Reserve Auxiliary Transformer 12 Auxiliary	C
4E-1377G	Schematic Diagram Reserve Auxiliary Transformer 12 Auxiliary	B
4E-1377H	Schematic Diagram Reserve Auxiliary Transformer 12 Auxiliary	C
4E-1377J	Schematic Diagram Reserve Auxiliary Transformer 12 Auxiliary	A
4E-1377K	Schematic Diagram Reserve Auxiliary Transformer 12 Main Tank Sudden Pressure Relay Protection	C
4E-1377L	Schematic Diagram Reserve Auxiliary Transformer 12 Load Tap Changer Sudden Pressure Relay Protection	C
4E-1460	Schematic Diagram Standby Liquid Control System	AJ
4E-1461	Schematic Control Diagram Auto Blowdown Part 1, Sheet 2	AW
4E-1501D	Schematic Diagram PCI System Switch Development	V
4E-1503A	Schematic Diagram PCI System Panel 901-15 Trip Logic and Condenser	AU
4E-1503B	Schematic Diagram PCI System Panel 901-17 Trip Logic	BC
4E-1505A	Schematic Diagram PCI System Inboard Main Steam Valves 203-1A, 1B, 1C and 1D	AA
4E-1530	Schematic Diagram – HPCI System Valves MO 1-2301-14 and -35	Z
4E-1608A	Nameplate Reserve Auxiliary Transformer 12	B
4E-1655 B	Wiring Diagram 4160 V Switchgear Bus 13-1	Y
4E-1675 C	Wiring and Schematic Diagram, Reactor Building Essential Service 480 V MCC 18-1A, Part 3	BA
4E-1902X	Cable Tabulation Cables 12250 to 12299	AB
4E-2350C	Schematic Diagram Fuel Pool Clg Water Pump 2B and DG Clg Wtr Pump 1 Feed Transfer Control	J
4E-6577 D	Schematic Diagram ATWS Recirculation Pump Trip System Part 4	H
4E-6577 F	Schematic Diagram ATWS Recirculation Pump Trip System Part 6	T
C5450-5-120	Series: U06 Description: Valve 3/2-NC MSRV U06 Model Number: C5450-5-120XX, Sheet 1 of 2	8/16/99
C5450-5-120	Series: U06 Description: Valve 3/2-NC MSRV U06 Model Number: C5450-5-120XX, Sheet 2 of 2	8/16/99
K-C6930-010	Vendor Data Sheet SOV's MSIV SO-1-203-1A, Series: UMS Description: KIT C6930-010 UMS Model Number: K-C6930-010	F

DRAWINGS

Number	Description or Title	Revision
M-13, Sh. 1	Diagram of Main Steam Piping	AV
M-13, Sh. 2	Diagram of Main Steam Piping	NW
M-16, Sh. 5	Diagram of Condensate Piping	R
M-41, Sh. 2	Diagram of Control Rod Drive Hydraulic Piping	Y
M-46, Sh. 1	Diagram of High Pressure Coolant Injection – HPCI Piping	CD
M-46, Sh. 2	Diagram of High Pressure Coolant Injection – HPCI Piping	S
M-46, Sh. 3	Diagram of HPCI Turbine Lubricating and Hydraulic Oil System and Pump Seal Cooler Piping	G
M-60, Sh. 1	Diagram of Main Steam Piping	AU
M-60, Sh. 2	Diagram of Main Steam Piping	BL
M-87, Sh. 1	Diagram of High Pressure Coolant Injection – HPCI Piping	BN
M-87, Sh. 2	Diagram of High Pressure Coolant Injection – HPCI Piping	R
M-87, Sh. 3	Diagram of HPCI Turbine Lubricating and Hydraulic Oil System and Pump Seal Cooler Piping	I

MISCELLANEOUS

Number	Description or Title	Date or Revision
	HPCI System Health Report	Q2-2014
	Main Steam System Health Report	Q3-2014
	SBLC System Health Report	Q3-2014
	EDG System and Auxiliaries System Health Report	Q2-2014
	FASA for 2014 NRC CDBI Quad Cities	08/01/14
1485944	Apparent Cause Report – Condition Report 1485944	1
14-VT2-056	U0 DGCW 1st period VT2 Pressure Test (ISI)	09/29/14
85-84	Review NRC IN - Inadequate Inservice Testing of MSIVs	11/23/85
Binder No. EQ-40Q	Maintenance and Surveillance Requirements to Maintain Qualification SO-1-203-1A Tab E Section 2	12
Binder No. EQ-43D/Q	AVCO Solenoid Valve Assembly P/Ns C5450-5, C5450-5-110, C6948-110 and C5450-5-120-E	3
EBO-8-270	Quad Cities MSIV System Evaluation	06/22/88
EC 388506	Structures Monitoring 2012, Q2R21	0
EC 393227	Structures Monitoring Walkdown included all Unit 1 RHRSW Vaults	07/26/13
EXL 72999	Evaluation Establishing DGCW Pump Rotating Element Requirement	07/13/11
G-E-002-91	Cast Iron NEMA Frame Motors	03/91
GEH-2614F	Installation and Maintenance of 7700 Line Motor Control Center	11/75
IEE 57291	Replacing Ingersoll Rand DGCW Pumps with Flowserve Pumps	09/08/07
IEE 65774	DGCW Pump Rotating Assembly Cat ID 1433938-01	06/05/09

MISCELLANEOUS

Number	Description or Title	Date or Revision
JPM LP-032-1	Depressurize the Scram Air Header	14
JPM NP-099-1	Trip Recirculation Pump Locally	0
LER 2013-002	Outboard MSIV Stroke Times Exceeded	0
NEDE-25026	Studies of ATWS for Dresden 2 and 3 and Quad Cities 1 and 2	12/96
Optima2-TR026QC-ATWS	ATWS Analysis for the Introduction of SVEA-96 Optima2 Fuel at Quad Cities Units 1 and 2	1, 1a
PE 65774	Parts evaluation of Cat ID 1433938-01 to replace Cat ID 1433046	06/05/09
PE 73000	Parts evaluation of Cat ID 1447344-1 to replace Cat ID 1433938-1	07/13/09
SIL No. 482	MSIV Closure Testing Requirements	02/22/89
SIL No. 482	SIL Status Response - MSIV Closure Testing Requirements	06/27/89
SP 91-4-57	Dresden Test Procedure – Full Closure Timing and Exercising of MSIVs, With and Without Non-Safety Grade Instrument Air	03/28/92
TCA/TSA Scenario #1	DEHC Pressure Controller Failure/Group 1 Isolation/Hydraulic ATWS	1
TIC-558	Modification test for EC 339429, Unit 1 SBLC pumps	10/29/02
WC81-0039	Power Transformer Certified Test Report	04/12/06

MODIFICATIONS

Number	Description or Title	Date or Revision
EC 349585	Increase Sodium Pentaborate Tank Boron 10 Enrichment to Greater than or Equal to 45 Atomic Percent from 30 Percent	1
EC 351280	Replacement of Reserve Auxiliary Transformer 12	5
EC 355357	DCP IECP to Replace Unit 1 DGCW Pump with Low NPSH Impeller	07/16/09
EC 365401	SBLC System Operation Change from 2 Pumps to 1 Pump	04/14/08
EC 369612	MSIV Limit Switch Relocation	2
EC 373760	Technical Evaluation of DGCW Pump Replacement Materials	0
EC 392761	Modify Instrument Air to the Target Rock by Increasing the Accumulator Volume	1

OPERABILITY EVALUATIONS

Number	Description or Title	Date
EC 389153	Operability Evaluation for Degraded Grease in Merlin Gerin Circuit Breakers	1

OPERABILITY EVALUATIONS

Number	Description or Title	Date
EC 398313	Operability Evaluation for Level III Ground on the Unit 1 125Vdc Battery System	2

PROCEDURES

Number	Description or Title	Revision
ER-AA-302-1004	Motor Operated Valve Performance Trending	9
ER-AA-321	Administrative Requirements for Inservice Testing	12
ER-AA-321-1006	Inservice Testing of Motor Operated Valves	2
ER-AA-335-1005	Standard Approach on How to Evaluate and Inspect Outside Diameter (OD) Corrosion on Piping and Components	3
ER-AA-450	Structures Monitoring	3
ER-AA-700-1003	Screening and Evaluation of Potential Aging Issues	1
MA-AA-716-026	Station Housekeeping/Material Condition Program	12
MA-AA-723-301	Periodic Inspection of Limitorque Model SMB/SB/SBD-000 through 5 Motor Operated Valves	8
MA-AA-723-325	Molded Case Circuit Breaker Testing	13
MA-AB-725-117	Preventive Maintenance and Receipt Inspection on Merlin Gerin SF6 4 kV type AMHG Circuit Breakers	14
MA-MW-772-701	Calibration of Overcurrent Protective Relays	3
MA-QC-716-026-1001	Seismic Housekeeping	2
OP-AA-108-115	Operability Determinations (CM-1)	14
OP-QC-103-102-1002	QC Strategies for Successful Transient Mitigation	12
PI-AA-120	Issue Identification and Screening Process	1
QCAN 901(2)-3 B-11	HPCI Turbine Inlet Drain Pot High Level	5a
QCAN 901-8 E-2	Reserve Transformer 12 Trip	0
QCDA 6100-03	Loss of Offsite Power	40
QCEMS 0210-01	Battery Charger Testing for Safety Related 250Vdc Batteries	0
QCEMS 0210-02	Battery Charger Testing for Safety Related 125Vdc Batteries	4
QCEMS 0250-11	480/208Vac Motor Control Center Cubicle Maintenance and Surveillance	53
QCEPM 0400-02	Inspection, Repair, and Maintenance of DC Operated Cutler-Hammer Motor Controllers	33
QCOA 6100-13	Reserve Auxiliary Transformer 12 Trouble	19
QCOA 6100-14	Reserve Auxiliary Transformer Loss of Cooling	13
QCOP 0010-01	Winterizing Checklist	69
QCOP 0010-02	Required Cold Weather Routines	44

PROCEDURES

Number	Description or Title	Revision
QCOP 2300-09	Bypassing HPCI and RCIC High Torus Level Auto Suction Transfer	5
QCOP 2300-14	Bypassing HPCI Area High Temperature Isolation Signal	6
QCOP 6500-04	Racking out 4160v Horizontal type Breakers	32
QCOP 6500-29	Reserve Auxiliary Transformer 12 (22) Load Tap Changer Operation	18
QCOS 0202-17	Off Line Functional Test of U1 ATWS RPT and ARI Logic	9
QCOS 0202-19	Online Testing of Unit 1, Division I ATWS Recirculation Pump Trip and Alternate Rod Insertion Logic	6
QCOS 0202-20	On Line Testing of U1 Div II ATWS RPT and ARI Logic	9
QCOS 0203-01	Safety and Relief Valve Acoustic Monitor Surveillance	12
QCOS 0203-02	Safety and Relief Valve Temperature Surveillance	29
QCOS 0203-12	SRV Air Operator Test	4
QCOS 0250-04	MSIV Closure Timing	26
QCOS 0250-09	MSIV Solenoid testing	12
QCOS 1600-17	Unit 1 PCI Group 1 Isolation Test	24
QCOS 2300-01	Periodic HPCI Pump Operability Test	52
QCOS 2300-05	HPCI Pump Operability Test	75
QCOS 2300-13	HPCI System Manual Initiation Test	43
QCOS 2300-27	HPCI Pump Comprehensive/ Performance Test	33
QCOS 3300-02	CCST and CST Heater Testing	6
QCOS 4700-02	Inboard MSIV and Target Rock Valve Pneumatic System Leak Test	7
QCOS 7500-07	Standby Gas Treatment System 24 Month Operability Test	16
QCTS 0820-14	Outboard MSIV Pneumatic System Leak Test	10
QGA 100	RPV Control	9
QGA 101	RPV Control (ATWS)	13
QGA 200	Primary Containment Control	9
QGA 500-1	RPV Blowdown	13
QOA 6100-01	Loss of Reserve Auxiliary Transformer 12 (22) During Power Operation	31
QOA 900-8 C-2	901-8 (902-8) Row C Annunciator Procedures	7
QOA 900-8 F-2	901-8 (902-8) Row F Annunciator Procedures	4

SURVEILLANCES (COMPLETED)

Number	Description or Title	Date
QCOS 0203-01	Safety and Relief Valve Acoustic Monitor Surveillance	08/27/14
QCOS 0203-02	Safety and Relief Valve Temperature Surveillance	09/03/14
QCOS 0203-12	SRV Air Operator Test	03/28/13

SURVEILLANCES (COMPLETED)

Number	Description or Title	Date
QCOS 0250-04	MSIV Closure Timing	03/11/13
QCOS 0250-08	MSIV Fail-Safe and MSIV Actuator 2-Way Air Pilot Valve Testing at Reactor Shut Down	03/25/13
QCOS 1100-07	SBLC Pump Flow Rate Test	07/30/14
QCOS 2300-01	Periodic HPCI Pump Operability Test	04/07/13
QCOS 2300-05	HPCI Pump Operability Test	08/12/14
QCOS 2300-13	HPCI System Manual Initiation Test	05/18/13
QCOS 2300-27	HPCI Pump Comprehensive/ Performance Test	02/12/14
QCOS 4700-02	Inboard MSIV and Target Rock Valve Pneumatic System Leak Test	03/29/13
QCOS 6600-06	DGCW Pump Flow Rate Test	09/19/13
QCOS 6600-06	DGCW Pump Flow Rate Test	06/13/14
QCOS 6600-06	Common Unit 0 EDGCW Pump Flow Rate Test	09/29/14
QCTS 0820-14	Outboard MSIV Pneumatic System Leak Test	01/29/13

WORK DOCUMENTS

Number	Description or Title	Date
00515287	MOV Non-EQ Limitorque PM for MOV 1-2301-14	10/17/05
00771679	JOG MOV Margin Improvement for MOV 1-2301-14	05/20/07
00971692	Program Mechanical Inspection and Stem Lube 1-2301-14	11/18/08
01027667	MO 1-2301-3 Inspection and Stem Lube	02/15/13
01079798	U1 MSIV Disconnect/Reconnect MSIV 0203-1A1	05/14/09
01105098	MCC 18-1A Switchgear Inspection	05/28/11
01175534	Non-EQ MOV 1-2301-14 Electrical Inspection	02/11/14
01186889	Overhaul Unit 1 EDGCW Pump	11/25/08
01210003	Install New U1 DGCWP Impeller	06/05/09
01255685	U-1 Reserve Aux Transformer Functional Test	03/19/13
01255686	U-1 RAT LTC Testing	05/14/11
01255932	MCC 1B Cub 02 “1-1301.17 RCIC Steam Sply OTBRD Isol Vlv”	05/19/11
01259950	T12 Electrical Testing	05/13/11
01262345	Lube MO 1-2301-3	02/15/11
01301062	Replace U1 DGCW Pump Rotating Element	09/22/11
01363402	MCC 18-1A Cub A2 “RHR HX Normal Inlet Valve”	01/30/12
01367587	Q1R22 Pre-Outage 480V Breakers #N023 Inspection	01/29/13
01367587	Complete Inspection & Install Brk N023 @ Bus 18, Cubicle 3A	03/20/13
01376512	Oil Sample Particulate, Ferrography, Corrosion, Sulfur Content	01/10/12
01438340	Transformer 12 Protective Relay Routine	03/21/13
01441049	U-1 RAT Maintenance Inspection	03/19/13
01445069	Outboard MSIV Pneumatic System Leak Test	03/25/13
01445447	U-1ReserveAux Transformer T12 LTC Testing Doble Tests	03/19/13

WORK DOCUMENTS

Number	Description or Title	Date
01453194	Inboard MSIV & Target Rock Valve Pneumatic System Leak Test	02/29/13
01462300	Calibrate RAT T12 Oil and Winding Temperature Gauges	03/22/13
01462315	U-1 AVCO Solenoid Valve Inspection per QCEMS 0250-12	03/28/13
01472107	QCOS 2300-13 HPCI System Manual Initiation Test	05/18/13
01473369	Functional Test of ATWS/RPT/ARI Logic	03/12/13
01474175	HPCI Steam Line Hi Flow Transmitter Cal QCIS 2300-06	03/12/13
01482655	CDBI Evaluate Discrepant Test Data: U1 250Vdc Batt Chg	10/28/11
01485819	U1 250 VDC Charger Replace Capacitor Due to Ripple Voltage	03/09/12
01516363	Program Stem Lube Only (MOV) 1-2301-14	05/14/13
01528014	DGCWP 1-3903 QCOS 6600-06 Comp Test done Sep 19, 2013	09/19/13
01593030	EP ½ DGCW (exclude HW) 1st Period System leakage test (ISI)	09/29/14
01626315	Perform Static Votes Test 2-1001-34A	09/12/14
01636071	Inspect Cooling System on Transformer 12 (PM)	04/02/14
01680901	Perform Load Tap Changer Oil Analysis	10/06/14
01717722	1-3903 DGCWP QCOS 6600-06 Test	06/13/14
01734981	Unit 1 SBLC A Pump Flow Rate (IST)	07/30/14
01738959	HPCI Pump Discharge Flow Switch Cal/Func Test	08/14/14
01738960	HPCI Steam Line High Flow Analog Trip Cal/Func Test	08/12/14
01751636	1-3903 DGCWP Group B Flow Test by QCOS 6600-06	09/29/14
01754862	EDG System Manager Walkdown for EDG System and Auxiliaries	10/02/06
01754874	Sample/Analyze Insulating Oil form Transformer 12 Reserve Au	09/24/14
01764418	Electrical Distribution Verification	08/30/14
01767647	Unit 1 HPCI System Walkdown	11/20/14

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access and Management System
AMP	Aging Management Program
AR	Action Request
ARI	Alternate Rod Insertion
ASME	American Society of Mechanical Engineers
ATWS	Anticipated Transient without Scram
BHP	Brake Horsepower
CDBI	Component Design Bases Inspection
CFR	*Code of Federal Regulations*
CNO	Chief Nuclear Officer
CCST	Contaminated Condensate Storage Tank
°F	Degrees Fahrenheit
DGCW	Diesel Generator Cooling Water
EC	Engineering Change
EDG	Emergency Diesel Generator
ETAP	Electrical Transient Analysis Program
GL	Generic Letter
gpm	Gallons per Minute
HPCI	High Pressure Coolant Injection
IEEE	Institute of Electrical and Electronic Engineers
IMC	Inspection Manual Chapter
IN	Information Notice
IST	Inservice Testing
kV	Kilovolt
LERF	Large Early Release Frequency
LLC	Limited Liability Corporation
MCC	Motor Control Center
MOV	Motor-Operated Valve
MSIV	Main Steam Isolation Valve
NCV	Non-Cited Violation
NPSH	Net Positive Suction Head
NRC	U.S. Nuclear Regulatory Commission
PARS	Publicly Available Records System
PRA	Probabilistic Risk Assessment
psig	Pounds per Square Inch Gauge
RIS	Regulatory Issue Summary
RPT	Recirculation Pump Trip
SBLC	Standby Liquid Control
SDP	Significance Determination Process
SIL	Service Information Letter
SR	Surveillance Requirement
SRV	Safety Relief Valve
TCA	Time Critical Action
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
Vac	Volts Alternating Current
Vdc	Volts Direct Current
WO	Work Order

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Sincerely,

/RA/

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

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