U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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Licensee:	Commonwealth Edison Company (ComEd)
Facility:	Quad Cities Nuclear Power Station, Units 1 & 2
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Dates:	July 8 through 26, 1996
Inspectors:	E. Duncan, Team Leader V. Beaston, NRR Inspector F. Burrows, NRR Inspector K. Salehi, Regional Inspector N. Shah, Regional Inspector T. Tella, Regional Inspector R. Eshleman, Parameter Inc. (consultant)
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Executive Summary

This inspection report contains the findings and conclusions for an engineering and technical support team inspection conducted from July 8 through July 26, 1996. In addition, an inspection of the licensee's work control process as well as an inspection of the licensee's actions subsequent to a 1991 electrical distribution system functional inspection were also part of this inspection.

Engineering

- Overall, the quality of the design changes packages reviewed by the inspectors was acceptable. However, poor communication of valve specifications resulted in a violation. In addition, poor communication of management expectations for in-office reviews following verbal approvals of safety evaluations, and the omission of pertinent information in a safety evaluation indicated a weakness in engineering department communications (Section E1.1).

- No immediate safety concerns related to cable ampacity and degraded voltage were identified based on the licensee's conservative analytical work, replacement of safety-related electrical cables on Unit 1, and conservative loading restrictions on Unit 2 (Section E1.2).

- The lack of depth in the licensee's engineering organization, lack of in-house analytical tools, and relatively limited onsite engineering knowledge required to resolve technical issues related to the auxiliary power system was a significant weakness (Section E1.2).

- During a review of a memorandum containing battery temperature operability limits, the inspectors identified that supporting calculations assumed non-conservative battery load profiles. In addition, the original calculations were inadvertently discarded (Section E1.3).

- Numerous failures of emergency diesel generator (DG) fuel oil pressure gauges without a timely root cause analysis or timely implementation of corrective actions once the root cause was identified indicated weaknesses in the licensee's root cause analysis and corrective action programs (Section E2.1).

- The inspectors identified several examples in which the licensee's implementation of the temporary alteration program was not consistent with written procedures. These examples were the subject of a violation. In addition, the licensee was not meeting the intent of the program since half the installed temporary alterations were greater than a year old (Section E3.1).

- The inspectors identified several examples in which implementation of the root cause analysis program was not consistent with written

procedures. These examples were the subject of a violation (Section E3.2).

- Overall, the general knowledge of the engineering staff concerning the function and operation of assigned systems was good, however, weaknesses identified in system walkdowns, equipment performance trending, and review of surveillance testing indicated that system engineers were not consistently using all available tools to evaluate the materiel condition of their systems (Section E4.1).

- System engineering involvement in the work control process was sometimes poor. Support in planning the scope of the work schedule prior to execution was inconsistent and resolution of engineering issues was occasionally slow (Section E4.3).

- In general, the threshold for generating a problem identification form (PIF) to identify a deficiency had been lowered and was considered a strength. However, procedural guidance concerning licensee identification of trends was vague and licensee personnel interviewed were unfamiliar with the trend identification process (Section E4.4).

- Despite a significant reduction, the licensee's vendor document update backlog remained high. Concerns regarding the review and implementation of vendor recommendations for General Electric (GE) 480 volt breakers were raised by the inspectors following a review of GE service information letter (SIL) 448 (Section E4.6).

- The licensee's post-modification training program for licensed operators lacked any formal tracking system to ensure licensed operators were appropriately trained on plant configuration changes prior to performing licensed activities (Section E5.1).

- Audits and surveillances conducted by Site Quality Verification (SQV) and the Independent Safety Engineering Group (ISEG) were considered performance-based overall. Use of auditors from other utilities was considered a strength. However, the failure to implement a 1994 Site Vice President directive to establish an engineering department self-assessment program was a weakness (Section E7.1).

- A review of licensee SQV audits identified continuing problems with the corrective action process. In addition, the inspectors identified weaknesses with SQV follow-up efforts to resolve those problems. Overall, the corrective action program remained poor. An improvement was noted regarding oversight of nuclear tracking system (NTS) activities (Section E7.2).

Maintenance

- Management failed to address slow progress to reduce the non-outage corrective maintenance backlog although goals had been formally established. Although recent trending of the non-outage planned and

minor maintenance backlogs and establishing backlog goals was a good initiative, these actions were not initiated in a timely manner (Section M1.1).

- Weaknesses were noted in the licensee's work control process, particularly in performance monitoring, self-assessment, and backlog classification (Section M1.2).

Report Details

I. Engineering

E1 Conduct of Engineering

E1.1 Design Changes

a. Inspection Scope (37550)

The inspectors reviewed the following design change packages (DCPs).

DCP	Description
8800039	125 Vdc Battery Replacement
8900106	125 Vdc Breaker Replacement
8900109	125 Vdc Breaker Replacement
9000253	General Electric Time Delay Relay Replacement
9100067	Gould Charger Replacement
9200082	Motor Control Center 18-2 Feeder Cable Upgrade
9300223	2A and 2B Drywell Air Dryer Replacement
9400108	ECCS Torus Suction Butterfly Valve Replacement
9500064	250 Volt Charger AC and DC Breaker Replacement
9500088	Standby Liquid Control Check Valve Replacement

Particular emphasis was placed on ensuring that 10 CFR 50.59 safety evaluations, including supporting calculations, were accurate and adequately reviewed, necessary approvals were obtained when required, engineering documents and procedures were included when required, and post-modification testing was correctly identified and completed.

b. Observations and Findings

The inspectors identified deficiencies concerning a calculation to replace an emergency core cooling system (ECCS) torus suction butterfly valve and a standby liquid control (SBLC) valve which are discussed below.

ECCS Torus Suction Butterfly Valve Replacement

The inspectors reviewed ECN 04-01260M, a modification which replaced six ECCS torus suction butterfly valves on Unit 2 due to excessive leakage.

The inspectors determined that the analysis for the modification was performed by Vectra, a consultant, and five of the six valves were nearly identical in size and weight to the valves replaced. The sixth valve replaced, however, a butterfly valve for the reactor core isolation cooling (RCIC) system, only weighed 100 pounds which was significantly less than the weight of the replacement valve (160 pounds). This information was provided by the valve vendor to the licensee as well as the consultant. However, the consultant used 140 pounds, an estimated value previously provided in a formal memorandum by

the licensee, as a basis in the seismic and hydrodynamic calculations as part of their safety evaluation. The licensee's review of the consultant's calculations failed to identify this error. Although the difference in weight did not pose a major hazard, the inspectors' were concerned that the design control process failed to detect this error, especially since the licensee reviewed this calculation as part of their safety evaluation.

10 CFR 50, Appendix B, Criterion III required that measures be established for the selection and review for suitability of application of parts that are essential to the safety-related function of structures, systems, and components. The issue described above was an example where this requirement was not met and is a violation (50-265/96010-01).

Standby Liquid Control System Check Valve Replacement

The inspectors reviewed ECN 04-1-95-036, a modification which replaced Unit 1 SBLC check valves 1101-15 and 1101-16. During that review, the following concerns were identified:

- The safety evaluation was performed on March 25, 1996, and was verbally approved by a designated reviewer on March 26, 1996, however, a follow-up in-office review was not performed.

  The inspectors discussed this practice with licensee management who stated that they expected verbal approval of documents including safety evaluations to be followed by a full review of the content of the associated document by the cognizant reviewer on the next business day. However, the inspectors also identified that these expectations were not formally documented. At the end of the inspection, the licensee had generated a memorandum disseminating management's expectation regarding verbal approval of documents over the telephone and initiated actions to revise appropriate procedures to include management's expectations.

  The inspectors concluded that licensee management had poorly communicated their expectations regarding follow-up in-office reviews of verbal approvals of safety evaluations.

- Although maintenance had been performed on the 1101-16 valve to address excessive leakage and the results of the most recent local leak rate test (LLRT) were satisfactory, the safety evaluation omitted this information and implied that leakage rates exceeded operability limits.

  The inspectors concluded that the omission of this information in the safety evaluation was a weakness in the licensee's written documentation.

c. Conclusions

Overall, the quality of the design changes packages reviewed by the inspectors was acceptable. However, problems were identified involving communication of valve specifications during an ECCS butterfly valve replacement; and communication of management expectations for in-office reviews following verbal approvals of safety evaluations, and omission of pertinent information in a safety evaluation for a standby liquid control system valve replacement. These problems indicated a weakness in engineering department communications.

E1.2 Auxiliary Power System

a. Inspection Scope (37550, 37551)

The inspectors reviewed calculations, documents, and engineering activities to evaluate the licensee's ability to identify and resolve technical issues related to the auxiliary power system. The review focused on safety issues associated with cable ampacity, degraded voltage, and completion of corrective actions regarding electrical distribution system functional inspection (EDSFI) findings.

The inspectors reviewed the structure, technical capabilities, and analytical tools available to the design engineering department, as well as management support for issues raised by design engineers responsible for the auxiliary power system.

b. Observations and Findings

1. Cable Ampacity

The design issue of cable ampacity requires the proper selection of cables to ensure a reasonable service life and the proper application of circuit protection devices to ensure cables are not thermally damaged during an auxiliary power system overload or system fault.

Engineering activities related to cable ampacity involved the proper selection of cables, the proper application of circuit protection devices used in auxiliary power system modifications, and verification that auxiliary power system modifications would not reduce the service lives of installed cables.

EDSFI Findings Related to Cable Ampacity

A concern regarding cable ampacity at Quad Cities was identified by inspectors during an April 1991 EDSFI. Specifically, the inspectors determined that the licensee did not have sufficient documentation to effectively evaluate cable sizing and cable fill requirements. This concern arose because the licensee could not identify the industry standards used to develop the architect engineer standards for cable

selection during plant construction. Unresolved Items 50-254/91011-05 and 50-265/91007-05 (Closed) documented this concern.

A related issue focused on the licensee's ability to demonstrate compliance with Section 8.3.1.7 of the Updated Final Safety Analysis Report (UFSAR) which stated, in part:

> "Cable tray electrical power loading is limited to a nominal 36 watts per foot (W/ft) within a pan section. A computer program is used whereby overloading of pan sections is 'flagged'. In such cases, the specific cables within a pan section are checked for their function to determine the coincidental loading values and, if required, cables are rerouted from this section."

To resolve this issue, the licensee used a Sargent & Lundy Interactive Cable Engineering (SLICE) program to calculate heat generation rates for each program routing point to demonstrate compliance with the nominal UFSAR limit of 36 W/ft. The initial run of the SLICE program used default maximum full-load current values based on Sargent & Lundy design standard ESA-104a. As a result, 90 cable tray routing points were identified as potentially overloaded in excess of 36 W/ft. The licensee subsequently replaced the default currents for the potentially overloaded cables with calculated full-load running currents and re-ran the program. The results from the second run did not identify any potentially overloaded cable tray routing points.

In August 1992, an error was discovered in the component of the SLICE program used to identify potentially overloaded cables. After the error was corrected, the licensee identified 901 potentially overloaded cable tray routing points. The licensee resolved concerns associated with many of the routing points by replacing default maximum full-load currents with calculated full-load running currents. To resolve concerns associated with the remaining potentially overloaded cable tray routing points, the licensee initiated a Cable Tray Temperature Measurement Program and used the results to modify the thermal model utilized by SLICE. This further reduced the number of potentially overloaded cable tray routing points. The unresolved items related to cable ampacity were subsequently closed based on licensee plans to evaluate and resolve each of the remaining potentially overloaded cable tray routing points. The licensee completed this evaluation in June 1996 and concluded that the station design conformed to UFSAR Section 8.3.1.7. No actual plant changes resulted from this evaluation. The inspectors reviewed the licensee's evaluation and concluded there were no thermally overloaded cables. The conclusions drawn above closed Unresolved Item 50-254/265-96008-10.

Motor Control Center (MCC) 29-2 Main Feeder Breaker Trip

On October 4, 1995, the main feeder breaker for MCC 29-2 tripped due to a current overload condition caused by high pressure coolant injection surveillance testing during an abnormal MCC loading configuration.

As part of the licensee's immediate corrective actions, loads were realigned to administratively reduce the maximum loading of MCC 29-2. Subsequently, the licensee reviewed load flow calculations to identify the design basis load profile for each safety-related bus. The licensee also performed additional load flow evaluations using all connected loads for safety-related buses to determine the scope and magnitude of the overload problem.

Following this investigation, the licensee concluded that since nonsafety-related loads were shed during a design basis accident, no immediate safety concerns existed. However, the licensee also concluded that operational loading restrictions were necessary for Unit 1 and Unit 2 to prevent MCC feeder breaker trips during surveillance testing. In addition, the licensee increased the trip setpoints for safety-related MCC feeder breakers to obtain additional operating margin.

To remove the loading restrictions imposed as a result of this event, the licensee modified six safety-related MCC electrical feeder cables on Unit 1 during refueling outage Q1R14 (Modifications E04-1-95-060-A through -F) and planned to modify MCC feeder cables for Unit 2 during refueling outage Q2R14.

At the end of the inspection, the licensee was evaluating MCC loading for the nonsafety-related portion of the auxiliary power system to determine what actions should be taken to improve the overall reliability and availability of balance-of-plant equipment.

Findings Related to Cable Ampacity

To assess whether there were any immediate safety issues related to cable ampacity, the inspectors reviewed the licensee's operability evaluation related to the trip of MCC 29-2 and the analytical work performed to establish operational loading restrictions for the safety-related MCCs. The inspectors noted that the licensee's analysis had conservatively evaluated the ability of feeder cables to supply all connected loads on the MCCs and had not relied upon diversity factors. Based on the analysis, the inspectors concluded that the licensee had established conservative loading restrictions.

Based on the licensee's conservative analytical work, the replacement of safety-related MCC feeder cables on Unit 1, and the conservative loading restrictions in effect on Unit 2, the inspectors concluded that there were no immediate safety concerns related to cable ampacity.

To address cable ampacity issues regarding nonsafety-related balance-of-plant equipment, the licensee installed data logging instrumentation on Unit 2 during refueling outage Q2R13 (Summer 1995). The licensee planned to use the information collected to update an electrical load monitoring program to determine what actions were necessary to improve the overall reliability and availability of balance-of-plant equipment.

The inspectors concluded that there was reasonable assurance that balance-of-plant cables were not being overloaded based upon the licensee's past operating experience (i.e., an historical lack of bus trips) and the fact that circuit protection devices were set to prevent cable thermal damage. The inspectors noted that the licensee had installed data logging equipment prior to the trip of MCC 29-2 and concluded that licensee engineers were cognizant of the broader issues related to cable ampacity and the need to evaluate individual cable loading prior to the trip of MCC 29-2.

The inspectors concluded that prior to the MCC 29-2 trip, the licensee's response to cable ampacity concerns was narrowly limited to an effort to demonstrate compliance with UFSAR Section 8.3.1.7. Following the trip of MCC 29-2, however, the licensee expanded the scope of their effort and evaluated the potential for MCCs to trip as a result of current overload.

The inspectors reviewed the analytical work performed to demonstrate compliance with UFSAR Section 8.3.1.7 and concluded that the licensee had adequately verified that past modifications to the auxiliary power system had not shortened the service lives of installed safety-related cables.

2. Degraded Voltage

The design issue of degraded voltage requires the installation of second-level undervoltage relays to protect Class 1E equipment from sustained low voltage conditions when that equipment is connected to the offsite electric power system. In the event of a sustained low voltage condition, the relays protect equipment by tripping offsite power breakers which results in starting and loading the emergency diesel generators.

Engineering activities related to degraded voltage involved the selection of undervoltage protection relay setpoints and time delays to ensure that adequate voltage is supplied to all Class 1E equipment, adequate margin exists between the minimum anticipated offsite voltage and the selected setpoint to avoid spurious tripping, and adequate margin exists between the selected setpoint and minimum required equipment voltage to account for instrument tolerances.

EDSFI Findings Related to Degraded Voltage

A concern regarding degraded voltage at Quad Cities was identified by inspectors during an April 1991 EDSFI. The concern was that undervoltage relay settings were too low and an evaluation could not be performed since supporting calculations were not available. As a result, Unresolved Items 50-254/91011-1a and 50-265/91007-01a (Closed) documented this concern.

To resolve this concern, the licensee performed additional degraded voltage calculations and in April 1992 determined that the setpoints for

the degraded voltage relays used to provide protection to all safety-related equipment were non-conservative. This determination was based on an updated calculation for minimum voltage to run 480 Vac safety-related motors. Corrective actions included new degraded voltage relays, revised relay setpoints, administrative controls, and additional evaluations.

Most of the unresolved items regarding degraded voltage were closed in IR 50-254/93003; 50-265/93003 based on the licensee's completed corrective actions. However, a concern regarding the effect of balance-of-plant loads on the selection of undervoltage relay setpoints remained open because the licensee's Electrical Load Monitoring System (ELMS) computer analysis did not model nonsafety-related loads in degraded voltage calculations. Subsequently, the licensee conservatively modeled BOP loads in the ELMS program. The remaining unresolved items were then closed based on the licensee's plans to quantify the existing margin in the degraded voltage setpoint utilizing actual plant load measurements.

Motor Control Center (MCC) 29-2 Main Feeder Breaker Trip

On May 23, 1996, during preparations for the design change to install a new feeder cable to MCC 29-2, the licensee discovered that the cable length used in degraded voltage calculations was significantly shorter then the actual cable length. When corrected, the degraded voltage calculation indicated that adequate voltage would not be supplied to several safety-related loads from MCC 29-2 during a loss of coolant accident (LOCA) with the 4 kilovolt (KV) system bus voltage just above degraded voltage relay setpoints. Subsequently, the licensee determined that although the feeder cable had been replaced and rerouted in 1972, the database had not been updated to reflect the longer length. Also, the licensee's review identified additional discrepancies between cable lengths used in the SLICE database and the cable lengths used in degraded voltage calculations.

The additional discrepancies between the cable lengths used in the SLICE database and the actual installed cable lengths led to the licensee reviewing the accuracy of cable length data input into degraded voltage calculations. The SLICE program calculated cable lengths based on cable routing including cable end lengths and tray disconnects. The cable lengths used in SLICE were not directly factored into degraded voltage calculations. To increase the level of accuracy in degraded voltage calculations for components with marginal voltages, SLICE cable length data was compensated for cable end lengths and cable tray disconnects based on a review of plant installation drawings and performance of plant walkdowns. The new lengths were compared to the lengths previously used in degraded voltage calculations and the longer values were then used. Resulting revised degraded voltage calculations indicated possible inadequate voltages to safety-related equipment including motor contactor circuits. The licensee's corrective action included plant modifications such as the installation of interposing relays in motor contactor circuits (See QDC-7800-E-0183 and 0192).

Findings Related to Degraded Voltage

Prior to the EDSFI, degraded voltage calculations contained many unverified assumptions and did not address equipment at all voltage levels and conditions (e.g., motors running and motors starting). Subsequently, the licensee developed controlled calculations with defined acceptance criteria to ensure adequate voltage at the input terminals of each component required for LOCA mitigation.

The inspectors reviewed the analytical work performed by the licensee to support degraded voltage determinations. Representative calculations 8913-67-19-1, 8913-69-19-4, 8913-19-19-8, 8913-67-19-6 and 8913-67-19-6 which evaluated the adequacy of input terminal voltages, and calculation 8913-67-19-3 which determined the actual setpoint for the degraded voltage relays accounting for the instrumentation tolerances were reviewed. The inspectors also reviewed a licensee letter (Chron 211209) regarding an evaluation of the maximum reset value of the degraded voltage relay and the minimum expected switchyard voltage at worst-case accident loading to ensure adequate margin existed to avoid spurious tripping of the degraded voltage relays. The inspectors also noted that the licensee had installed data logging equipment to collect actual load measurements required to support the analyses obtained from ELMS.

Based on the licensee's conservative analytical work and plant modifications, the inspectors concluded that adequate voltage was supplied to all Class 1E equipment, adequate margin existed between the minimum anticipated offsite voltage and the selected setpoint to avoid spurious tripping, adequate margin existed between the selected setpoint and the minimum required equipment voltage to account for instrument uncertainties. The inspectors concluded that no safety issues related to degraded voltage existed.

The inspectors also concluded that the licensee's identification of cable length discrepancies between the SLICE database and the cable lengths used in degraded voltage calculations, and the licensee's initiatives to install data logging equipment were good.

However, the failure to verify that SLICE cable length data reflected the as-built design is a violation of 10 CFR 50, Appendix B, Criterion III, "Design Control." This licensee-identified and corrected violation is being treated as a non-cited violation, consistent with Section VII.B.1 of the NRC Enforcement Policy. In addition, the conclusions drawn above close Unresolved Item 50-254/265-96008-09.

3. Completion of EDSFI Corrective Actions

Inspection Report 50-254/91011; 50-265/91007 contained numerous items which were closed based on licensee planned corrective actions. During this inspection, the inspectors reviewed the following items:

Deviation 254/91011-2a; 265/91007-2a 4KV Switchgear Breaker Overduty

The EDSFI team identified that the overduty condition of certain 350 and 250 MVA breakers relative to their maximum interrupting ratings was a deviation from FSAR Section 8.2.2. This item was closed in Inspection Report 93003 based, in part, on the licensee's plans to upgrade the 250 MVA switchgear. During this inspection, the inspectors determined that all upgrades had been completed except for indicating light wiring changes which were pending. The inspectors concluded that the licensee had made adequate progress to upgrade the interrupting capability of the 250 and 350 MVA breakers.

Open Item 254/91011-6;265/91007-6 Fuse Control Problems

The EDSFI team identified problems associated with fuse control as an open item pending review of the licensee's actions to replace incorrectly sized fuses and to establish an effective fuse control program. This item was closed in Inspection Report 94026 based on an improved fuse control procedure, a developed fuse list and the licensee's plans to walk down all safety-related fuses. During this inspection, the inspectors discussed the status of plant walkdowns with the licensee and determined that although about 90 percent of the fuse walkdowns had been completed, the remaining walkdowns would not be completed until additional funding became available. This is an inspection follow-up item (50-254/265-96010-03) pending further NRC review.

Unresolved Item 254/91011-09a,b,c; 265/91007-09a,b,c Breaker Coordination

The EDSFI team identified that the mis-coordination of 250 Vdc, 125 Vdc, and 120 Vac breakers was an unresolved item. These items were closed in Inspection Report 94026 based on the licensee's plans to achieve full coordination at these three voltage levels. During this inspection, the inspectors determined that the licensee planned to cancel the modifications required to achieve full coordination. This is an inspection follow-up item (50-254/265-96010-04) pending further NRC review.

4. Auxiliary Power Transition Plan

The inspectors reviewed the structure, technical knowledge, and analytical tools available to the design engineering department, as well as management support for issues raised by design engineering, to determine whether the licensee had an effective engineering organization that could successfully identify and resolve technical issues related to the auxiliary power system. This review was motivated by the perception that these areas of analytical tools, technical knowledge and support may have contributed to engineering's ineffectiveness in identifying potential MCC loading concerns prior to the trip of MCC 29-2.

At the end of the inspection, the licensee was in the process of formalizing an auxiliary power transition plan to transfer engineering

responsibilities for analysis and design of the auxiliary power system from corporate engineering and the architect engineer to the onsite engineering organization.

Structure of the Engineering Organization

The structure of the licensee's engineering organization responsible for the auxiliary power system consisted of onsite engineering, corporate engineering, and architect engineering support. Onsite engineering had responsibility for identifying technical issues and problems with the auxiliary power system. Corporate engineering was responsible for working with onsite engineering to address these issues. However, the analytical work and system modifications required to resolve these issues were performed by architect engineers. The licensee planned to transfer responsibility for analytical work and system modifications to the onsite engineering organization. Two onsite engineers had been identified to form the basis of an auxiliary power team that would assume this responsibility.

Technical Knowledge

The inspectors noted that two licensee engineers were qualified by the licensee to oversee analysis and design modifications to the auxiliary power system - one onsite engineer and one corporate engineer. The licensee's corporate engineer was extremely knowledgeable of the auxiliary power system at Quad Cities and was mentoring onsite engineers. The licensee planned to continue corporate mentoring of onsite engineers until the onsite auxiliary power team was capable of assuming full responsibility for the analysis and design of the auxiliary power system.

Analytical Tools

The inspectors identified that the licensee relied upon architect engineers to perform most of the analytical work related to the auxiliary power system. The analytical work previously performed for the licensee has been accomplished using two computer programs - the ELMS program and SLICE program. The technical knowledge required to review and interpret the results of analyses performed using these programs was limited to an offsite corporate engineering group. Onsite engineers relied upon corporate engineers to review and concur in the analytical work performed for the licensee by architect engineers. Licensee engineers had requested that station management purchase both the ELMS and SLICE programs, and they planned to train onsite engineers how to use these programs as part of the plan to transfer responsibility for analysis and design of the auxiliary power system to the onsite engineering group.

Management Support

Management support for resolving auxiliary power system issues appeared to have significantly increased as a result of the MCC 29-2 trip. At

the end of the inspection, licensee management was reviewing an auxiliary power issues transition plan and was in the process of hiring an additional senior electrical engineer to complement the onsite auxiliary power team.

Findings Related to the Auxiliary Power Transition Plan

The inspectors concluded that the lack of depth in the licensee's engineering organization and the lack of in-house analytical tools needed to identify and resolve technical issues related to the auxiliary power system was a significant weakness.

The lack of depth in the licensee's engineering organization ha led to a lack of accountability for identifying and resolving technica issues related to the auxiliary power system. Onsite engineers, in consultation with corporate engineers, were responsible for making day-to-day operability decisions, however, the detailed technical understanding of design calculations required to make informed decisions was with the corporate engineers and the architect engineers. Onsite engineers were technically knowledgeable, but not intimately familiar with design documents because the licensee hired architect engineers to perform most of its analytical work and corporate engineers were responsible for reviewing the work. Onsite engineers had not been sufficiently trained in the use of computer analysis methods to critically review the computer analyses performed by architect engineers or to identify limitations inherent in the computer analyses results.

The lack of in-house analytical tools needed to identify and resolve technical issues related to the auxiliary power system resulted in ineffective electrical load management of the auxiliary power system by the licensee. Because onsite engineers did not have the analytical tools necessary to evaluate the impact of specific plant loading conditions, engineers were not effective in identifying potential MCC loading concerns prior to the trip of MCC 29-2. The inspectors concluded that the lack of in-house analytical tools significantly contributed to the trip of MCC 29-2.

The inspectors concluded that licensee actions to resolve auxiliary power system issues had increased significantly and was adequate. At the end of the inspection, licensee management was reviewing an auxiliary power transition plan to improve the engineering organization's ability to identify and resolve technical issues, and was in the process of hiring an additional senior electrical engineer to complement the auxiliary power team.

c. Conclusions Related to the Auxiliary Power System

The inspectors concluded that there were no immediate safety issues related to cable ampacity based on the licensee's conservative analytical work, the replacement of safety-related MCC feeder cables on Unit 1, and the conservative loading restrictions in effect on Unit 2. Based on the analytical work performed by the licensee to demonstrate

compliance with the UFSAR, the inspectors concluded that the licensee had adequately verified that past modifications to the auxiliary power system had not impacted the service lives of installed safety-related cables.

The inspectors also concluded that there were no immediate safety issues related to degraded voltage based on the licensee's conservative analytical work.

The inspectors concluded that the lack of depth in the licensee's engineering organization and the lack of in-house analytical tools and onsite engineering knowledge needed to identify and resolve technical issues related to the auxiliary power system was a significant weakness. The inspectors also concluded that the licensee's identification of cable length discrepancies between the SLICE database and the cable lengths used in degraded voltage calculations, and the licensee's initiatives to install data logging equipment were good. At the end of the inspection, management was reviewing the auxiliary power transition plan intended to improve the engineering organization's ability to successfully identify and resolve technical issues related to the auxiliary power system.

E1.3 Battery Temperature Operability Limits

a. Inspection Scope (37550)

The inspectors reviewed a memorandum from system engineering to operations which established minimum temperature operability limits for the station's batteries.

b. Observations and Findings

The inspectors identified that system engineering issued a memorandum to operations on February 5, 1996, which established minimum temperature operability limits for safety-related and nonsafety-related batteries. These temperatures ranged from 35°F to 62°F for safety-related batteries and 30°F to 65°F for nonsafety-related batteries.

The inspectors requested supporting calculations for the values, however, the licensee indicated that these calculations had been discarded and were unavailable.

On July 22, 1996, the licensee prepared a calculation to support the operability determination. However, the inspectors identified that this calculation did not take into account the electrical load profile of a station blackout. The licensee re-performed the calculation utilizing station blackout considerations, the results of which will be reviewed as an inspection follow-up item (50-254/265-96010-05).

c. Conclusions

The inspectors concluded that the failure to provide original calculations to support operability limits of the safety-related batteries indicated a weakness in the licensee's control of documentation. In addition, the inspectors concluded that the licensee failed to utilize a conservative bounding electrical load profile until questioned by the inspector which indicated weaknesses in the knowledge and performance of system engineering.

E2 Engineering Support of Facilities and Equipment

E2.1 Emergency Diesel Generator (DG) Fuel Oil Pressure Gauge Failures

a. Inspection Scope (37550)

During a routine walkdown, the inspectors identified an 18 month old action request to replace a broken Unit 1 DG fuel oil pressure gauge. The inspectors reviewed the work request history for repair and replacement of fuel oil discharge pressure gauges for the DGs which are summarized below:

Unit	Failure Date	Replacement Date
1		5/92
1		10/93
1	12/94	7/96
2		3/92
1/2		8/92
1/2		7/96

b. Observations and Findings

The inspectors identified that repetitive failures of the gauges did not result in a timely root cause analysis or an appropriate corrective action since several failed gauges were repaired with like-for-like replacements. A subsequent investigation by the licensee determined that the gauges suffered internal damage due to vibration induced by the DGs in operation. Corrective actions to replace the installed gauges with oil-filled gauges to reduce the impact of vibration were initiated following a sixth failure in December 1994.

c. Conclusions

The inspectors concluded that numerous failures of DG fuel oil pressure gauges without a timely root cause analysis and timely implementation of corrective actions once the root cause was identified indicated weaknesses in the licensee's root cause analysis and corrective action programs.

E2.2 Management Action Plans

a. Inspection Scope (37550)

The inspectors reviewed management's involvement and oversight of licensee management action plans generated to address nine significant equipment problems.

b. Observations and Findings

Station management divided the nine equipment problem areas into safety, administrative and economics categories. The inspectors examined the safety category. For each category, station management established accountability for delineated actions as well as due dates. The inspectors examined compliance with the action plan due dates and identified that there were seven objectives which were neither met nor extended. The inspectors concluded that although the effort to establish the program was a good initiative, implementation was weak.

c. Conclusions

The inspectors concluded that the engineering staff's failure to request an extension, and management's sanctioning of this omission to be a weakness. Although the plan to resolve problems was a good initiative, implementation was weak.

E3 Engineering Procedures and Documentation

E3.1 Temporary Alterations Program

a. Inspection Scope (37550)

The inspectors sampled installed and completed temporary alterations, reviewed temporary alteration records, and interviewed licensee personnel to determine if licensee implementation of the temporary alteration program was in accordance with QAP 0300-12, "System Temporary Alterations," QCTP 1020-2, "System Temporary Alteration Review," and NRC requirements.

b. Observations and Findings

During the inspection, the following observations and findings were identified concerning the nature of the temporary alteration backlog and the licensee's implementation of the temporary alteration review program.

Temporary Alteration Backlog

The inspectors noted that QAP 0300-12 defined a temporary alteration as a minor alteration made to plant equipment generally expected to be installed for three months or less. However, upon review of the licensee's temporary alteration backlog, the inspectors identified that

of the 48 temporary alterations currently installed, 24 were greater than one year old. The oldest current temporary alteration was installed over six years ago on May 15, 1990.

The inspectors concluded that based upon the number of current temporary alterations installed more than one year ago, the licensee was not consistently meeting the intent of the temporary alteration program.

Temporary Alteration Review Program

The inspectors identified the following requirements in QCTP 1020-2:

- For each temporary alteration, the cognizant system engineer shall review each temporary alteration in effect for greater than three months addressing the continued applicability of the safety evaluation.

- Submit all temporary alteration three month evaluations to the Technical Staff Supervisor for approval.

- Prepare a monthly report on all temporary alterations greater than 6 months old to include an outline of the current status of actions required to resolve each alteration, the cognizant individual's name, and identification of alterations that have had limited progress toward resolution.

The inspectors reviewed records for currently installed temporary alterations greater than three months old and identified that temporary alteration evaluations 94-1-6, 93-1-52, and 94-2-5 failed to address the continued applicability of the safety evaluation as required by QCTP 1020-2. In addition, the inspectors identified that the evaluations were not always accurate with respect to removal plans since the removal plans were in some cases out of date.

The inspectors identified that three month reviews had not been signed for approval by the technical staff supervisor for temporary alterations 94-2-34, 94-1-84, and 94-1-121.

The inspectors identified that on a monthly basis, the temporary alteration coordinator reported on the status of the temporary alteration program. However, the inspectors identified that although the monthly report identified temporary alterations in place and projected removal dates, the report failed to identify responsible individuals and temporary alterations which have had limited progress toward resolution as required by QCTP 1020-2. In addition, the temporary alteration coordinator indicated that prior to 1996, monthly temporary alteration reports were not consistently generated.

c. Conclusions

The inspectors concluded that the licensee's implementation of the temporary alteration program was poor. Examples described above where

the licensee failed to properly implement procedures relating to the control of installed temporary alterations was a violation of 10 CFR 50, Appendix B, Criterion V (50-254/265-96010-02a, b and c).

E3.2 Engineering Root Cause Analysis

a. Inspection Scope (37551)

The inspectors reviewed the licensee's implementation of the root cause analysis (RCA) program.

b. Observations and Findings

The inspectors identified that two programs were currently utilized to conduct root cause investigations. The first program, a system level review, was assigned to the Process and Administration group within the engineering department. The other RCA program focused on equipment and human performance problems and was implemented in accordance with QCAP 2300-24, "Levels 1, 2, and 3 Root Cause Investigation."

1. System Level Root Cause Program

The inspectors reviewed the licensee's system level root cause program and determined that the group had been assembled at the beginning of 1996 to address repetitive system failures and included an experienced consultant, two specially trained staff members, and three contractors. Following some initial success, however, the group was assigned other duties. Recently, the group was re-activated under the supervision of one of the original staff members. Additional staff was added to the group, but specialized training had not yet been completed nor had a permanent leader been assigned to meet goals established in the 1996 Management Action Plan.

The inspectors concluded that the system level root cause program was a good initiative, but lacked sustained implementation.

2. Engineering Root Cause Program

To evaluate the effectiveness of engineering root cause determinations, the inspectors reviewed the results of the root cause analysis efforts for level 3 problems identified in the following PIFs:

PIF	Description
96-0460	Unit 1 DGCWP Oilers Mispositioned
96-0067	Spent Fuel Pool Cooling Issues
96-0828	Unit 1 24/48 VDC Battery Inoperable
96-1097	Unit 1 DGCWP Fan Coolers Rotating Wrong Direction
96-0810	Fire Protection Penetration #3 Inoperable

At the end of the review, the inspectors concluded that with the exception of the root cause analysis associate with PIF 96-0810, the

evaluations were narrowly focused and provided limited information. In addition, the inspectors identified the following problems associated with adherence to the implementing procedures:

- QCAP 2300-24, "Level 1, 2, and 3 Root Cause Investigation," identified training in root cause analysis as a requirement for selection as a root cause team leader. However, the inspectors identified that team leaders for root cause investigations associated with PIFs 96-0460, 96-0067, 96-0828, and 96-1097 failed to attend root cause analysis training as required by QCAP 2300-24.

- QCAP 2300-24 required the use of causal codes in the report to enable tracking of root cause problems. However, the inspectors identified that the reports associated with the PIFs mentioned above did not contain causal codes as required by QCAP 2300-24.

c. Conclusions

The inspectors concluded that the licensee's root cause analysis program was adequate, however, examples described above where the licensee failed to properly implement root cause analysis procedures was a violation of 10 CFR 50, Appendix B, Criterion V (50-254/265-96010-02d and e). The system level root cause program was a good initiative, but lacked sustained implementation.

E4 Engineering Staff Knowledge and Performance

E4.1 Systems Engineering Knowledge and Performance of Routine Activities

a. Inspection Scope (37550)

The inspectors evaluated selected system engineers to determine whether engineering performance was in accordance with the licensee's expectations contained in System Engineering Directive (SED) 2, "System Engineer Job Description," SED 3, "Expectations for System Engineer Walkdowns," SED 5, "System Engineering Handbook," and regulatory requirements. To perform this evaluation, the inspectors conducted interviews with system engineers and management, performed system walkdowns with cognizant engineers, reviewed system notebooks, observed system engineering involvement in testing of plant systems and components, and reviewed training and qualifications records.

b. Observations and Findings

Overall, the general knowledge of the engineering staff concerning the function and operation of assigned systems was good. However, weaknesses were identified in system walkdowns, equipment performance trending, and review of surveillance testing as discussed below.

System Engineering Walkdowns

The inspectors identified that all system engineers interviewed were aware of management's expectations for walkdown requirements contained in SED 2 and SED 5. However, during walkdowns with system engineers, the inspectors identified material condition problems which had not been identified by the cognizant system engineers although it appeared those conditions had existed for a long period of time.

Equipment Performance Trending

The inspectors identified that the primary mission of system engineering as stated in the SED 5 was to monitor and trend equipment performance to prevent equipment failures and reduce system unavailability. However, the inspectors identified that the system engineers interviewed did not always trend critical system performance parameters. For example, safety-related battery surveillance data such as cell voltage, specific gravity, and cell temperature was not trended, although this information could be used to trend equipment performance. The inspectors concluded that the failure to consistently trend equipment performance hindered evaluation of system material condition.

Review of Surveillance Testing Results

The inspectors identified that SED 2 established an expectation that system engineers would review the performance monitoring program for assigned systems including surveillance test results. However, the inspectors identified that system engineers were not consistently made aware of surveillance tests. The inspectors concluded that this potentially hindered an accurate evaluation of system material condition.

c. Conclusions

Overall, the general knowledge of the engineering staff concerning the function and operation of assigned systems was good, however, weaknesses identified in system walkdowns, equipment performance trending, and review of surveillance testing indicated that system engineers were not consistently using all available tools to evaluate the material condition of their systems.

E4.2 Faulty Electrical Penetration Pressure Gauge

a. Inspection Scope (37550)

The inspectors reviewed the licensee's response to a faulty nonsafety-related pressure gauge used to measure nitrogen pressure for a safety-related electrical penetration.

b. Observations and Findings

During a routine plant walkdown, the inspectors identified deficiency tag B2527 dated July 22, 1992, installed on damaged nitrogen pressure gauge PI-1-8741-38 for electrical penetration 100A. At Quad Cities, electrical penetrations are backfilled with nitrogen gas to minimize the effects of humidity, lengthening the life of electrical cables. The damage consisted of a bent indicator needle. Quad Cities Operating Surveillance (QCOS) 1600-16, "Primary Containment Electrical Penetration Pressures", was performed monthly by operations and noted the condition of the needle. Licensee personnel stated that during previous surveillance tests, the gas tank gauges (not the damaged gauge) were used for backfilling. In addition, licensee personnel stated that the vendor's view was that monthly charging of the penetrations, without a specific pressurization value, would be sufficient to maintain the integrity of the penetrations.

The licensee determined that the deficiency tag did not exist in the work control system. As an immediate corrective action, the licensee initiated a work request to repair the gauge. As a long term corrective action, the licensee planned on determining if this deficiency tag problem was an isolated event or if it represented a more wide-spread problem.

c. Conclusions

The inspectors identified several problems which included the absence of a deficiency tag entry into the work control system, the lack of system engineering involvement, and the lack of operations follow-up although this failed gauge was noted during monthly surveillance testing activities. This is an inspection follow-up item (50-254/265-96010-06) pending a review of the licensee's corrective actions.

E4.3 Engineering Involvement in the Work Control Process

a. Inspection Scope (37550, 62703)

To evaluate the extent of engineering involvement in other organizations, the inspectors reviewed engineering's support for the non-outage work control process.

b. Observations and Findings

The inspectors identified that engineering involvement in the work control process was directed by Quad Cities Administrative Procedure (QCAP) 2200-03, "Planning and Scheduling Operating Cycle Work," and System Engineering Directive (SED) 2, "System Engineer Job Description." These procedures contained two primary elements:

- System engineering involvement in planning the scope of the work schedule prior to execution, and

- Resolution of engineering issues included in the work schedule within 8 weeks of planned execution.

The inspectors reviewed records and interviewed numerous work control personnel who indicated that system engineers were not consistently prepared for or were not attending the weekly work scope planning meeting. As a result, the work control lead unit planners (LUPs) were required to determine items to be worked although the system engineer, as described in QCAP 2200-3 and SED 2, was responsible for this duty.

In addition, licensee personnel also stated that in some cases, engineering was slow to support resolution of engineering issues, and as a result, these issues were added to the Plan of the Day (POD) topic list to track completion.

The inspectors discussed this issue with system engineers and supervisors who agreed with the inspectors' findings. In response to these concerns, the licensee held a meeting between system engineering and work control management during which the following corrective actions were planned:

- Increased system engineering preparedness in advance of the weekly work scope planning meeting to include a list of prioritized activities that the system engineer wants accomplished.

- Consistent system engineering attendance at the weekly work scope planning meeting.

- Increased feedback from work control to system engineering concerning work scope changes.

The effectiveness of these actions and the system engineer role will be continuously evaluated through future resident and regional inspections.

c. Conclusions

The inspectors concluded that system engineering involvement in the work control process was sometimes poor. Support in planning the scope of the work schedule prior to execution was inconsistent, and resolution of engineering issues was occasionally slow.

E4.4 Problem Identification in Engineering

a. Inspection Scope (37551)

The inspectors reviewed the licensee's problem identification program to determine if the licensee was adequately identifying problems associated with individual events as well as problem trends.

b. Observations and Findings

1. Problem Identification

The inspectors identified that 2033 problem identification forms (PIFs) were generated in the first six months of 1996 which represented a 69 percent increase over the previous year. In addition, the inspectors noted an increased sensitivity to reporting problems, particularly those involving engineering issues. The inspectors concluded that the problem identification threshold at the station had decreased.

2. Problem Trending

During the inspection, the inspectors reviewed the licensee's problem trending program and identified the following concerns.

SQV instruction 4 required that "recurrent" Levels I, II or III issues identified in the SQV monthly report be elevated. Also, QCAP 2300-27, "Problem Trending," required that a PIF be written for "adverse" trends identified during reviews of the PIF database.

Several SQV auditors and other licensee personnel interviewed provided varying perspectives regarding the meaning of "recurrent" or "adverse" trends. Also, these terms were not explicitly defined in the above procedures. For example, although problems with error detection practices (i.e. self-check) was an issue from October 1995 to March 1996, the April 1996 monthly report concluded that there was no sustained trend in self-check issues nor was a trend PIF issued. Based on the above discussions with the plant staff, it was unclear whether this issue should be considered a trend under the stated procedural guidance.

Since the SQV group administers the PIF process, many individuals believed that SQV was issuing trend PIFs based on the monthly report findings. In fact, several system engineers and regulatory assurance personnel stated that station practice was to issue a trend PIF if there were a number of recurrent PIFs which exceeded a threshold for a given time period. Some licensee personnel interviewed believed that this guidance was incorporated into the SQV review process. However, a discussion with SQV management indicated that trend PIFs were generated at the request of individuals and not as a result of audit findings.

c. Conclusions

The inspectors concluded that the threshold for identifying a problem had decreased and was a strength, however, procedural guidance concerning the licensee's identification of problem trends was vague and personnel interviewed were unfamiliar with the trend identification process.

E4.5 Vendor Information and Operating Experience Reports

a. Inspection Scope (37550)

The inspectors sampled licensee evaluations of vendor information, NRC correspondence such as Information Notices (INs) and Generic Letters (GLs), and industry operating experience reports to determine whether effective reviews were accomplished.

b. Observations and Findings

The inspectors determined that the licensee had implemented both a formal and thorough process to review technical information for site applicability with separate evaluations generated for each correspondence. For the responses sampled, the inspectors concluded that the evaluations were thorough and corrective actions implemented as a result of the findings were appropriate. There were, however, a few cases in which the licensee's evaluation of the event failed to address the root cause which may have been applicable although differences in plant designs would not have made that easily distinguishable. Overall, the inspectors concluded that the review process was effectively implemented.

c. Conclusions

The licensee's program to review technical correspondence was formal and thorough and was being effectively implemented. One minor weakness concerning the evaluation of root causes of events for systems or components of differing designs was identified.

E4.6 Vendor Document Control

a. Inspection Scope (37550)

The inspectors reviewed the licensee's vendor document control program and the vendor document update backlog. In particular, the licensee's processing of General Electric (GE) Service Information Letter (SIL) 448 was reviewed, in view of the recent failure of a GE breaker at another facility.

b. Observations and Findings

The inspectors noted that the licensee was aware of a large backlog in the review of vendor documents. The backlog had been reduced from 1500 vendor documents at the beginning of 1995 to about 880 in July 1996. The inspectors concluded that this backlog was high.

The inspectors noted the licensee's processing of GE SIL-448 regarding maintenance of GE 480 volt breakers. This SIL, issued on December 23, 1986, recommended that preventive maintenance and inspections of these breakers be done at 12 month intervals and that these breakers be completely disassembled and overhauled at intervals not exceeding 5

years. The licensee closed this SIL on September 16, 1989, stating that full implementation was completed by revision of Quad Cities Electrical Preventive Maintenance Procedures (QCEPM) 200-2, 200-5, 200-8, 200-9 and 200-10. However, the inspectors identified that the recommendations had been only partially incorporated into the maintenance procedures and omitted breaker disassembly. The licensee did not document the justification for not following the vendor recommendations. The current plant maintenance procedures, QCEPM 0200-09 and 16, also did not include the recommendations made in SIL-448. At the end of the inspection, the licensee was reviewing breaker maintenance practices and periodicities for all ComEd nuclear power plants and planned to develop new common procedures.

c. Conclusions

The licensee had a large backlog of unreviewed vendor documents. The review of the licensee's response to GE SIL 448 vendor document control practices at Quad Cities is an inspection follow-up item (50-254/265-96010-07) pending further review.

E5 Engineering Staff Training and Qualification

E5.1 Post Modification Training

a. Inspection Scope (37550)

The inspectors reviewed the licensee's program to ensure that all licensed personnel were cognizant of completed modifications prior to performing licensed activities.

b. Observations and Findings

The inspectors identified that no formal process or procedure existed to ensure licensed personnel were trained or otherwise apprised of plant changes including modifications. Although a random sample of several completed modifications did not identify any untrained staff, the process relied heavily on the cognizance and awareness of the training department and operating department personnel.

c. Conclusions

The inspectors concluded that the licensee's post-modification training program for licensed operators lacked any formal tracking system to ensure licensed operators were appropriately trained on plant configuration changes prior to performing licensed activities.

E7 Quality Assurance in Engineering Activities

E7.1 Licensee Self-Assessment Activities

a. Inspection Scope (40500)

The inspectors reviewed the licensee's self-assessment program to determine if the program was effectively implemented. Site Quality Verification (SQV) and Independent Safety Engineering Group (ISEG) audits and surveillance reports were reviewed. Selected SQV and ISEG personnel were interviewed. In addition, engineering department self-assessment efforts were also reviewed.

b. Observations and Findings

The inspectors reviewed the following SQV audit reports conducted during 1995 and 1996.

Audit	Description
04-95-08	Staffing and Training
04-95-09	Safe Shutdown Makeup System
04-95-10	Engineering and Technical Support
04-95-11	Corrective Action II
04-96-02	Corrective Action I
04-95-04	Outage Activities
04-96-09	Staffing and Training

The inspectors concluded that the audits were generally performance-based and noted that auditors from other ComEd sites as well as other utilities were included on the audit teams. The inspectors considered this a good practice.

The inspectors also reviewed ISEG evaluations and surveillances conducted in 1995 and 1996, and considered them to be thorough and effective. The inspectors reviewed some recent field monitoring reports and considered them satisfactory.

The Site Vice President issued Quad Cities Policy and Program (QCPP) directive 106 on September 30, 1994, which directed that each department establish a self-assessment program. The inspectors identified that although this directive was nearly two years old, the engineering departments had not yet established a self-assessment program. The inspectors considered the failure of the engineering department to establish a self-assessment program in accordance with QCPP 106 a weakness.

c. Conclusions

The audits and surveillances conducted by SQV and ISEG were considered to be generally performance-based. Utilization of auditors from other plants was considered a good practice. The failure of the engineering

department to implement the Site Vice President's 1994 directive to establish self-assessment program was a weakness.

E7.2 Review of Corrective Action Process

a. Inspection Scope (40500)

The inspectors reviewed the licensee's corrective action process and nuclear tracking system (NTS), with emphasis on a Level I corrective action record (CAR 4-95-004) issued by SQV in February 1995. To accomplish this review, the inspectors reviewed licensee procedures, selected problem identification forms (PIFs) and SQV audit reports generated in 1995 and 1996. In addition, the inspectors discussed the results of an SQV corrective actions audit with the auditors.

b. Observations and Findings

1. Review of Level I CAR

The Level I CAR was based on SQV audits and other observations which indicated a poor corrective actions program. In the CAR, SQV received several corrective action commitments.

Although SQV was regularly reviewing these commitments, the inspectors identified several problems with the follow-up process which included:

- The documented follow-up actions in the Level I CAR did not always reflect the actual follow-up process.

  As documented in the Level I CAR, SQV's follow-up actions appeared to primarily focus on procedural revisions. However, several SQV auditors indicated that other station corrective actions (such as management meetings, written staff guidance, etc) were also reviewed. However, the results of these reviews were not documented in the Level I CAR.

- The effectiveness of procedural changes required by the Level I CAR were not documented in the CAR.

  Commitment I.A.3 stated that the term "Significant Condition Adverse to Quality" would be defined in the next revision to QCAP 2300-20, Problem Identification." On June 7, 1995, SQV documented that the revision was made, but did not document if it was effective. SQV indicated that the auditors reviewed the effectiveness of procedural changes prior to acceptance, but that the results were not documented in the CAR.

- It was unclear whether SQV verified that procedural revisions were carried over into new procedures.

  On June 7, 1995, SQV verified that guidance regarding the significance of nonconformances was provided in station procedure

QCAP 2300-21. However, this procedure was subsequently replaced with QCAP 2300-20, which did not contain the required revision. A discussion with SQV auditors and a review of the follow-up documentation could not clearly establish if the change was reviewed.

- Related audit findings (CARs) documented in other audits, were not referenced to the Level I CAR when appropriate.

  Corrective action record 4-96-007 was issued in a subsequent audit of the corrective actions program for recurrent equipment failures resulting from poor root cause analyses. However, this CAR was not referenced in the follow-up to the Level I CAR, which concluded that the root cause evaluation process was ineffective. The auditors stated that there were several other findings related to the root cause process in other audits and that there was no formal mechanism to identify related findings.

The inspectors concluded that these weaknesses diluted the effectiveness of the SQV follow-up process.

2. Management Oversight of the Nuclear Tracking System (NTS) Database

Corrective action commitments for NRC, SQV and PIF investigative findings were tracked as NTS action items. Inspection report 94020 identified the following problems with the NTS process:

- NTS items were closed without verifying completed actions;
- NTS commitment due dates were extended with little or no management review; and
- There was a large number of overdue commitments.

Subsequently, several corrective actions were taken which included station manager approval to either close or extend the due date of an NTS item. In addition, for closure, management approval was contingent on actual, not planned, corrective actions. However, the inspectors identified that although this expectation was stated in a March 29, 1996 station manager memorandum and was incorporated into station QCAP 2300-20, "Problem Identification," this guidance was not included in QCAP 2300-6, "Station Commitment and Action Item Tracking." The inspectors discussed this with the licensee, who planned to revise the procedure.

During daily and weekly station meetings, the inspectors noted that station management held personnel accountable for assigning and complying with NTS due dates. Also, the "Plan of the Day" report summarized those NTS action items whose due dates were approaching or exceeded, and the individual(s) responsible for the item. The inspectors reviewed selected NTS items and verified that these items were closed to actual and not planned corrective actions. No deficiencies were identified.

Monthly, the SQV group distributed a report summarizing the progress of NTS oversight efforts. The inspectors reviewed the June 1996 report and noted a decline in the number of overdue NRC/SQV commitment items for the last six months of 1995. However, the inspectors noted that in 1996, a large influx of emergent engineering issues resulting from a station review of engineering deficiencies had increased the total number of open and overdue items.

3. Review of Station Audits

The SQV group audited the corrective actions process about every six months. Audits 4-95-11 and 4-96-02 were conducted following the Level I CAR and contained several SQV findings which indicated continuing problems with the corrective action process. Examples included:

- Corrective action record 4-95-072, documented several examples where corrective actions for level 4 PIFs were untimely and/or ineffective;

- Corrective action records 4-95-067, 4-96-007, 4-96-004 and 4-96-005 documented examples where corrective actions were closed without verifying that these actions were completed, were overdue, and/or were not tracked in the NTS database; and

- Corrective action record 4-96-007 documented a repeat finding of inadequate root cause analyses which led to recurring equipment failures.

At the end of the inspection, the licensee was conducting a routine corrective actions audit. The audit included a review of corrective actions taken by the station to address the above findings, and in particular, the Level I CAR. The auditors indicated that to date, the audit findings indicated that some improvements were being made, but that overall, the corrective actions program was still weak and warranted continued attention.

c. Conclusions

A review of audit results identified continuing problems with the licensee's corrective action process. These problems were documented in a Level I CAR, which was being regularly followed by SQV. However, several problems were identified with the follow-up process. Improvement was noted with management oversight of NTS activities. An SQV audit of the corrective action process was ongoing, but to date, the audit findings indicated that the overall station corrective action program was still weak and warranted continued attention.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Maintenance Backlog

a. Inspection Scope (62703)

The inspectors reviewed the licensee's non-outage corrective, planned, and minor maintenance backlog for size, nature of items, and overall trend to assess the licensee's ability to manage the backlog.

b. Observations and Findings

The inspectors made the following observations and findings concerning the licensee's non-outage corrective, planned, and minor maintenance backlogs.

Non-Outage Corrective Maintenance Backlog

The inspectors identified that the licensee's June 23, 1996, non-outage corrective maintenance backlog was relatively large, 1534 items, and had increased by 88 items from week 1 to week 26 of 1996, which was in part due to an extended refueling outage. In addition, the inspectors reviewed the licensee's historical trend data and identified that not only had the corrective maintenance backlog increased slightly since the beginning of 1996, but over the last 9 months no significant additions or reductions in the backlog had occurred.

The inspectors also identified that the licensee had established a goal to reduce this backlog to 750 items or less by the end of 1996, but had not established any interim goals or corrective actions to meet that goal. The inspectors concluded that the licensee's failure to address this issue demonstrated a weakness in the licensee's performance monitoring process and management oversight of the backlog.

Non-Outage Planned Maintenance Backlog

The inspectors identified that the licensee's June 23, 1996, non-outage planned maintenance backlog was 422 items, and had increased significantly (by 128 items) from week 1 to week 26 of 1996. In addition, the inspectors identified that the licensee had only recently begun trending the planned maintenance backlog in their performance monitoring report and that a goal of 1250 items by the end of the year for total backlog (the sum of non-outage corrective work requests, planned work requests, and action requests) had only very recently been established. The inspectors concluded that although trending the backlog and establishing performance goals was a good initiative, these actions were not initiated in a timely manner.

Minor Maintenance Backlog

The inspectors identified that the licensee's June 23, 1996, minor maintenance backlog was 455 items, had increased by 416 items from week 1 to week 26 of 1996, and that although the licensee had recently established an overall total backlog goal, a specific goal for minor maintenance items did not exist. The inspectors concluded that although these items are minor in nature and most can be completed in less than a shift, the increase in the backlog over the last 6 months may eventually result in a reduction in the effectiveness of the licensee's minor maintenance programs to address minor maintenance items. In addition, the inspectors concluded that the lack of a specific minor maintenance backlog goal could result in a diversity of standards for good performance among maintenance personnel, resulting in reduced maintenance staff productivity.

c. Conclusions

The licensee failed to address reduction of the non-outage corrective maintenance backlog to meet established goals despite minimal progress. Although trending of the non-outage corrective and minor maintenance backlogs and establishing performance goals was a good initiative, the failure to initiate these actions in a more timely manner was a weakness.

M1.2 Effectiveness of the Work Control Process

a. Inspection Scope (62703)

The inspectors reviewed the licensee's rolling 13-week non-outage work control process to determine the effectiveness of the organization in prioritizing, planning, and executing maintenance tasks.

b. Observations and Findings

Through discussions with licensee personnel and a review of the licensee's performance monitoring program, the inspectors identified the following concerns and/or weaknesses in the licensee's work control process in addition to those identified in paragraph E1.1:

- Lack of Performance Monitoring Goals. The inspectors identified that the licensee trends numerous work control process effectiveness indicators. These include maintenance department schedule adherence, work schedule scope changes, and emergent work additions. However, the inspector also identified that the licensee failed to establish any goals for these indicators. The inspectors concluded that the lack of performance monitoring goals could result in slow corrective actions to address negative performance trends and could result in a diversity of standards for good performance among licensee personnel.

- Work Control Process Milestones Not Tracked. The inspectors identified that although the licensee had established milestones for performance as part of the 13-week rolling schedule, monitoring to ensure these milestones were satisfactorily accomplished was not consistently applied. For example, milestones concerning out-of-service preparation, radiation work permit preparation, and maintenance walkdowns were also not trended. The inspectors concluded that the failure to trend these milestones was a potential missed opportunity to identify work control process problems.

- Self-Assessment Weaknesses. The inspectors identified that the licensee had established a work week critique report to determine the effectiveness of execution of maintenance for the previous week. This report predominantly consisted of an assessment sheet delineating the jobs in the original work scope and the results of subsequent maintenance efforts. The inspectors concluded that although the critique sheet was a good way to track the effectiveness of maintenance for particular tasks, there appeared to be no accountability for overall results since no formal post execution week discussions were scheduled to critique the previous weeks results.

- Job Code Classification Weaknesses. The inspectors identified that although the licensee has established non-outage backlog categories such as corrective, planned, facilities, and minor maintenance, no formal definitions existed to guide licensee personnel on categorization of received work items. As a result, the inspectors identified numerous examples of items of similar natures located in different backlogs. Also, the inspectors identified an untrended backlog of about 200 items in an "unknown" backlog category with many items which appeared to be better assigned to other more visible backlogs such as planned, corrective, or facilities. Overall, the inspectors concluded that the lack of written job code classification guidelines could result in mis-classification of work requests and potential skewing of the trended backlogs.

The inspectors discussed these findings with the licensee who agreed with the characterization of the issues and proposed the following corrective actions and implementation schedule:

- Review items in non-outage backlogs for proper classification by August 31, 1996.

- Revise applicable work control procedures to include appropriate job code classification definitions and conduct necessary training by September 30, 1996.

- Establish monthly performance monitoring goals by September 30, 1996.

- Establish monthly backlog goals for the maintenance work teams by December 31, 1996.

- Establish a monthly backlog reduction goal (workoff curve) by September 30, 1996.

The effectiveness of these actions will be continuously reviewed in resident and regional inspections.

c. Conclusions

The inspectors concluded that the licensee's work control process was adequate, however, numerous weaknesses were noted, particularly in performance monitoring, self-assessment, and backlog classification. The licensee agreed with the inspectors findings and proposed corrective actions which will be reviewed in a future inspection report.

III. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on July 26, 1996. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

E. Kraft	Site Vice President
J. Hutchinson	Site Engineering Manager
D. Craddick	System Engineering Supervisor
J. Garrity	Design Engineering Supervisor
M. Tucker	Electrical Design Engineer
K. Peterson	Electrical Design Lead Engineer
F. Famulari	Site Quality Verification Director
M. Hayes	Site Quality Verification Audit Supervisor
J. Sirovy	Integrated Analysis Administrator
W. Lipscomb	Work Control Superintendent

NRC

D. Butler	Electrical Specialist Inspector

INSPECTION PROCEDURES USED

IP 37550	Engineering
IP 37551	Onsite Engineering
IP 37700	Design Changes and Modifications
IP 37702	Design Changes and Modifications Program
IP 40500	Effectiveness in Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 62703	Maintenance Observation
IP 71707	Plant Operations

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

96010-01	VIO	Design Control
96010-02	VIO	Procedure Adherence
96010-03	IFI	Fuse Control Program
96010-04	IFI	Breaker Coordination
96010-05	IFI	Battery Temperature Operability Limits
96010-06	IFI	Faulty Electrical Penetration Pressure Gauge
96010-07	IFI	Resolution of GE Service Information Letter 448

Closed

96008-09	URI	Degraded Voltage
96008-10	URI	Cable Ampacity

LIST OF ACRONYMS USED

AC	Alternating Current
CAR	Corrective Action Record
DC	Direct Current
DCP	Design Change Package
DG	Diesel Generator
DGCWP	Diesel Generator Cooling Water Pump
ECCS	Emergency Core Cooling System
EDSFI	Electrical Distribution System Functional Inspection
ELMS	Electrical Load Monitoring System
E&TS	Engineering and Technical Support
GE	General Electric
IFI	Inspection Follow-up Item
IR	Inspection Report
ISEG	Independent Safety Engineering Group
KV	Kilovolt
LER	Licensee Event Report
LLRT	Local Leak Rate Test
LOCA	Loss of Coolant Accident
LUP	Lead Unit Planner
MCC	Motor Control Center
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NTS	Nuclear Tracking System
PIF	Problem Identification Form
PIR	Problem Investigation Report
POD	Plan of the Day
QCAP	Quad Cities Administrative Procedure
QCEPM	Quad Cities Electrical Preventative Maintenance Procedure
QCOS	Quad Cities Operating Surveillance
QCPP	Quad Cities Policy and Program
QCTP	Quad Cities Technical Procedure
RCA	Root Cause Analysis
RCIC	Reactor Core Isolation Cooling
SBLC	Standby Liquid Control
SCFH	Standard Cubic Feet Per Hour
SED	System Engineering Directive
SIL	Service Information Letter
SLICE	Sargent and Lundy Interactive Cable Engineering
SQV	Site Quality Verification
UFSAR	Updated Final Safety Analysis Report
Vac	Volts AC
Vdc	Volts DC
W/ft	Watts Per Foot