

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-295/90017(DRP); 50-304/90019(DRP)

Docket Nos. 50-295; 50-304

Licenses No. DPR-39; DPR-48

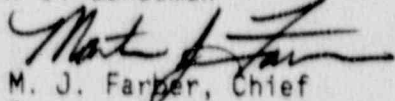
Licensee: Commonwealth Edison Company  
P. O. Box 767  
Chicago, IL 60690

Facility Name: Zion Nuclear Power Station, Units 1 and 2

Inspection At: Zion, Illinois

Inspection Conducted: July 15 through September 1, 1990

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9/28/90  
Date

Inspection Summary

Inspection from July 15 through September 1, 1990 (Reports No. 50-295/90017(DRP); No. 50-304/90019(DRP))

Areas Inspected: Routine, unannounced resident inspection of licensee action on previous inspection findings; summary of operations; operational safety verification and engineered safety feature (ESF) system walkdown; surveillance observation; maintenance observation; licensee event reports (LERs) and deviation reports (DVRs); training; and management meetings.

Results: Of the 14 areas inspected, no violations or deviations were identified. In the area of plant operations, the licensee's performance remains constant. However, a weakness was identified in the number of personnel errors that occurred as a result of inattention to details. One event caused by an operator involved an inadvertent trip of Unit 1 while attempting to trip the Unit 2 main turbine. In the second incident, an

operator's failure to verify proper valve position resulted in inadvertent flow from the boron injection tank (BIT). In contrast, when the turbine control system failed, aggressive and timely operator actions were initiated to stabilize the plant.

The licensee's performance in the area of Maintenance and Surveillance was overall considered good. Although the licensee performed a large number of outage-related, start-up and routine surveillances, no major problems or concerns were observed. However, due to a scheduling error, one surveillance was missed. During maintenance troubleshooting activities on the 2C containment spray pump, two personnel errors occurred when a mechanic inadvertently started the pump by lifting the wrong lead and then failed to notify the control room of the start.

The licensee's performance in Engineering and Technical Support was overall considered good. Root cause analysis was identified as a strength in the resolution of the 2B emergency diesel generation (EDG) auto synchronization breaker closure failures. The Technical Staff demonstrated thorough and good technical analysis in root cause determination for the electrical penetration failure. However, the Technical Staff performed less than satisfactorily in evaluating the environmentally qualified (EQ) requirements for the reactor vessel level indication system (RVLIS) resistance temperature detectors (RTDs).

In the area of Safety Assessment/Quality Verification, the licensee's performance remains adequate. However, there was one instance when the licensee failed to make a timely notification to the NRC when the OA lake discharge tank failed to isolate on a radiation monitor high radiation alarm.

In the area of Emergency Preparedness, the licensee's performance remains constant. Several weaknesses were identified during the annual NRC evaluated GSEP exercise which included personnel assembly/accountability, effectiveness of operations support center in dispersing support personnel, handling contaminated people, and quantifying radioactive release.

## DETAILS

### 1. Persons Contacted

- \*T. Joyce, Station Manager
- \*T. Rieck, Superintendent, Technical
- W. Kurth, Superintendent, Production
- R. Budowle, Onsite Nuclear Safety
- T. Broccolo, Director, Services
- D. Karjara, Director, Performance Improvement
- \*W. Stone, Assistant to Technical Superintendent
- D. Redden, Assistant to Production Superintendent
- P. LeBlond, Assistant Superintendent, Operations
- R. Johnson, Assistant Superintendent, Maintenance
- J. LaFontaine, Assistant Superintendent, Work Planning
- E. Fuerst, Project Manager, ENC
- \*T. Vandervoort, Quality Assurance Supervisor
- \*C. Schultz, Quality Control Supervisor
- R. Chrzanowski, Regulatory Assurance Supervisor
- W. T'Niemi, Technical Staff Supervisor
- R. Smith, Security Administrator
- \*T. Saksefski, Regulatory Assurance
- N. Valos, Unit 2 Operating Engineer
- W. Demo, Unit 1 Operating Engineer
- M. Carnahan, Unit 0 Operating Engineer
- W. Mammoser, PWR Projects

\*Indicates persons present at the exit interview.

The inspectors also contacted other licensee personnel including members of the operating, maintenance, security, and engineering staff.

### 2. Licensee Actions on Previous Inspection Findings (92701, 92702)

#### Violations

(Closed) Violation (295/88009, 304/88010-03): Failure to properly control temporary alterations to plant systems using Zion administrative procedure (ZAP) 3-51-4. The licensee conducted formal discussions with all mechanical maintenance department supervisors, specifically covering the requirements of ZAP 3-51-4, "Procedures governing the use of temporary cables, lifting of terminated wires, bypassing of alarms, and installation of mechanical blocks or bypasses". This violation is considered closed.

(Closed) Violation (295/88012-04): Failure to maintain retrievability of surveillance tests and to log associated activities in operating logs. The licensee issued a memo to all shift engineers stressing the need for improvement in log-keeping and that all test performed, whether failed, incomplete or otherwise are to be retained. This violation is considered closed.

(Closed) Violation (295/88012-07; 304/88013-06): Installation of heat traces on the EDG room damper airlines without modification controls. The licensee failed to control plant modification as required by procedure. The plant modification process has been rewritten to include this type of temporary design change item. This violation is considered closed.

(Closed) Violation (295/88012-09; 304/88013-07): Failure to perform quarterly channel functional tests for safeguards instruments for permissive P-12 from initial operations to June 1987 for both units. In early 1988, the licensee issued a new procedure, ZAP 5-51-25 "Technical Specification amendment," to aid in the implementation of new TS requirements from amendments. This violation is considered closed.

(Closed) Violation (304/88019-06): Failure to implement effective corrective action to preclude recurrence of low OC Boric Acid Tank concentration. The long term corrective action, a technical specification change, was pending; however, the short term corrective actions were not sufficient to preclude reoccurrence. The licensee discussed the event with the department heads, corporate management and all members of on-site review, to stress the need to take sufficient interim measures for those events where the long term corrective action cannot be performed immediately. This violation is considered closed.

(Closed) Violation (295/88021-01): Failure to initiate a DVR or discrepancy report as required by ZAPs 15-53-1 and 15-52-1 when all 20 Unit 2 main steam safety valves (MSSVs) were found with lift setpoints out of tolerance. The mechanical maintenance procedure for testing MSSVs have been changed to require that a DR be generated whenever the as found setpoints are found to be out of tolerance. The Quality Assurance (QA) department on-site conducted training on QA's responsibility of ensuring proper trouble reports such as DRs and DVRs were properly processed. This violation is considered closed.

(Closed) Violation (295/88021-02): Purchase orders failed to be properly marked as ASME SECTION XI or to include technical engineering requirements for Unit 1 MSSV testing. The procedure, ZAP 4-51-1, "Establishing quality requirements for requests for purchase and requisition cards," included verification from the technical staff that applicable requirements are included or referenced on request for purchase and computerized order forms. This violation is considered closed.

(Closed) Violation (295/89015-01(DRP)): Uncontrolled gas release due to an approved out-of-service card sheet with an improper sequence. The licensee's corrective actions included convening an Error Evaluation Committee to determine the root causes and counseling the operators on the importance of proper communications, planning, and control of out-of-service sequencing. In addition, special sequencing evolutions have been implemented by a program for partial clears and modification clears. This violation is considered closed.

(Closed) Violation (295/89015-04): Reactor trip due to low vacuum trip during instrument maintenance (IM) surveillance. As part of the licensee's commitment to review all non-safety related IM procedures, to date, of the 92 procedures which were identified, 89 have completed the review process. To prevent the use of the three remaining procedures, caution statements have been incorporated into the procedures. This violation is considered closed.

(Closed) Violation (295/89033-01): Failure to establish two operable flow paths from the motor driven auxiliary feedwater (AFW) pumps to the steam generators (SG) after the 1A turbine driven AFW pump was declared inoperable, within the time allowed by the action requirement. A change was made to the system lineup procedure to perform an operability test, PT-7, on the B AFW pump whenever it has been aligned to the A AFW pump header. PT-7 was revised to specify the acceptance criteria of required AFW flows following testing or header realignment. Technical Specification requirements to ensure AFW system flow path operability was published by the station to clarify the intent of TS 3.7.2.d. This violation is considered closed.

#### Unresolved

(Closed) Unresolved Item (295/88019-04): Resolution of the identified EQ deficiencies in DVR 1-88-109. 1C AFW pump fabricated splices were tested per Wyle Nuclear Environmental Qualification Test Report 17041-2. The test specimens met the acceptance criteria without exception. The remaining subject splices were found to be fully qualified per an engineering analysis of the splice designs and materials of construction. The electrical maintenance department has been instructed to consult the technical staff EQ coordinator prior to replacing any EQ splice and to adhere to the vendor splice installation instruction. This unresolved issue is considered closed.

(Closed) Unresolved Item (295/89013-01(DRP)): Review of licensee's interim measures to improve work packages. This issue was also identified by the Maintenance Team Inspection in inspection report 295/89018; 304/89017. This issue was identified as violation 295/1801-A; 304/1701-A in the above report and has subsequently been closed out by a follow-up inspection in inspection report 295/90009; 304/90010. This unresolved item is considered closed.

(Closed) Unresolved Item (295/89021-02(DRP)): AFW flow below design. This issue was tracked under violation (295/89033-01(DRP)) and is considered closed.

(Closed) Unresolved Item (295/89021-06): During MSSV testing improper test equipment was used. Maintenance procedure PIMS014/033-1, "On-line testing of the MSSVs," was developed for use when performing this surveillance test. ZAP 2-54-5 was revised to provide for the safety evaluation screen criteria. This unresolved issue is closed.

## Open Items

(Closed) Open Item (295/85042-03): Determine root cause of diesel generator phase breaker not closing or the reason why the linkage arm was incorrectly installed. The licensee discussed this issue with the maintenance department and applicable procedures were revised to examine for excessive play in the mechanism during inspection and overhauls. This open item is considered closed.

(Closed) Open Item (295/87034-04;304/87035-03): Lack of characteristic curves for all installed current transformers to determine protection for current transformer open secondary circuits. The licensee has obtained and evaluated all the current transformer curves as required. This open item is considered closed.

(Open) Open Item (295-88009-04): Concerns with inspection of valve 1MOV-SI8804B. Motor control center drawing 22E-1-4204 for 1MOV-SI8804B incorrectly identifies 8 terminal block termination locations due to a completed modification (MECN M-22E00064-00). A design change request (DCR) package (90-017) was initiated in February, 1990; to reflect the actual terminal block wiring. This item remains open pending completion of the DCR.

(Closed) Open Item (295/89013-02(DRP)): Replacement of steam generator tube plugs. NRC Bulletin 89-01, "Failure of Westinghouse steam generator tube mechanical plugs," requires licensees to: (1) verify and replace the number of Westinghouse mechanical plugs in the steam generators' hot and cold legs; (2) estimate the lifetime for all suspect plugs based on the Millstone Unit 2 benchmark, implement appropriate remedial actions for plugs whose estimated lifetimes expires prior to the next refueling outage, perform ALARA analysis of various plug replacement methods to determine the most dose reduction method, discontinue installation of the plugs, and examine the removed plugs for primary water stress corrosion cracking (PWSCC); (3) take action to defer remedial action for SG tubes that are partially depth expanded within the tubesheet; and (4) take action to defer remedial actions for "sentinel related" mechanical plugs.

All of the above mentioned actions except for items 3 and 4 have been satisfactorily performed by the licensee. The deferral of items 3 and 4 was not exercised by the station because the items were not applicable to the Zion station. However, it should be noted that item 2d, which requires all removed plugs to be examined for PWSCC, was not performed for Unit 1 or 2. The plugs for Unit 1 were inadvertently disposed of, and the plugs for Unit 2 were subsequently waived from examinations based on correspondence from the Westinghouse Electric Company. This Open Item is considered closed.

(Closed) Open Item (295/89015-03): Evidence of small tube rubbing on the 1B EDG. This issue was considered a violation (295/89200-01F). This Open Item is considered closed.

(Closed) Open Item (304/89035-03): Licensee's review and evaluation of all IM procedures affecting auto rod control. Review of the procedures directly affecting automatic rod motion showed that either the rods are placed in manual control or the affected temperature loop is defeated. Associated procedures were also reviewed and a new troubleshooting procedure was implemented. This open item is considered closed.

(Closed) Open Item (295/89039-02): Rework on packing for residual heat removal hot leg suction valve. The maintenance procedure, AM025-IN, has been revised to ensure that the valve stem is centered prior to installing the packing. This open item is considered closed.

(Closed) Open Item (295/89039-03): Review station battery surveillance program concerning electrolyte levels. In accordance with PT-30, electrical maintenance personnel add water only if electrolyte level is 1/4" below the full line. The vendor recommendation is that electrolyte level be maintained above the low level or bottom line. This open item is considered closed.

No violations or deviations were identified.

### 3. Summary of Operations

#### Unit 1

The unit operated at power levels up to 100% power for most of the inspection period. On August 13, 1990, a turbine trip-reactor trip occurred when a licensed operator inadvertently tripped the Unit 1 turbine instead of the Unit 2 turbine as requested. The unit was made critical on August 16 and was synchronized to the grid on August 17 at approximately 12:26 p.m. The unit operated continued at power levels up to 97% power for the remainder of the period. The unit was derated by 2% due to problems with the 1C SG steam flow transmitter, FT-522.

#### Unit 2

The unit entered the report period in cold shutdown from the cycle 11 refueling outage. On July 15, while attempting to repair a nitrogen leak on electrical penetration E-31 (associated with 2D reactor coolant pump), a catastrophic failure of the electrical penetration occurred. The penetration was replaced with a spare on July 28. Problems with the 2C containment spray (CS) pump further delayed Unit 2 heatup. On August 1, the 2C CS pump was successfully tested and progress continued in preparation to leave cold shutdown. On August 8, the unit was placed in hot shutdown in preparation for coming on-line. On August 20, the unit was taken critical for the start of low power physics testing. During startup preparation, a leak in the hydrogen side seal oil cooler developed which further delayed startup by requiring the unit to be placed in hot shutdown. On August 26, the unit was again made critical and on August 30, the unit was synchronized to the grid, ending the 162 day of a 70 day scheduled refueling outage.

No violations or deviations were identified.

4. Operational Safety Verification and Engineered Safety Features System Walkdown (71707 & 71710)

a. Operational Safety

During the inspection period between July 15 through September 1, 1990, the inspectors verified that the facility was being operated in conformance with the licenses and regulatory requirements and that the licensee's management control system was effectively carrying out its responsibilities for safe operation. This was done on a sampling basis through routine direct observation of activities and equipment, tours of the facility, interviews and discussions with licensee personnel, independent verification of safety system status and limiting conditions for operation action requirements (LCOARs), corrective action, and review of facility records.

On a sampling basis the inspectors daily verified proper control room staffing and access, operator behavior, and coordination of plant activities with ongoing control room operations; verified operator adherence with the latest revisions of procedures for ongoing activities; verified operation as required by Technical Specifications (TS); including compliance with LCOARs, with emphasis on engineered safety features (ESF) and ESF electrical alignment and valve positions; monitored instrumentation recorder traces and duplicate channels for understanding, off-normal condition, and corrective actions being taken; examined nuclear instrumentation and other protection channels for proper operability; reviewed radiation monitors and stack monitors for abnormal conditions; verified that onsite and offsite power was available as required; observed the frequency of plant/control room visits by the station manager, superintendents, assistant operations superintendent, and other managers; and observed the Safety Parameter Display System for operability.

b. ESF Systems (71710)

During the inspection, the inspectors selected accessible portions of several ESF systems to verify status. Consideration was given to the plant mode, applicable TS, LCOARs, and other applicable requirements.

Various observations, where applicable, were made of hangers and supports; housekeeping; whether heat tracing circuits, if required, was installed and operational; valve position and conditions; potential ignition sources; major component labeling, lubrication, cooling, etc.; whether instrumentation was properly installed and functioning and significant process parameter values were consistent with expected values; whether instrumentation was calibrated; whether necessary support systems were operational; and whether locally and remotely indicated breaker and valve positions agreed.



During the inspection, the accessible portions of the AC electrical power system; DC electrical power system; reactor protection system; residual heat removal system; containment and support system; engineered safety features system; radiation monitoring system; service water system; component cooling water system; main and auxiliary steam system; condensate, feedwater system; process sampling system; circulating water system; main generator system; diesel generator and auxiliaries system; plant fire protection system; and control room system were inspected to verify operability. The inspectors verified the operability of selected emergency systems, reviewed tagout records, and verified proper return to service of affected components. Tours of the auxiliary and turbine buildings were conducted to observe plant equipment conditions, including potential fire hazards, fluid leaks, and excessive vibrations and to verify the maintenance requests had been initiated for equipment in need of maintenance.

c. Onsite Event Follow-up (93702)

Unit 1 Electro Hydraulic Control (EHC) System Plant Upset

On July 17, 1990, the Unit 1 main turbine number four governor valve inadvertently cycled open causing a slight power transient. The turbine electrical power momentarily increased from 1080 megawatts (MW) electric to 1120 MW. The operator immediately took manual control of the turbine with the valve positioner limiter and reduced power to 1060 MW, terminating the transient. Investigation and troubleshooting determined that the turbine up-down control electronic card was defective. The card was replaced and no further problems have occurred.

Unit 1 Turbine Trip - Reactor Trip

On August 13, 1990, while performing PT-5A, "Reactor Protection Logic, Reactor at Shutdown" surveillance on Unit 2, the control room operators had difficulty opening two of the turbine stop valves. An auxiliary operator (A-man) and foreman were dispatched to investigate the problem. The Unit 2 turbine was latched and was rolling at approximately 200 rpm when an erratic EHC speed channel tripped three of the four bearing oil lift pumps. The operators were concerned with the potential of damaging the turbine bearings from lack of lubrication and decided to trip the turbine. It was decided not to trip the turbine from the control room due to the possible safety hazard to the A-man who was believed to be inside of the turbine front standard. One of the extra licensed operators performing the test left the control room to locally trip the Unit 2 turbine. In his haste to trip the turbine to protect the bearings, the operator mistakenly approached the Unit 1 turbine, manually tripped it, and subsequently caused a turbine trip-reactor trip. Unit 1 was at 99% power at the time of the trip.

The root cause of this event was personnel error. The operator was preoccupied with the urgency to trip the Unit 2 turbine that he did not verify that he was on the right unit before taking action. Contributing factors included the fact that the operations staff does not routinely carry radios and that the operator was not cognizant of the plant color coding due to infrequent in-plant activity involvement. The newly implemented operations staff reorganization requires the operators to perform tasks outside of the control room; thereby increasing their involvement with the in-plant activities.

#### Inadvertent Flow From the BIT

On August 15, 1990, while performing a safeguards actuation test on Unit 2, flow through the BIT occurred due to an incorrect lineup of the BIT discharge and BIT injection valves. The unit was in hot shutdown at the time of the event. While performing the step which required the operator to close the BIT discharge valve, the operator did not hold the control switch long enough for the close signal to seal in. The operator proceeded with the test and did not verify that the discharge valve had closed. The operator opened the injection valve per procedure and noted a decrease in the volume control tank (VCT) level and an increase in the pressurizer level. The operator realized that both the injection and discharge valves were opened and closed them which terminated the flow through the BIT. The boron concentration of the BIT and VCT are the same; thus, no dilution of the reactor coolant system occurred. There was a slight level increase in the reactor. The root cause of the event was personnel error in that the operator did not verify a procedure step before proceeding to the next step.

#### Reorganization of the Operations Department

For better command and control of plant events and assignment of tasks to the operations personnel, the licensee implemented the following changes in the control room. The responsibility of the shift engineer remains the same. The non-licensed and licensed shift supervisors direct the radwaste equipment attendant and reserve personnel. A senior licensed control room unit supervisor, two licensed nuclear station operators, and auxiliary operators are assigned to each unit. The role of the Shift Technical Advisor will be assumed by either unit supervisors or the licensed shift supervisor. The unit supervisor is responsible for directing the inplant personnel and for controlling the activities of the unit. One of the assigned nuclear operators has the primary responsibility for the unit and the other provides assistance both in and out of the control room. The reorganization was implemented on August 31, 1990. The resident inspectors will continue to monitor and evaluate the affects of these changes.

### Operational Staff Overtime

Due to the dual unit outages and the extended refueling outages, the level of overtime for the operating department has been excessive. In April 1990, the licensee implemented ZAP-09, "Overtime Guidelines" to control the amount of overtime of the plant personnel in order to meet the intention of NRC and corporate Commonwealth Edison (CECo) overtime policy. The operations staff has continuously and excessively deviated from the guidelines, both non-licensed and licensed operators personnel. The licensee routinely authorized 84 hour work weeks due to the work load created by the outages. The licensee attempted to limit overtime on an individual basis; however, was unsuccessful. As of September 7, 1990, the licensee will not schedule, offer or force overtime that would result in a violation of the NRC/CECo policy. This is considered an unresolved item (295/90017-01(DRP); 304/90019-01(DRP)) pending further review of the licensee's overtime practices and corrective actions.

#### d. Current Material Condition (71707)

The inspectors performed general plant as well as selected system and component walkdowns to assess the general and specific material condition of the plant, to verify that Nuclear Work Requests had been initiated for identified equipment problems, and to evaluate housekeeping. Walkdowns included an assessment of the buildings, components, and systems for proper identification and tagging, accessibility, fire and security door integrity, scaffolding, radiological controls, and any unusual conditions. Unusual conditions included but were not limited to water, oil, or other liquids on the floor or equipment; indications of leakage through ceiling, walls or floors; loose insulation; corrosion; excessive noise; unusual temperatures; and abnormal ventilation and lighting. The licensee promptly resolved and corrected any concerns identified by the inspectors.

#### e. Radiological Controls (71707)

The inspectors verified that personnel were following health physics procedures for dosimetry, protective clothing, frisking, posting, etc., and randomly examined radiation protection instrumentation for use, operability, and calibration.

#### Lake Discharge Tank Failed to Isolate on a High Radiation Signal

On July 27, 1990, at approximately 10:45 a.m., the OA lake discharge tank (LDT) was being discharged when the discharge radiation monitor (ORT-04) alarmed. A close signal was sent to the canal discharge isolation valve, OFCV-WD08; however, the valve did not fully close.

The valve was then closed manually by the local operator. A sample was taken prior to the discharge from OA LDT which determined that the radioactivity of the water was within the allowable release limits. After the tank was isolated, a confirming sample was taken from the OA LDT which showed no increase in radioactivity from the initial sample. The contents of the tank was then released as a batch release.

An investigation revealed that the liquid canister of radiation monitor (ORT-PRO4) had internal contamination which caused a high background level. It is believed that the radiation monitor alarmed due to a spurious signal. Accordingly, ORT-PRO4 was taken out of service and the liquid canister was cleaned. A functional test was performed on valve OFCV-WD08 just prior to the tank release and the valve closed on the high radiation alarm as required. After investigation, it is believed that the valve closed on the high radiation signal, but reopened when the radiation monitor was reset according to the design of the circuit.

f. Security (81064)

Each week during activities or tours, the inspector monitored the licensee's security program to ensure that observed actions were implemented in accordance with the approved security plan. The inspector noted that persons within the protected area displayed proper photo-identification badges and those individuals requiring escorts were properly escorted. The inspector also verified that checked vital areas were locked and alarmed. Additionally, the inspector also verified that observed personnel and packages entering the protected area were searched by appropriate equipment or by hand.

g. Emergency Preparedness

On July 18, the station conducted the annual NRC evaluated GSEP exercise. Weaknesses were identified in the areas of personnel assembly/accountability and in the operations support center which included timeliness in dispersing support personnel, handling contaminated people, and quantifying radioactive release.

h. Assessment of Plant Operations

The weaknesses identified during this period included personnel errors, one which involved an inadvertent trip of the wrong main turbine which caused the Unit 1 reactor trip. In another example, the operator did not verify a valve position which resulted in flow from the VCT through the BIT tank to the reactor.

On the positive side, coordination between the operations, maintenance and radiation protection was very good during the repair of the safety injection suction valve which resulted in an inoperability time of only 15 minutes during a maintenance activity. Also, the control room operator responded rapidly and took manual control of the main turbine when the turbine control system failed.

No violations or deviations were identified. One unresolved item was identified in the area of operations staff overtime.

5. Monthly Surveillance Observation (61726)

The inspector observed TS required surveillance testing on the plant systems and verified whether testing was performed in accordance with adequate procedures, whether test instrumentation was calibrated, whether limiting conditions for operation (LCO) were met, whether removal and restoration of the affected components were accomplished, whether test results conformed with TS and procedure requirements and were reviewed by personnel other than the individual directing the test, and whether any deficiencies identified during the testing were properly reviewed and resolved by appropriate management personnel.

The inspector also witnessed portions of the following test activities:

PT-2B	Verification of Containment Recirculation Sump Valve Stroke and ECCS Continuity
PT-2C	ECCS Valve Interlock Test
PT-2G	Accident Monitoring Instrumentation Channel Check Test
PT-5	Reactor Protection Logic at Normal Operating Conditions or at Hot Shutdown
PT-7	Auxiliary Feedwater System Checks and Tests
PT-11	Diesel Generator Loading Test
PT-15C	Hydrogen Recombiner Low Level Readiness Test
PT-23	Main Steam Isolation Valves Refueling/Cold Shutdown Surveillance
TSSP 024-90	SI Check Valve Hydro
TSSP 092-90	AFW Overspeed
TSS 15.6.35.2	Manual Actuation of the Safety Injection and Safe Shutdown Systems and Diesel Generator Loading Test

TSS 15.6.43-2 Endurance Testing of Diesel Generators During Refueling Unit 2

TSS 15.6.57 Rod Drop and Timing Test

a. Hydrogen Recombiner

On August 1, 1990, Unit 1 Hydrogen Recombiner failed PT-15C, "Hydrogen Recombiner Low Level Readiness Test." This put Unit 1 on a 30-day LCO clock in accordance to TS 3.8.8.A. On August 2, 1990, the Unit 1 hydrogen recombinder was repaired and returned to service ending the action requirements of the LCO clock.

b. Assessment of Surveillance

The licensee performed an extensive number of surveillances which included outage-related, start-up and normal routine surveillances. In spite of the large number of surveillances, no major concerns were noted.

One instrumentation calibration surveillance was missed due to a scheduling error.

No violations or deviations were identified.

6. Monthly Maintenance Observation (62703)

Station maintenance activities affecting the safety-related systems and components listed below were observed/reviewed to ascertain that they were conducted in accordance with approved procedures, regulatory guides and industry codes or standards, and in conformance with TS.

Z93030	1C CS pump failure, June 10, 1990
Z93703	1C CS pump failure, July 7, 1990
Z93302	2A RCFC High Speed Breaker
Z88054	Repair Outboard Seal of 2B Auxiliary Feedwater Pump
Z82906	Adjust Inboard Seal Gland Leakoff for 2B Auxiliary Feedwater

The following items were considered during this review: the LCO were met while components or systems were removed from and restored to service; approvals were obtained prior to initiating the work; activities were accomplished using approved procedures and were inspected as applicable; functional testing and/or calibrations were performed prior to returning components or systems to service; quality control records were maintained;

activities were accomplished by qualified personnel; parts and materials used were properly certified; radiological controls were implemented; and fire protection controls were implemented. Work requests were reviewed to determine the status of outstanding jobs and to assure that priority is assigned to safety-related equipment maintenance which may affect system performance.

a. 2C Containment Spray Pump Inadvertent Start

On July 28, 1990, at 11:22 a.m., while troubleshooting the failure of the 2C containment spray (CS) pump to start during a routine surveillance, an electrician lifted a lead which inadvertently started the pump. No spray to the containment occurred since the system was lined up in the testing configuration. The root cause of the event was personnel error in that the incorrect lead was lifted by the electrician to monitor the battery voltages while cranking the 2C CS diesel engine.

b. Unit 2 Refueling Outage Maintenance

After a 162 day refueling outage, Unit 2 was synchronized to the grid on August 30 at 1:21 a.m. The outage was extended 92 days due to the Unit 1 forced outage, electrical penetration E-31 repair, annunciator grounds and blown fuses problems, and balance of plant maintenance problems including secondary side cooler leaks. Major activities included overhaul of the 2A and 2B EDGs, detailed control room design review modifications, steam generator feedwater J-tube replacements, inspection of 23 Anchor Darling check valves, investigation and repair of the E-31 penetration, resolution of the EQ requirements for the RVLIS resistance temperature detectors, corrective actions associated with the containment flooding design calculation discrepancies, repair of the No. 1 component heat exchanger, and inspection of selected safety motor operator valves for torque switch settings.

c. Assessment of Maintenance

Two weaknesses were identified during troubleshooting activities on the 2C CS pump. The mechanic lifted the wrong lead which caused the inadvertent start of the pump and failed to notify the control room of the start.

One new strength includes the implementation of a new three day rolling maintenance schedule which will track and plan current work and will aid in reducing the prioritized backlog of work requests.

No violations or deviations were identified.

7. Engineering and Technical Support (37828)

The inspectors evaluated the extent to which engineering principles and evaluations were integrated into daily plant activities. This was accomplished by assessing the technical staff involvement in non-routine events, outage-related activities, and assigned TS surveillances; observing on-going maintenance work and troubleshooting; and reviewing deviation investigations and root cause determinations.

a. Starting Failures of the 1C and 2C CS pumps

On June 1, 1990, while performing PT-6, "Containment Spray (CS) System Check", the 1C CS diesel engine successfully started from battery No. 1; however, on a subsequent start, failed to start on the battery No. 2 as required. Subsequent maintenance starts indicated that the problem had been solved as the 1C CS pump diesel was sequencing properly between the batteries on the consecutive starts. On June 10, the diesel again failed to start from battery No. 2. It appeared that the voltage sensing relay was sensing a low voltage on the No. 2 battery and switched to battery No. 1. Inspection of the variable resistor, R18, indicated that the resistances were incorrect and the relay was replaced. The diesel engine was then successfully started several times from both Unit 1 batteries. On July 5, the 1C diesel failed to start from battery No. 2. The electrical maintenance readjusted the resistance, and the diesel was then started several times from both batteries successfully.

During this inspection period, the 2C CS pump experienced at least four failures. On two occasions, the engine failed to start from the alternate batteries. Investigations indicated evidence of degraded voltages and the batteries were replaced. This is considered an Open Item (295/90017-02(DRP); 30490019-02(DRP)) pending review of the root cause analysis.

b. 2B EDG Output Breaker Auto Closure

On August 9, 1990, while performing a test on bus 249, the 2B EDG output breaker unexpectedly auto closed when the sync selector switch was placed in the on position. While checking the EDG frequency on August 10, again the output breaker auto closed when the switch was placed in the on position. Investigation by the technical staff and the Operational Analysis Department identified a cable which was not in the wiring diagrams. The cable was connected to an auxiliary relay terminal point of bus 249 to a contact on a test switch of the 2CB94 safeguards logic test cabinet. The automatic synchronization check (ASC) relay which was installed during this outage was connected to the same terminal point in the auxiliary relay. During the test, jumpers were installed in the



safeguards logic test cabinet which provided the unknown circuit path. When the sync selector switch was turned on and the associated contacts closed, the circuit was completed causing the auto closure of the breaker.

It was later determined that the cable should have been unlanded in 1973 during a modification but was not. The cable had no effect on the breaker operability since the path was not complete prior to the installation of the ASC relay. The unit remained in cold shutdown since the ASC relay was installed. The licensee walked down the remaining Unit 1 and Unit 2 buses to verify that similar wiring discrepancies did not exist. A cable was found in bus 248; however, it was properly unlanded. No generic concerns were identified. The licensee disconnected the cable and reperformed the test on bus 249 to verify the breaker operation.

c. Environmental Qualification of RTDs in the RVLIS

In June, it was determined that the Unit 2 RVLIS RTD 2TE1323 was reading open. Upon attempting to replace the RTD, the mechanics noted that it was found to be different from the RTD in stock and informed the technical staff. This was brought to the attention of technical staff. Investigation indicated that the original RTD was not EQ; however, the RTD from stock was an EQ model. The technical staff referenced the discrepancy in the station EQ binder; however, associated the discrepancy with the TMI post accident monitoring system instead of as a violation of 10 CFR 50.54 environmental qualification. The onsite review of this issue agreed with the technical staff evaluation.

The licensee performed a Unit 2 containment walkdown and reviewed the historical modification packages for RVLIS. The walkdown revealed that all eight RVLIS RTDs on Unit 2 were not EQ. Review of the modification packages showed some documentation acknowledging the intention of replacing the non-EQ RTDs, but no information could be found as to why it never actually happened. The licensee replaced the 2TE1323 RTD and had planned to replace the remaining seven RTDs when EQ model spares arrived at the plant.

On August 7, the station was informed that the accuracy of the non-EQ RTDs was not acceptable. A DVR for both units was generated and the systems were taken out-of-service. Investigation indicated that the Unit 1 RTDs were EQ models. All eight RVLIS RTDs on Unit 2 were replaced. The RVLIS systems for both units are fully operable at this time.

NRR is evaluating the EQ requirement for RVLIS RTD. This is an Unresolved Item (304/90019-03(DRP)), pending their review completion.

d. Unit 2 Electrical Penetration Failure E-31

On July 15, 1990, the Unit 2 electrical penetration for 2D Reactor Coolant Pump (RCP) catastrophically failed. At the time of the event, the licensee was pursuing a repair on the penetration pressurization system side of the penetration. The RCP was operating. The licensee pulled a vacuum inside the penetration to maximize the effectiveness of the epoxy sealant as instructed by the manufacturer procedure.

Destructive examination of the penetration and analysis of available data, indicated that the cause of the failure was the application of a vacuum to the penetration interior. The vacuum reduced the dielectric strength of the internal plates causing the metal to ionize. The ions formed a "plasma" which ultimately led to high current faulting due to the fact that the 2D RCP was energized at the time. This main fault sequence, on the order of 20K amp to 40K amp, resulted in internal pressures believed to have exceeded 2000 psi, causing large scale bushing failure. Subsequent to the main fault sequence, secondary faults are believed to have developed which were fed primarily from the RCP motor winding when the RCP breaker opened. These secondary faults aggravated the damage to the penetration.

The root cause of this event is attributed to a procedural deficiency of the manufacturer's instructions. The manufacturer was contacted but did not imply that the cable should be deenergized during the fix. The licensee believes these instructions should have explicitly stated that the penetration must be deenergized during the entire course of the repair procedure and repressurized to at least atmospheric conditions prior to operation.

Based on the licensee's analysis, this event is limited to this particular penetration. All evidence indicates that there is no generic concern for the remaining penetrations or the replacement of the E-31 penetration.

The electrical penetration E-31 was cut out, replaced with a new electrical penetration that was welded in, inspected and tested, and returned to service. All other cable penetrations in the vault and within the immediate vicinity were inspected for damage, on both the vaults and containment side. No significant debris impact damage was found and no repairs to these penetrations were required. Additionally, all cabling in the vault and containment side was inspected for damage. No damage was found and the cable pans were cleaned as a precautionary measure to mitigate any further mechanical damage.

e. Assessment of Engineering and Technical Support

The discrepancy with the environmental qualification of the resistance temperature detectors for the reactor vessel level indication system was not properly evaluated for required actions when it was first discovered.

Strengths were identified in the root cause analysis of the 2B emergency diesel generator auto synchronization breaker closures. The technical analysis of the root cause of the electrical penetration failure was challenging and was well managed by the staff. The staff was also very supportive to the operations department in solving the Unit 1 annunciator horn problems and the IC steam generator steam flow transmitter, FT-522, spiking incidents. The technical staff has been proactive in responding to NRC concerns and requests.

No violations or deviations were identified. One unresolved item concerning the EQ requirements for RTDs was identified.

8. Safety Assessment and Quality Verification (SAQV)

a. Emergency Notification System (ENS) Notifications Not Made Within Required Time Period

The licensee had difficulty in determining the reporting requirements to the NRC when they believed that the OA lake discharges tank did not isolate as required on a radiation monitor high radiation alarm. Based on the failure of the valve to automatically terminate the radioactive liquid discharge, the licensee believed that a 30 day licensee event report per 10 CFR 50.73(a)(2)V applied to the event per NUREG 1022, Supplement 1, Question 7.13. On further evaluation by the licensee, the determination was made that an ENS phone call was required within four hours of the event per 10 CFR 50.72(b)(2)(iii)(c) which states, in part, that the licensee shall notify the NRC as soon as practical and in all cases, within four hours of the occurrence of any event or condition that alone could have prevented the fulfillment of the safety function of systems that are needed to control the release of radioactive material. This ENS phone call was then made on July 28, 1990, at 9:00 a.m., 21 hours and 15 minutes after the event. This is considered an Unresolved Item (295/90017-03(DRP)) pending review of the licensee's methodology for determining reportability requirements.

b. Management Positions Changes

The following changes to Zion Station positions were made:

<u>FROM</u>	<u>TO</u>
Services Director	Onsite Nuclear Safety/Zion
Director of Zion Performance Improvement Program	Services Director
Operations Assessments	Director Zion Performance Improvement Program
Regulatory Assurance Supervisor	Assistant to Technical Superintendent
Nuclear Station Divisions - Staff	Assistant to Production Superintendent
Zion Nuclear Licensing Advisor	Regulatory Assurance Supervisor

c. Assessment of SAQV

The onsite review for the EQ reactor vessel level indication system was poor. The licensee had difficulty in determining the reporting requirement for ENS notification.

No violations or deviations were identified.

9. LERs and DVRs Followup (92700)

Through direct observations, discussions with licensee personnel, and review of records, the following event reports were reviewed to determine that reportability requirements were fulfilled, immediate corrective action was accomplished, and corrective action to prevent recurrence had been accomplished in accordance with TS. The LERs listed below are considered closed:

UNIT 1

<u>LER NO.</u>	<u>DESCRIPTION</u>
88023	Low Isolation Valve Seal Water Tank Pressure Due to Failed Check Valve
89006	Reactor Protection Loop Inoperable and Untripped Over Two Hours
89007	Unit 1 in an Unanalyzed Condition with Two Trains of Containment Recirculation Spray Inoperable

- 89010 Train "A" Reactor Trip Defect Due to Installation of Unauthorized Jumper
- 89012 Inadequate AFW Flow Settings with Inoperable AFW Pump Due to Administrative Errors and Procedural Inadequacies
- 89013 Main Steam Safety Valve Inoperability Due to Testing Method Errors
- 89015 Loss of Containment During Refueling Operations Due to Inadequate Procedure
- 89019 Missed Firewatch Surveillance on Unit 1 Volume Control Tank Room Due to Personnel Error
- 89024 Diesel Generator Inoperability Due to Aircraft Crash Damper Failure
- 90007 Unable to Obtain Sample Due to Clogged Line
- 90008 Inadvertent Start of 2C Containment Spray Pump Due to Personnel Error
- 90016 OA Lake Discharge Tank Failure to Isolate on Hi Rad Signal

Regarding LER 295/88023, the failed check valve (CV) was valve 1IW0162 in the air supply line used to pressurize the Isolation Valve Seal Water (IVSW) Tank. The immediate corrective actions including the performance of T.S.S. test surveillance 15.6.88 on Unit 2 to verify that the CV allowed flow to the Unit 2 IVSW tank, and long range corrective actions were completed by the licensee. This LER is considered closed.

Regarding LER 295/89006, this issue was primarily an administrative and a lack of effective communications problem. The work by the instrument maintenance department was completed; however, the required proper signatures were needed prior to returning the loop to service. When it was determined that the work package was not closed within the technical specification allowable time, the licensee took appropriate actions, declared the loop inoperable and expedited the work request closure. This LER is considered closed.

Regarding LER 295/89007, this issue was discussed in a previous inspection report and was considered to be a violation 295/89017-01(DRP). This LER is considered closed.

Regarding LER 295/89010, this issue was discussed in a previous inspection report and was considered one part of a two-part violation (295/89021-05(DRP)). Additionally, the licensee issued an Operating Experience Report to increase the awareness of the event. All corrective actions have been completed. This LER is considered closed.

Regarding LER 295/89012, this issue was discussed in a previous inspection report and was considered to be a violation 295/89033-01(DRP). The licensee issued a supplemental report, LER 295/89012-01, to address the safety analysis of the event. The licensee concluded that the degraded flow condition was bounded by the Loss of Normal Feedwater reanalysis included in the Transient Methodology Topical Report submitted to the NRC in 1989. This LER and supplement are considered closed.

Regarding LER 295/89013, the Safety Analysis of the Event section indicated that the as found setpoints of the MSSVs had no adverse effects on the results of the accident analysis for the plant. This LER is considered closed.

Regarding LER 295/89015, this event was discussed in Inspection Report (50-295/89029(DRP)). The licensee failed to meet an internal commitment to meet the intent of the Standardized TS, regarding containment integrity during core alterations; however, actual plant TS were not violated. No radioactive releases occurred, thus, the overall safety significance of the event was minimal. Corrective actions included immediate steps to insure no other vent paths existed, and a new commitment was generated to evaluate, in the future, methods used by other plants with TS, to help minimize the potential for a recurrence of this event. This LER is considered closed.

Regarding LER 295/89019, the firewatch was missed by 15 minutes. Due to plant conditions at the time, the safety impact was minimal. This issue was an example of several similar items which resulted in the station establishing a separate organization for the performance of firewatches. This LER is considered closed.

Regarding LER 295/89024, this issue was discussed in a previous inspection report and was considered to be a violation with a proposed civil penalty (295/87036-01(DRP)). This LER is considered closed.

Regarding LER 295/90007, the licensee was unable to obtain the technical specification required daily sample from ORT-PRO6 due to silt plugging. The radiation instrument monitors the service water return flow from the waste evaporator package. The licensee plans to submit a TS change to decommission the radiation monitor since the evaporator has been nonfunctional for years. The silt build up in small sample lines has been a recurring problem. The licensee plans to include periodic flushing of these lines in the preventative maintenance program. This LER is considered closed.

Regarding LER 295/90008, the event is discussed in Paragraph 6. The electrician did not communicate to the control room operator that the pump start was inadvertent; therefore, the 10 CFR 50.72 notification was not made. The technical staff engineer was not made aware of the start until later in the day; however, the engineer was not knowledgeable on the reporting requirement. In the evening, the engineer mentioned the inadvertent start to the unit Operating Engineer. The requirements of 10 CFR 50.72(b)(2)(ii) states that a notification to the NRC shall be made within four hours of an event that results in an automatic actuation

of any ESF. The ENS phone call was made within four hours after a licensed individual became aware of the actuation. Failure to notify the control room of the inadvertent start is considered a weakness in communication between the maintenance, technical staff and operations departments. This LER is considered closed.

Regarding LER 295/90016: This issue is discussed in Paragraph 4f and is considered closed.

## UNIT 2

- 89003            Manual Reactor Trip Following Dropped Rods Due to Personnel Error During Troubleshooting of Rod Urgent Failure
- 89004            Unmonitored Effluent from Temporary Radiation Monitor Blower Installed on Wrong Unit
- 90006            Damage to Grid Strap of Assembly Y48B

Regarding LER 89003, this issue was discussed in a previous inspection report (50-304/89002(DRP)). The licensee's analysis and associated corrective actions were to be reviewed further after the LER was issued. This NRC review concluded that the analysis was correct and all of the corrective actions were completed. This LER is considered closed.

Regarding LER 89004, this event had minimal safety impact due to the short duration of the event and the existence of an operable downstream monitor. The corrective actions have been completed. A supplemental report which will include recommendations for future actions has not been issued. This LER is considered closed.

Regarding LER 90006, the notification was made pursuant to 10 CFR 20.403(a)(4) due to damage in excess of \$200,000. This issue was previously discussed in Inspection Report 304/90007. Investigation showed that the overload and underload protection on the manipulator crane were not designed properly. The crane manufacturer assisted in the calibration and setpoint changes for the load protection. This LER is considered closed.

In addition to the foregoing, the inspectors reviewed the licensee's DVRs generated during the inspection period. This was done in an effort to monitor the conditions related to plant or personnel performance and potential trends. Deviation Reports were also reviewed to ensure that they were generated appropriately and dispositioned in a manner consistent with the applicable procedures and the quality assurance manual. The following DVRs were reviewed:

- DVR 22-2-89-059      Failure of IRPI M-12
- DVR 22-2-90-064      2A RCFC Low Speed Breaker Trip

Concerning DVR 22-2-90-064, the DVR stated that the replacement breaker was a safety related, 10 CFR 21 breaker. The inspector reviewed the work package and found that the replacement breaker was purchased commercial grade. Discussions with the technical staff indicated that the breaker was purchased commercial grade and was dedicated for safety related application. A revised DVR was to be issued correcting the discrepancy. The inspector had no other concerns.

No violations or deviations were identified.

10. Training (41400)

During the inspection period, the inspectors reviewed abnormal events and unusual occurrences which may have resulted, in part, from training deficiencies. Selected events were evaluated to determine whether the classroom, simulator, or on-the-job training received before the event was sufficient to have either prevented the occurrence or to have mitigated its effects by recognition and proper operator action. Personnel qualifications were also evaluated. In addition, the inspectors determined whether lessons learned from the events were incorporated into the training program.

Events reviewed included the events discussed in this report. In addition, LERs were routinely evaluated for training impact. No event reviewed this period was found to have significant training deficiencies as contributors.

One training session on the revised radiation work request was attended by the resident inspectors.

No violations or deviations were identified.

11. Open Items

Open Items are matters which have been discussed with the licensee which will be reviewed further by the inspector and which involve some action on the part of the NRC or licensee or both. One Open Item disclosed during this inspection is discussed in Paragraphs 7a.

12. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance or deviations. Three Unresolved Item disclosed during this inspection are discussed in Paragraphs 4c, 7c, and 8a.

13. Management Meetings (30703)

- a. On July 24, 1990, Chairman Carr and Mr. E. G. Greenman, Director, Division of Reactor Projects, toured the Zion facility and attended a presentation by the licensee. The Chairman stated that Zion needed to improve the performance of the plant and recognized the licensee's efforts in the Performance Improvement Plan.



- b. On July 31, 1990, Mr. W. Forney, Deputy Director, Division of Reactor Projects and Mr. M. J. Farber, Chief, Section 1A, met with Mr. T. Joyce, Zion Plant Manager, at the Zion Station for the monthly Performance Improvement Plan (PIP) status update. Corrective actions to the Diagnostic Evaluation Team (DET) findings, latest plant events, and operator overtime issue were also discussed. Mr. Forney was concerned with the amount of overtime authorized for the operators.
- c. On August 21, 1990, Mr. A. B. Davis, Regional Administrator and Mr. W. Forney, Deputy Director, Division of Reactor Projects and other NRC managers met with Mr. T. Joyce, Zion Plant Manager, at the Zion Station for the monthly PIP status update. Corrective actions to the DET findings, latest plant events, and operator overtime issue were also discussed. Mr. Davis was concerned with the amount of overtime authorized for the operators.
- d. DET meetings in Region/telecon/exit

On July 29, the DET held a mini-exit. The findings consisted of control room operators and management interface concerns; control of motor operator valve torque switch settings discrepancies; service water system performance and accident vulnerabilities; root cause analysis; and limited corporate engineering support.

A followup inspection of the DET concerns was conducted by regional inspectors in August. The inspection scope was expanded to look at the component cooling water system to review flow adequacy and heat exchanger degradation. No operability concerns were noted. The licensee issued an administrative standing order to define the combinations of service water pumps which need to be operable until testing and engineering analysis resolves the DET concern (under the current TS, it possible to have a total of two pumps operable for both units after considering a single failure).

Mr. H. J. Miller, Director, Division of Reactor Safety, members of his staff, and representatives from the Division of Reactor Projects, Analysis and Evaluation of Operational Data, NRR Mechanical Systems, NRR Plant Systems, and NRR Projects met with Mr. T. Maiman, Vice President of PWR Operation, Commonwealth Edison Company, members of his staff and Zion Station management in the Region III office on July 25, 1990. This meeting discussed findings of the recent DET Inspection at Zion. Specific items discussed included motor operated valves and service water system operability. A Region III special inspection was performed to follow up on service water system issues.

No violations or deviations were identified.

14. Exit Interview (30703)

The inspectors met with licensee representatives (denoted in Paragraph 1) throughout the inspection period and at the conclusion of the inspection on September 7, 1990, to summarize the scope and findings of the inspection activities. The licensee acknowledged the inspectors' comments. The inspectors also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents or processes as proprietary.