U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-295, 50-304
License Nos:	DPR-39; DPR-48
Report No:	50-295/96011(DRS); 50-304/96011(DRS)
Licensee:	Commonwealth Edison Company
Facility:	Zion Nuclear Generating Station, Units 1 and 2
Location:	105 Shiloh Boulevard Zion, IL 60099
Dates:	July 22 - August 22, 1996
Inspectors:	Zelig Falevits, Team Leader, Region III Joel Guzman, Reactor Inspector, Region III Bob Winter, Reactor Inspector, Region III Daniel Rich, Reactor Engineer, Region III Robert Stakenborghs, Contractor, Parameter, Inc. John Heller, Contractor, Parameter,Inc.
Approved by:	Mark A. Ring, Chief, Lead Engineers Branch Division of Reactor Safety

Inspection Summary

A team inspection of engineering and technical support was performed using NRC inspection procedures (IPs), including IPs 37001, 37550, 37551, 37700, and 37828.

Results: Five apparent violations were identified. The first apparent violation involved an inadequate 10 CFR 50.59 safety evaluation process, which resulted in a lack of safety evaluations or inadequate safety evaluations. The second apparent violation involved a failure to ensure that field-installed design change modifications had been properly evaluated, tested and signed off prior to placing them in service. The third apparent violation concerned failure to indicate the operability status of systems structures and components that had been modified and placed in use, but not yet fully tested. The fourth apparent violation concerned failure to take timely corrective actions for an extended period of time to address equipment nonconforming conditions. The fifth apparent violation concerned inadequate procedures and failure to follow procedures, which contributed to Technical Specification Interpretation deficiencies and the failure to generate Problem Identification Forms on Updated Final Safety Analysis Report conformance review discrepancies.

EXECUTIVE SUMMARY

Zion Nuclear Generating Station, Units 1 and 2
Report No. 50-295/96011(DRS); 50-304/96011(DRS)

This inspection included aspects of Zion's engineering and technical support and was conducted from July 22 through August 22, 1996. The team determined that the Zion engineering organization was staffed with mostly experienced engineers. However, engineering performance was considered weak in several technical areas and processes. A summary of findings identified by the team follows:

- The licensee's process for controlling modifications to ensure adequate post-modification testing package closure appeared to have broken down. Nine safety related modifications and 19 non-safety related modifications had been physically installed and placed in service, even though the modification packages were not signed as completed and were not authorized for use by operations. These modification installations ranged from the mid-1980s through 1996. Most of these modifications also contained inadequate documentation to conclude that post-modification testing had been accomplished.

- Selected operability assessments reviewed by the team (3 of the 12 reviewed in detail) were found to be weak or inadequate. For example, the operability assessment for charging pump degradation noted during emergency core cooling system full flow testing was inadequate; the assessment failed to consider the pumps' ability to deliver the required flows at design conditions.

- The team identified numerous deficiencies in the sample of 10 CFR 50.59 safety evaluations reviewed during the inspection. The concerns identified indicated a continuing lack of quality, completeness and thoroughness relative to 50.59 safety evaluations. Of note was the licensee's superficial approach towards the safety evaluation of scaffolding erected and left inside the containment during plant operation. In view of the repetitive nature of these deficiencies and of the licensee's failure to implement effective corrective action for previous violation and self assessment findings related to 50.59, the team's findings demonstrate significant deficiencies in engineering activities and management oversight of the 50.59 safety evaluation process.

- The licensee failed to maintain adequate management controls over the Technical Specification Interpretation process, thereby allowing inappropriate Technical Specification interpretations.

- A recent Site Quality Verification audit that examined some engineering activities was considered to be good, in that it identified some deficiencies in the 50.59 process; however, Zion's self assessment program had not identified some of the significant problems identified by the team, such as the specific 50.59 problems noted in this report, modification testing and closeout problems, and corrective action issues.

- The mechanical modification related calculations reviewed by the team were generally well organized, complete and technically adequate. The electrical calculations reviewed were considered to be better than the industry average and were found to be appropriate to support the plant's modifications.

- The recently initiated instrumentation upgrade program established to resolve potential discrepancies in the safety related and/or seismic classification of instrumentation was considered a good initiative to improve the design bases at Zion; however, it was not yet fully implemented.

- Engineering activities relative to lube oil analysis, trending of equipment problems and resolution of recurring deficiencies were considered weak, in that recurring breaker failures, out of tolerance instrumentation, and unsatisfactory oil samples were not trended or investigated promptly.

- The licensee's Updated Final Safety Analysis Report (UFSAR) conformance review was viewed as a thorough, in-depth technical effort that identified many meaningful discrepancies between the UFSAR and the as-built and as-operated plant. This was considered a strong, positive licensee initiative. However, the subsequent delay in initiating prompt resolution to these discrepancies was considered inadequate.

- Inadequate procedures or failure to follow procedures contributed to Technical Specification Interpretation deficiencies and to the failure to generate Problem Identification Forms on deficiencies identified during the UFSAR conformance review.

- Longstanding problems existed in the various radiation monitoring systems. Many radiation monitors had failed frequently and were in poor materiel condition. Operators were required to take extensive compensatory actions to deal with this condition. The licensee had developed a comprehensive plan to correct the problems, but little progress had been made to date. However, the licensee's program to assess dose to the public from radioactive effluents was still effectively implemented.

- Based on interviews with engineers and managers, the team concluded that management expectations were not always clearly defined, nor understood by the engineering staff. For example, management expected that system engineers evaluate lube oil analysis sample results, even though the engineers had not been trained nor qualified to perform this evaluation. Also, management expectation relative to breaker testing following maintenance activities was not clearly understood by the engineers. Consequently, breakers were not always tested after they were racked into the cubicle.

TABLE OF CONTENTS

REPORT DETAILS

The NRC performed a team inspection of engineering and technical support (E&TS). During this inspection, the team reviewed the adequacy of the design, installation and testing of selected permanent and temporary modifications, 10 CFR 50.59 Safety Evaluations (50.59 SEs), operability assessments, root cause analysis, trending and corrective action programs and their implementation. In addition, the team performed system walkdowns with system engineers, conducted interviews and reviewed engineering related audits, surveillance and self assessments. The team also examined the interface between engineering and other plant support groups, including corporate. Five apparent violations were identified.

III. ENGINEERING

E1 CONDUCT OF ENGINEERING

E1.1 Modifications, Design Changes and Post-Modification Testing

a. Inspection Scope

The team reviewed design documents, calculations, 50.59 SEs, operability assessments and procedures related to the performance of design modifications to the facility. The review included approximately 35 mechanical, electrical and instrumentation modification packages in various stages of completion. The modification packages were reviewed for technical adequacy and completeness.

The team focused on the Auxiliary Power (AP) system, the Area Radiation (AR) and Process Radiation (PR) systems, the Containment Spray (CS) system and the Safety Injection (SI) system during this inspection.

b. General Observations and Findings

1. Inadequate Post-Modification Testing and Incomplete Closeout of Modification Packages

The team determined that 9 safety related (SR) and 19 non-safety related (NSR) design change modification packages had been physically implemented in the field and placed in use since installation, even though the packages were not signed off as completed and were not authorized by operations. These modifications had inadequate documentation to confirm that all modification test requirements had been successfully accomplished. The operating/shift engineer, engineering supervisor, quality assurance supervisor and training supervisor did not approve/sign the modification packages to indicate that the modifications had been completed and could be declared operable.

The SR modifications included:

M22-0-84-001:	OP1A-PR29 (process radiation monitor) signal to control room isolation and safety injection.
M22-0-87-042-B:	Provide redundant bubble tight damper isolation to the control room heating, ventilation and air conditioning.
P22-0-90-551:	S.S.O.M.I. (Safety System Outage Modification Inspection) item area 15 cable/cable tray.
M22-1-84-052:	Receptacle on battery charger and test switch.
M22-1-90-016B:	NIS source and intermediate range replacement with accident monitoring qualified instrumentation.
E22-1-93-248:	Change steam supply to auxiliary feed pump steam traps to choke traps (Unit 1).
E22-2-93-248:	Change steam supply to auxiliary feed pump steam traps to choke traps (Unit 2).
M22-2-84-080:	Replace vent valve on CC surge tank.
E22-2-93-272-B:	Remove the MOV motor brakes from 2MOV-SI8804A&B and 2MOV-SI8809A&B.

The status of each modification package could be placed into one of the following three categories: (1) testing incomplete or unacceptable; (2) configuration management items required prior to operability not completed; and (3) required signatures not obtained for package closeout. Some modification packages were installed in the field as early as 1986 and as late as 1996. Many of the packages were misplaced and could not be found when requested by the NRC. It was not clear during the inspection if all specified/required testing was completed. The licensee issued Problem Identification Forms (PIFs) 96-2024 and 96-2046 to document this problem and determine root cause.

Until questioned by the team on August 6, 1996, the licensee had not established a list of the misplaced modification packages that had been field-installed, not declared operable, but placed in use Nor was the licensee cognizant of the status of testing on the misplaced modifications. In addition, the licensee failed to indicate the operability status of the Systems, Structures, and Components (SSCs) that had been modified, placed in use, but not yet fully tested.

Examples of incomplete or inadequate post-modification testing for a system which has been placed in use included:

(a) SR Modification M22-0-84-001

This modification was installed in 1989 to provide another control room isolation upon receipt of an SI signal. The SI signal was added to shift the control room Heating, Ventilation and Air Conditioning (HVAC) to recirculation (a commitment to the NRC, since the existing radiation monitoring circuit was NSR). The modification binder was described to the team as missing, but eventually found on the desk of an engineer who had not worked at Zion for years. The PR system engineer was unaware of this open modification in his system.

The team determined that not all post-modification required testing was completed. For example, the modification approval letter required testing be performed to assure independence of the modified system from all other systems upon electrical failure of the installed modification. This was not accomplished. Also following inspector questioning, the licensee had to rely on other periodic operational tests to verify that the original testing requirements were met. It was not clear if all post-modification testing requirements were addressed. When questioned by the team, the licensee performed an operability assessment during the inspection to ensure that Technical Specification (TS) requirements were not being violated as a result of the incomplete testing.

To compound this problem, a second modification, M22-0-87-042-B, was subsequently installed in 1990. This modification changed portions of circuit logic that was installed by modification M22-0-84-001. The modification provided bubble tight damper isolation to the control room HVAC. After modification M22-87-042-B was implemented in the field, the licensee could not locate portions of the original test data and had to rely on subsequent operational tests. During the processing of modification M22-0-87-042-B, the licensee again failed to evaluate and complete the test requirements specified in original modification M22-0-84-001. In addition, several Field Change Requests (FCRs) were issued against this modification, but were not in the modification package, and it was not clear if they were approved and field implemented. It was also not clear if all applicable procedures had been revised. These modifications were not declared operable at the end of the inspection.

(b) SR Modification M22-1(2)-84-052

This modification installed and wired test switch blocks and test jacks on direct current (DC) distribution center busses 011, 111, 112, 211 and 212. The test switches were installed to allow for testing of the DC bus relays without disconnecting any electrical leads. The test jacks were installed to allow voltage and current reading from outside the panel.

In 1986, test switches were installed on DC busses 111 and 112. Construction test ECTP #19 was performed in 1987. Modification testing on the test switches was not performed until August 1996. In August 1993, test jacks were installed on busses 111 and 112 and ECTP #19 was performed. No modification test was performed.

In March 1994, test switches and jacks were installed on bus 011. In November 1995, ECTP #19 was performed. The test switches and jacks on bus 011 were placed in use but not modification tested nor declared operable until August 1996 following questioning by the NRC.

In March 1992, the Nuclear Engineering Department (NED) reviewed this modification and determined that the modification was partially installed, but was never completed. There were six modification addendum letters to this modification since the initial approval letter in 1984. The following post-modification testing requirements were identified by NED, using ENC QE06.4, Exhibit A:

- Electrical construction test procedure #19.
- Verify the DC bus relays are functioning properly by test.
- Test all three meter jacks with a multimeter and observe proper readings with no circuit loading.
- Verify that no DC bus grounds were created by the new wiring.

In October 1995, post-modification test procedure TSSP 128-93 was written to verify that the test jacks were installed properly during modification M22-1-84-052. In July 1996, modification testing TSSP-128-93 was performed. During the review of the test results, the team noted that not all post-modification test requirements were accomplished by this test or documented as completed. The team identified the following concerns:

- The test results for bus 111, as documented in TSSP 128-93, failed to meet the acceptance criteria set in Section 7 of the test, which required that the panel meter reading and the DVM should be within 4.5% of each other to include all instrument tolerances. In addition, step 8.0.11 of the test procedure for bus 011 and 112 documented a reading of 0 for the battery ammeter reading and a 0 for the DVM reading. This step required that the readings on both instruments be compared. The reading of 0 was obtained because the scale on the instruments used was not appropriate to read the low values expected.
- Test switches were purchased NSR and field installed, but no documentation was available in the package to determine that NSR components in SR circuits were acceptable.
- Test requirements specified in the modification approval letter were not documented as accomplished in the modification package. The Operational Analysis Department protective relay sheets, OADMP-1B4, were apparently used to indicate successful post-modification test results.
- Modification ground testing requirement was not documented in the package as performed.

The team noted during the inspection and interviews that the current DC system engineer exhibited a good questioning attitude for present-day activities. The system engineer questioned the data results for the August 13, 1996, monthly surveillance test on battery 112. As a result of his inquiry, the licensee later determined that the wrong battery was tested by the electrical maintenance technicians (112 instead of 111) and that the monthly surveillance on battery 111 was missed.

(c) SR Modification E22-1(2)-93-248

This modification was installed in February 1994. The modification changed the auxiliary feedwater (AFW) pump steam supply steam traps. The system was operating, but had not been returned to operability in accordance with the modification procedures. Additionally, the team determined that no 50.59 SE had been performed to support the operation of the system in its installed configuration. The installed configuration differed from the as-designed configuration in that the steam traps, which would normally have steam flow, were placed in the bypass position continuously. This resulted in larger steam flows to the condenser than would have been present through the modified traps. The team questioned if this could invalidate any of the assumptions made for the operation of the AFW pumps. The licensee reviewed this circumstance and determined that the loss of steam through the open bypass would not impair the function of the pumps. The following concerns were noted:

- This modification was in service even though testing was incomplete. Modification testing was not satisfactorily completed. Periodic operational tests were performed.

- The modification was operating in a mode which was not adequately analyzed (continuous bypass of the orifices). No design change or 50.59 SE was performed to address the new operating mode prior to the inspection. This is considered an example of an apparent violation of 10 CFR 50.59 (295/96011-01A(DRS); 304/96011-01A(DRS)).

(d) SR Modification M22-1-90-016B

This modification was installed in January 1994. The modification replaced existing NIS source and intermediate range instrumentation with accident monitoring environmentally qualified instrumentation to satisfy R.G. 1.97.

The modification package resided with the operating engineer since September 1995 to complete additional testing during power operation.

The licensee could not locate test documentation for four NIS drawers and loop calibrations for four NIS channels. The calibrations were performed under WR Z28666 which could not be located by the end of the inspection. Subsequently, the licensee located the test documentation. The final closure of the modification was dependent on additional testing to be performed during power ascension

activities following the outage in 1994. This additional testing was finally completed in 1995, but the package was not signed by operations until September 1996. Other Operations Department priorities combined with turnover of the modification upon retirement of the design engineer contributed to the delay in declaring the modification operable in September 1996.

(e) NSR Modification M22-0-88-20, "Install Time Delay Relay and Rewire Circuit"

Water treatment facility improvements: it was not clear from the modification documents what was installed in the plant. Field as-built walkdown was needed to determine field configuration.

(f) NSR Modification M22-0-84-014, "Pressure Gauges/Surge Tanks/Values to Alum Feed"

This modification was installed in 1989. The licensee stated that equipment was apparently out of service. An FCR would be issued to abandon installed components.

2. Corrective Action and Root Causes

When first identified by the team, the licensee stated that only four such modifications existed. Following NRC interviews with system and design engineers, additional packages were found by the system and design engineers. At the end of the inspection, the licensee identified 24 additional packages in this category.

The licensee has reviewed and evaluated the post-modification testing accomplished to determine the status of testing of the modifications. An operability assessment was performed on two modifications. The modified systems were found to be operable. In addition, in some instances, the licensee relied on periodic operational testing as a substitute for the post-modification testing specified in the modification letter.

The majority of the SR modifications were declared operable by the end of this inspection. The team reviewed portions of the licensee's efforts to assure that modification testing was adequate to declare the modifications operable and identified the concerns noted in previous sections 1(a), (b), (c), and (d). As of the end of this inspection, the licensee had not evaluated the status of the 19 NSR modifications.

The team determined the apparent contributing causes for inadequate post-modification testing and incomplete closeouts to be:

- Inadequate control of the modification closeout and testing process.
- Lack of management expectations such that installed modifications were allowed to be in use prior to successful testing and package closeout.

- Lack of management oversight and involvement in the modification testing and closeout process.

- Lack of configuration management control.

- Lack of questioning attitude by the engineers that possessed these modifications for an extended period of time.

- Inadequate modification turnover program (from engineer to engineer).

- Inadequate process for prioritization of activities (conflicting priorities).

- Large backlog of engineering work activities.

Also, the modification process relied on the lead engineer to verify that all testing, documentation changes, and any other requirements listed in the modification package were accomplished prior to closing the modification. No other tracking mechanism was in place to assist the lead engineer or support the process in the lead engineer's absence.

The team informed the licensee that:

(a) Failure to ensure that SR modification closeout requirements have been successfully accomplished in accordance with portions of the Modification, Installation and Testing procedure, Sections G.6.d, "Quality Control;" G.6.e, "System Engineer;" G.7.c, "Modification Coordinator;" G.7.d, "System Engineer Supervisor;" and Appendix B, Section 3, "Mod Test Results Reviewed" of procedure ZAP 510-02, "Plant Modification Program," prior to declaring the modified SSCs as operable and placing them in use is an apparent violation of 10 CFR 50, Appendix B, Criterion V (295/96011-02A(DRS); 304/96011-02A(DRS)).

(b) Operating the plant with installed SR modifications that have not been completely tested to demonstrate that modified SSCs will perform satisfactorily on demand is an apparent violation of 10 CFR 50, Appendix B, Criterion XI (295/96011-03A(DRS); 304/96011-03A(DRS)).

(c) Failure to indicate by use of suitable marking or tracking systems the operability status of SR SSCs modified by plant modifications that had been installed as early as 1986, placed in use, but not declared operable or signed as completed, is an apparent violation of 10 CFR 50, Appendix B, Criterion XIV (295/96011-04(DRS); 304/96011-04(DRS)).

c. Conclusions

The team concluded that the licensee had operated the plant, in some cases for up to ten years, with multiple installed modifications that were placed in use by plant staff, but had not been completely tested (construction, modification and operation tests) or authorized by operations. At least one modification was being used in a

mode which was not adequately analyzed (i.e., continuous bypass of the orifices). In one case, a second modification was installed and changed the design/logic configuration of the first installed modification; testing was not completed. However, the team did not identify any immediate safety issues with the incomplete modifications. Four apparent violations with multiple examples involving procedures, 50.59 SEs, test control and operability status were identified.

E1.2 Parts Replacement Program

a. Inspection Scope

The team reviewed parts evaluation No. Z-95-xx-00989-00, dated January 24, 1995, and the related replacement package to determine its technical adequacy and its adherence to site procedures. The parts replacement package allowed the replacement of a valve disk and stem with similar parts.

b. Observations and Findings

The intent of the valve disk replacement was to increase the thrust margin by increasing the thrust to fail the disk. The team's review of the parts replacement package indicated that the only change to the disk was a slight material change (from CF8 to CF8M). Per the package, there was no increase in the new material allowable stress or ultimate stress values. Therefore, the team concluded that some other change had been made to the valve disk to accommodate the increased thrust value for failure. The team determined that this particular design activity lacked the required interface between the parts replacement engineers and design engineers. Also, the technical expertise of the engineers performing and reviewing this parts replacement was determined to be lacking in that there was no apparent knowledge of the reason behind the change. Subsequently, the licensee reviewed the documentation provided by the disk manufacturer and verified that strength properties of the disk had been changed. The licensee agreed that the original parts replacement package was in error and agreed to revise the package to address the change. Although the distinction between the disks was minor, and the safety significance appeared minimal, this issue high lighted inadequate controls in the design process.

c. Conclusions

The team concluded that an inadequate design review was performed on this package. Also, a lack of engineering knowledge was noted in performing the evaluation in that the engineers failed to recognize that a design change to the disk had to exist in order for the thrust margin to increase. In addition, there was poor interdiscipline coordination between design and parts replacement engineering.

E1.3 Modification Related Calculations

1. Mechanical Modification Calculations

a. Inspection Scope

The team reviewed mechanical calculations associated with plant modifications. Three calculations were reviewed during the inspection. The calculations were reviewed for technical adequacy and completeness.

b. Observations and Findings

The calculations reviewed were generally well organized and complete. The assumptions were clearly stated and references listed. The calculations were technically adequate in all instances but one.

The team reviewed calculation No. 22S-B-006M-0051, dated February 13, 1996, which determined the thrust required to open a pressure locked gate valve. The team determined that this calculation had an apparent error in the text portion of the calculation. The bonnet pressure was reported in the text to be acting on an incorrect area of the valve disk. However, upon review by the licensee, it was determined that the calculated thrust was correct. The thrust was calculated by a computer program generated by the licensee corporate staff. The team agreed that this program did indeed use the correct disk area. It appeared that the licensee plant personnel were unsure of how the program arrived at its answer. Further review by licensee personnel found two additional instances in similar calculations where the text was incorrect and did not match the computer calculation. The licensee agreed to revise these calculations to remove the error from the text in these calculations.

c. Conclusions

The calculations reviewed were found to be adequate and technically sound, with the exception of the error discovered in one calculation. However, based on that error and the additional examples found by the licensee, the team determined that the technical knowledge and expertise of the mechanical and structural engineering staff appeared lacking in certain instances.

2. Electrical Modification Calculations

a. Inspection Scope

The inspection team reviewed 11 electrical engineering calculations, four of which related to the plant modifications that were reviewed. The remaining, though not reviewed in close detail, related to the 4 kV bus second level undervoltage or degraded voltage relay setpoint changes that were to be completed during the Unit 2 outage, which was scheduled to start in September 1996.

b. Observations and Findings

The team determined that the electrical calculations reviewed, which were performed in the last two to three years, were of good quality, well documented with regard to assumptions, input, methodology, conclusions, etc., and served their purpose well. The team concluded that the electrical calculations reviewed were better than the industry average based on what had been observed by the team during inspections of other nuclear stations.

c. Conclusion

The inspection team found the electrical calculations that were reviewed adequate and appropriate to support the plant's modifications for which they were intended.

E1.4 Temporary Alterations (TAs)

a. Inspection Scope

The team reviewed selected TAs for technical adequacy and completeness. TA 96-013 was performed to install heat tracing and insulation on a portion of the SI recirculation piping to prevent freezing of the water. Another TA was performed to provide a temporary method of filling the CS diesel fuel oil day tank.

b. Observations and Findings

The team reviewed TA 96-013, dated March 18, 1996, which installed temporary heat tracing and insulation for the SI recirculation piping. This TA was determined to be inadequate in several instances. The TA lacked sufficient detail in describing the actual modification. There was little description of a thermocouple which was installed on the piping to verify temperature. The team reviewed the SE screening which was performed to support this alteration. This screening determined that a 50.59 SE was not required. The basis for this conclusion was that the modification did not alter the method of performing the function of the recirculation piping. However, the heat tracing and insulation appeared to be necessary to prevent the piping from freezing, and this was a change to the system as described in the UFSAR. The screening also addressed the impact of the modification on another safety system. Both of these points should have prompted a 50.59 SE per site procedure ZAP-100. A review of the installation indicated that there were several failure modes associated with the heat tracing and insulation which should have been reviewed and documented in accordance with the requirements of 10 CFR 50.59.

The licensee stated that a 50.59 SE was not required, since the modification was not required to ensure that the piping did not freeze and it did not constitute a change to the design of the SI recirculation system. However, the team disagreed with the licensee's conclusion and noted that the licensee event report which was performed to report the freezing condition specifically discussed the use of the heat

tracing and insulation as a means of protecting the piping from freezing and ensuring the safety function of the SI system.

The team informed the licensee that failure to perform a 50.59 SE and document the results for a temporary modification that appeared necessary to prevent freezing, was different from the UFSAR, could potentially impact another system, and could introduce new failure modes is considered an example of an apparent violation of 10 CFR 50.59 (295/96011-01B(DRS); 304/96011-01B(DRS)).

E1.5 10 CFR 50.59 Safety Evaluations

1. General Review of Safety Evaluations

a. Inspection Scope

The team reviewed selected 50.59 SEs. The review included technical adequacy, completeness, and thoroughness of the review for any Unreviewed Safety Question (USQ), particularly with respect to potential failure modes. The review involved various SR modification evaluations and safety evaluations associated with other activities. The other activities consisted of normal plant evolutions, such as scaffolding erection, a setpoint change for a radiation monitor alarm, and a diesel fuel oil tank out of service.

b. Observations and Findings

The review identified several weaknesses in specific 50.59 SEs as well as in the process. Details of the specific instances are provided below.

(1) Safety Evaluation 50.59/0166/95

The team reviewed safety evaluation 50.59/0166/95, dated November 16, 1995 (revised on April 12, 1996), performed to allow scaffolding around the SI accumulators to remain in place inside containment during plant operation. The accidents reviewed in the original 50.59 SE to support the installation were incorrect. Also, there was little technical basis to support the USQ determination. This 50.59 SE was also reviewed by the licensee's off-site review committee four months after scaffolding installation and was determined to be unacceptable. As a result, the safety evaluation was revised in April 1996. However, because the licensee had placed the units in operation during the four month period, this review process was inadequate to prevent a modification or other activity with a potential USQ from occurring.

A subsequent NRC walkdown identified that the scaffolding was installed near instrumentation and piping. The revised 50.59 SE still did not discuss any potential impact on this piping and instrumentation as a result of the scaffolding installation. The 50.59 SE also did not address other interactions, such as thermal growth of piping and pipe break effects. Further, one of the scaffolds was installed around the pressurizer relief tank (PRT) instead of an accumulator. However, other than

noting this fact, the safety evaluation made no specific reference to the PRT or its associated piping and instrumentation. All of the descriptive rationale included in the safety evaluation was based on installation around accumulators. The failure to perform an adequate safety evaluation is considered an example of an apparent violation of 10 CFR 50.59 (295/96011-01C(DRS); 304/96011-01C(DRS)).

(2) SR Modification E22-1-95-218

The team noted that modification E22-1-95-218, "MOVs SI-8803A/B Bypass Line Addition," and the associated 50.59 SE credited a containment isolation valve seal water system function for the volume control (VC) system that was not credited in the Updated Final Safety Analysis Report (UFSAR). In this case, seal water system function means that the charging pumps in the VC system would stay running following an accident. The pressure from the charging pumps would be applied to the outside containment side of the valve, thus "sealing" any radiation inside containment and maintaining containment integrity. The licensee subsequently identified two additional instances where a plant system was not credited as a seal system in the UFSAR, but had been assumed to be a seal system in the licensee's containment isolation testing program. The safety evaluation was inadequate in that it failed to identify that UFSAR Table 6.2.4 states that there is no seal system for containment penetration P-4. The modification took credit for the seal system. This was considered by the NRC to be a change to the facility as described in the UFSAR. As of August 22, 1996, this UFSAR change had not received a written safety evaluation. This is considered an example of an apparent violation of 10 CFR 50.59 (295/96011-01D(DRS); 304/96011-01D(DRS)).

In addition, the team determined that the containment isolation system engineer was not consulted by design engineering and had no input to this particular modification.

2. 50.59 Safety Evaluation Process Deficiencies

a. Inspection Scope

The team reviewed 50.59 SEs and procedures used by Zion for generating safety evaluations. These included ZAP 100-06, Rev. 7, "Safety Review and Approval," and NEP 04-03, Rev. 1, "10 CFR 50.59 Safety Evaluations."

b. Observations and Findings

The team identified numerous concerns in the sample of safety evaluations reviewed during the inspection as well as with the 50.59 SE process. Deficiencies in the 50.59 SE process were also identified during a recent Site Quality Verification (SQV) audit completed in August 1996.

The team determined that the numerous examples of 50.59 SE violations identified during the inspection indicated a continuing lack of quality, completeness and thoroughness relative to 50.59 SEs, as follows:

(1) TA 96-14 installed heat tracing and insulation in March 1996 to preclude freezing (along with administrative controls) of the SI pump mini-flow recirculation piping. As of August 22, 1996, the change did not have a written safety evaluation to provide the bases for the determination that the change does not involve a USQ or TS change (see Section E1.4 for details).

(2) Modification E-22-2-95-218 credited the use of the charging system as a seal system for purposes of containment isolation. The safety evaluation for this modification was inadequate in that it did not identify that UFSAR Table 6.2.4 states that there is no seal system for this containment penetration (see Section E1.5.1.b(2) for details).

(3) Technical Specification (TS) 4.3.1.A.4.b and TS 3.7-1 were incorrect and had been changed via TS Interpretations (TSIs) 89-03 and 94-02, respectively. The TSIs did not receive a 50.59 SE and the licensee did not identify that the TSI would result in a change to the TS. Subsequently, the licensee identified TSI 95-01 and TSI 95-03 as also requiring amendments (see Section E8.1.b for details).

(4) SE 50.59/0166/95, performed to leave scaffolding installed in containment (four scaffolds per unit) during operation, was inadequate. Failure effects of the scaffolding were not appropriately analyzed (see Section E1.5.1.b for details).

(5) Modification E22-1(2)-93-248 changed the AFW pump steam supply steam traps. The modification was operating in a mode which was not adequately analyzed. No design change or 50.59 SE was performed to address the new operating mode prior to this inspection (see Section E1.1.b.1.(c) for details).

Additionally, the NRC considered that corrective actions to four 50.59 SE related violations issued by the NRC over the last three years were ineffective in correcting 50.59 related problems (Reference NRC Inspection Report Nos. 50-295/304-93023; 50-295/304-94020; 50-295/304-94021; 50-295/304-95014).

A recent SQV audit at Zion identified numerous 50.59 SE procedure noncompliances across the three engineering groups and among all levels of the engineering organization. This finding became a Level II Corrective Action Record (CAR). The issues identified were similar to 1993 SQV findings that had also resulted in a CAR. But the 1993 CAR had been closed prematurely in 1995 based on completed training and perceived improvements in 50.59 SE quality. Deficiencies in 50.59 SEs identified during the 1996 SQV audit included:

- incorrect safety evaluation answers.
- missing safety evaluation information.
- deficiencies in quality, completeness and thoroughness.
- incorrect determination of UFSAR effects.
- use of wrong revision of safety evaluation forms.

The team also determined that there was no mechanism in place to track and address commitments made in 50.59 SEs.

Based on interviews and numerous discussions with design and modification engineering staff who were qualified reviewers and preparers, the team concluded that the 50.59 SE process was not always clearly understood, appreciated or rigorously applied. For example, the shortcomings in the safety evaluations for the scaffolding in the containment and for the SI piping heat tracing were considered by Zion staff to be of minor significance and were not rigorously re-evaluated. It appeared to the inspectors that the 50.59 SE reviews were viewed by some licensee staff as "just another piece of paper to complete" versus understanding the purpose behind 50.59 and conscientiously applying the tests.

c. Conclusions

The 50.59 SEs reviewed by the team were, in some instances, technically weak and did not provide sufficient detail to support the determination of no USQ. In at least one instance, a system described in the UFSAR was modified without a 50.59 SE being performed. The expectations for quality standards of SEs were unclear, and the training in response to earlier violations appeared to be inadequate for preparers and reviewers in all levels of the organization.

In view of the repetitive nature of these violations and of the licensee's failure to implement effective corrective action for previous violation and self assessment findings relative to 50.59, the team's findings demonstrate significant deficiencies in engineering activities and management oversight of the 50.59 SE process.

The examples of a violation of 10 CFR 50.59 collected in this section are discussed in more detail in other sections of this report. However, these examples are being considered collectively as a single apparent violation, indicative of a breakdown in the licensee's process for complying with 10 CFR 50.59.

E1.6 Review of Operability Assessments

The team reviewed selected operability assessments performed by the licensee. The operability assessments were reviewed for technical adequacy as well as thoroughness of the arguments used to establish operability.

1. Review of Operability Assessment ER95004439

a. Inspection Scope

The team reviewed operability assessment ER95004439, dated November 8, 1995, which verified that a residual heat removal to refueling water storage tank suction valve was operable in Mode 4. The assessment addressed the potential pressure locking concern for that valve.

b. Observations and Findings

The team determined that the assessment did not conclude that the valve was operable, and recommended a procedural change to lock the valve open. This

change was rejected by operations and the operability assessment was revised only to reflect this fact. No additional evidence to support operability was provided until the licensee was questioned by the team. The additional information, that the valve does not have a design basis function to open during Mode 4, was sufficient for the team to concur with the operability assessment.

The team reviewed several assessments that were written for the same systems by different authors. These assessments differed in the list of system safety functions. For example, in one instance, the penetration seal function was not listed for the VC system. The licensee informed the team that the operability assessment would be revised to add the required penetration seal function.

2. Review of Operability Assessment ER9604259

a. Inspection Scope

The team reviewed operability assessment ER9604259, dated August 13, 1996, which supported unit operability with scaffolding installed in the containment.

b. Observations and Findings

The operability assessment was determined to be ineffective in that evidence was not provided to support the operability determination that the scaffolding was acceptable for long-term use in the containment. The team was concerned that the determination was made based solely on engineering judgment. The team performed an independent walkdown of the scaffold installation in Unit 1 to verify the assertions made in the operability assessment. The team noted that interactions between scaffolding, equipment and instrumentation were not fully addressed.

3. Review of Operability Evaluation ER9603282 (Charging Pump Performance Degradation)

a. Inspection Scope

The team reviewed operability assessment and engineering request ER9603282 (PIF 96-1218), portions of the Emergency Core Cooling System (ECCS) Small Break Loss of Coolant Accident (SBLOCA) analysis, ECCS test procedures TSS 15.6.4, and In Service Testing (IST) documents.

b. Observations and Findings

The licensee generated an operability assessment as a result of a UFSAR conformance review finding related to charging pump degradation. The team determined that the initial operability assessment was inadequate. The assessment failed to address the affects of pump degradation on design flow requirements until prompted by the NRC.

By plotting the full flow (approximately 500 gpm) pump test data onto the IST pump curves, the licensee's conformance review determined that all four charging pumps had total developed head of greater than 10% difference from the corresponding IST pump curve values. However, Pump 1B had the greatest performance degradation with (-)24%.

In response to the identified degradation, the licensee determined in its initial operability assessment that no operability issue existed because: (1) the pump had consistently met the IST test acceptance criteria conducted at low flow; and (2) the pump had met the ECCS full flow test acceptance criteria of less than pump runout. Since the licensee determined that an operability issue did not exist, no further corrective action was taken or required. The NRC found the operability assessment to be inadequate because the pumps' ability to deliver the required flows at design conditions was ignored in the operability assessment. Neither of these tests verified minimum flow at SBLOCA design conditions.

In view of the degradation data, the NRC was also concerned with the validity of the IST 10%-degradation curve used for these pumps. Because pump testing at design conditions (approximately 325-450 gpm at 1100-1500 psig for SBLOCA) was not possible, pump degradation testing under IST was conducted at lower than design condition flows. IST testing for these pumps was conducted using the pump minimum flow test line at a reference point of approximately 100 gpm and recent testing indicated that the pumps' performance was within 3% of the reference curve at that point. A basic assumption of the IST program was that the 10% required action degradation curve stayed constant along the entire pump curve. But if evidence of greater than 10% degradation is noted, even if it's at a point different from the IST testing point, the validity of the 10% degradation curve is questionable and its applicability to design conditions cannot be ignored.

ECCS full flow test TSS 15.6.84, "Charging and Safety Injection Flow Test," dated October 1995, contained the noted pump degradation data. The stated purpose of the test was to verify that the flow rates were within the bounds of those assumed in the accident analysis for Zion station. The acceptance criteria, which was recommended by Nuclear Fuel Services and Site Engineering to ensure minimum acceptable ECCS performance, verified that runout flows were not exceeded and that large break loss of coolant accident minimum flows were satisfied. However, the criteria failed to address minimum SBLOCA flow requirements. This inadequate test evaluation is considered an example of an apparent violation of 10 CFR 50, Appendix B, Criterion XI (295/96011-03B(DRS); 304/96011-03B(DRS)). The licensee's conformance review actually identified this problem and provided it to the station in an exit on June 28, 1996. However, as described earlier, the licensee's response to the issue exacerbated the situation by failing to recognize the problem and thus failing to take action.

After prompting by the NRC, the licensee reviewed the effects of the worst case pump degradation flowrates at design conditions. This was done by assuming a degradation trend curve drawn through the two available data points (IST and full flow test data) and by comparing these flows against those assumed in the ECCS

SBLOCA accident analysis. The comparison demonstrated that the flowrates available with the worst case pump degradation were still greater than the flowrate values used as input into the accident analyses. Although the margin in the analysis had prevented the unnoticed degradation from impacting the pump's specified function, the NRC viewed this as fortuitous. Had the unnoticed degradation been slightly higher, the analytical conservatism may not have been sufficient. The charging pumps may not have been able to deliver the SBLOCA design flows, but would have still met the full flow test and the IST test acceptance criteria.

4. Conclusion for Section E1.6

The team concluded that in general, the operability assessments reviewed were weak and some were inadequate. For example, the operability assessment for charging pump degradation noted during ECCS full flow testing was inadequate. The operability assessment did not evaluate operability at design flow conditions and the licensee failed to fully address this until prompted by the NRC. The team also noted that the amount of detail provided in the assessments reviewed was inconsistent. Several assessments contained sufficient detail to verify the operability determination, while others provided the bare minimum of information. There were also discrepancies in the system safety function descriptions.

E1.7 General Conclusion for Conduct of Engineering (Sections E1.1 through E1.6)

The team determined that in general, many of the modification packages reviewed were technically correct and complete. The modifications, in most cases, appropriately addressed the problems they were to resolve. The calculations reviewed were found to be generally adequate and technically sound. The testing portions of many of the modifications reviewed contained the tests required to verify successful installation. However, the team found that the engineering modification process was deficient in areas associated with modification completion and post-modification testing, engineering knowledge, design reviews, 50.59 SEs, operability assessments and interdiscipline coordination between engineering groups. The deficiencies in the licensee's control of modifications and compliance with 10 CFR 50.59 were widespread and repetitive, such that licensee programs in these areas appeared to have broken down. Four apparent violations involving test control, safety evaluations, procedures and operability status were identified.

E3 ENGINEERING PROCEDURES AND DOCUMENTATION

E3.1 UFSAR Conformance Review

a. Inspection Scope

The team reviewed Zion's UFSAR conformance review findings, plans for resolution of UFSAR discrepancies, PIFs and operability assessments generated from the findings. The team also reviewed Zion procedure 700-08, Rev. 10, "Problem Identification Process."

b. Observations and Findings

During June 1996, Zion performed a vertical slice sample review on the Chemical and Volume Control System (CVCS), the radiation monitor (RM) system, and the steam generator tube rupture UFSAR sections in response to NRC Information Notice 96-17. The UFSAR conformance review focused on operating practices and procedures to ensure conformance with the UFSAR. At the conclusion of the review on June 28, 1996, Zion's review team had identified 175 UFSAR discrepancies. Upon further review and validation, the number of discrepancies was reduced to 115.

The NRC determined that the UFSAR conformance review was a positive management effort, and noted that the team consisted of experienced technical reviewers that identified important issues. However, after identification of the discrepancies, the licensee failed to promptly document the identified deficiencies in the corrective action process.

Zion administrative procedure ZAP 700-08, 0, "Problem Identification Process," Rev. 1, Appendix A, Item 16, required generation of PIFs for events or conditions identified by an assessment group. Although the conformance review was completed by the end of June, only one discrepancy had a PIF generated as of the week of July 22, 1996, when the NRC team arrived on site. Twenty-four PIFs were subsequently generated for the remaining discrepancies.

The failure to generate the PIFs for identified self assessment issues as prescribed by ZAP 700-08 is considered an example of an apparent violation of 10 CFR 50, Appendix B, Criterion V (295/96011-02B(DRS); 304/96011-02B(DRS)).

Since PIFs were not promptly generated for the conformance review discrepancies, the licensee had not decided whether to fix the discrepancies or change the FSAR. As a result, the team was concerned that the licensee had not promptly addressed the identified discrepancies under 10 CFR 50.59, either. If the licensee chooses not to fix the discrepancies under an Appendix B corrective action process, then changes in the facility or in procedures as described in the Safety Analysis Report (SAR) must have a written SE which provides the bases for determining that the change does not involve a USQ. Instead of formally pursuing either of these courses of action, Zion relied on a group of station engineering and operations personnel to effect daily reviews of these discrepancies for safety significance and operability. The NRC was concerned that these reviews were not documented until after the NRC team questioned the review process.

c. Conclusions

Zion's UFSAR conformance review was considered a positive management effort. The NRC noted that the review team consisted of experienced technical reviewers. This review appeared to be thorough and rigorous, identifying several meaningful issues. However, after identification of the discrepancies, the licensee failed to initiate prompt corrective action to address the identified deficiencies or determine if

a 10 CFR 50.59 concern existed. One example of an apparent violation concerning procedures was identified.

E3.2 Vendor Equipment Technical Information Program (VETIP)

a. Inspection Scope

The team reviewed the licensee's vendor document control program including evaluations of vendor information and the vendor document backlog. Documents reviewed included procedure ZAP 510-01, "Vendor Equipment Technical Information Program," Rev. 4 and procedure NEP 07-04, "VETIP Process Control," Rev. 0.

b. Observations and Findings

The licensee had recently implemented a program to improve the VETIP process by reducing the backlog of unreviewed VETIP binders and by streamlining the process. However, evidence of progress in reducing the backlog was minimal; also, the NRC was concerned with the potential use of non-controlled VETIP binders for activities affecting quality.

As of this inspection, a backlog of approximately 260 VETIPs were pending review of revision/update documents. The team could not evaluate the effectiveness of the licensee's recent initiatives. No data was yet available to demonstrate an improving trend in backlog reduction.

The team noted that the VETIP binders were uncontrolled and considered reference documents only; however, the team determined that unrevised VETIPs may potentially be used for activities affecting quality. For example, NTS items 304-201-96CAT4-0426, 0488, and 0610 detail cases where VETIPs were required to repair or troubleshoot instrumentation after failed surveillance tests. This indicated that the maintenance procedures had insufficient detail for the maintenance personnel and that the uncontrolled VETIPs may have been required for activities affecting quality. The team noted that lack of detail in maintenance procedures led to reliance on non-controlled VETIPs for completion of activities affecting quality. This issue is considered an Unresolved Item (URI) pending review of the licensee's actions, including review of maintenance procedure adequacy (295/96011-05(DRS); 304/96011-05(DRS)).

c. Conclusions

The team concluded that weaknesses in maintenance procedures and in the VETIP program may allow use of uncontrolled VETIPs for work activities affecting quality. Some changes to the VETIP program had been initiated but evidence of backlog reductions was not apparent.

E.1.5.3 Miscellaneous Engineering Tasks (Procedures and Documents)

a. Inspection Scope

The team reviewed various engineering related procedures and documents. These included PIFs and other procedurally driven activities such as surveillance testing and scaffolding.

b. Observations and Findings

1. Scaffolding Erection Inside Containment

The team reviewed the details of the installation of scaffolding inside the containment (portions of this issue are also discussed in Section E.1.5.1.b). This scaffolding was installed and left in place during unit operation. Four scaffolds were erected in the Unit 1 and Unit 2 containments (eight total), one near each SI accumulator tank, with one exception, where the scaffolding was built near the pressurizer relief tank. The scaffolds were erected under the site scaffolding procedure ZAP 920, Rev.1.

Procedure ZAP 920 requires that scaffolding be removed following work completion. The scaffolds were erected to allow operations access to valves manipulated during start-up and shutdown. Since the scaffolds were located inside the containment and the units were both operating, no work was being performed. Therefore, the scaffolds should have been removed. Essentially, the scaffoldings were being used as continuous and permanent changes. The team determined that, contrary to the requirements of ZAP 920, the scaffolds had not been inspected every month since installation. The team also determined that the scaffolds were installed in direct contact with SR equipment. This was also contrary to the requirements of ZAP 920. The team also noted that the licensee corporate level scaffold procedure (TID-MS-01) contained greater detail than the site procedure. This was determined to be a weakness in the site procedure. The licensee agreed to perform a modification to permanently install the scaffolds.

The team informed the licensee that failure to follow procedure requirements, as discussed in the paragraph above, is considered an example of an apparent violation of 10 CFR 50, Appendix B, Criterion V (295/96011-02C(DRS); 304/96011-02C(DRS)).

2. System Performance Monitoring Information

The team noted that in the month of June 1996, at least eight system engineers failed to update the materiel condition monitoring information used for trending of component and system performance on 13 systems. This information is used for the maintenance rule trending data and materiel condition windows color determination. Procedure ZAP-500-13A requires a monthly update of the window

data. This is considered an example of an apparent violation of 10 CFR 50, Appendix B, Criterion V (295/96011-02D(DRS); 304/96011-02D(DRS)).

3. Safety Injection Flow Balancing and Full Flow Testing

The team reviewed the procedures associated with the performance of the Unit 1 SI flow balancing and full flow testing (TSSP 139-92, dated June 22, 1992, and TSS 15.6.84, dated October 25, 1995). The team reviewed the full flow injection procedure and noted an apparent discrepancy in the differential pressures obtained in the four charging injection paths. Three of the four differential pressures were identical and one was approximately half of the other three under the assumed same flow condition. This indicated that the flow in this leg could be less than anticipated. The team reviewed the original procedure, which established the differential pressure for flow balance. This procedure had the same apparent discrepancy. The licensee performed a walkdown of the piping near the differential pressure taps to determine if differences in piping configuration could be the root cause of the discrepancy. The results of the walkdown indicated that the piping configuration could not account for the discrepancy, but the orientation of the flow measurement piping may account for the discrepancy. The licensee reviewed the Unit 2 procedure and determined that a similar condition could exist. The licensee then performed an operability assessment to determine the effects of the potentially degraded flow on unit operability. The licensee also committed to verify flow independently of the differential pressure method during the next refueling. This item is considered unresolved pending licensee test results from both units (295/96011-06(DRS); 304/96011-06(DRS)).

4. Protective Relay Setting Changes

The team found that protective relay setting changes for the SR 4 kV system were the responsibility of the corporate System Protection Department. This was said by the licensee to be a non-nuclear expertise group of protective relay specialists who were responsible for protective relay settings, 4 kV and above, throughout the Commonwealth Edison system. Any 4 kV relay setting changes were to be developed by the System Protection Department and issued using Relay Setting Orders to Zion Station for implementation. The team was concerned that such relay setting changes could be implemented without the formal review, concurrence and approval of the electrical design group (Electrical/I&C Engineering) at Zion Station regarding impact and compatibility with the Class 1E 4 kV system's design and safety functions. In response to this concern the licensee stated that the need to make specific requirements for Electrical/I&C Engineering review prior to implementation will be evaluated. This was acceptable to the team.

5. Design Basis Document and Diagram Revision

The team observed that the design basis document relating to the station's electrical system, including the Auxiliary Power System Design Basis Document Manual, DBD-ZI-024, was well written and adequate in scope; however, it was out-of-date in that it was issued in 1992 and had not since been revised to resolve

several open items and recent plant modifications. The licensee recognized that the document required updating.

During the review of the degraded voltage relay setpoint changes, the team found that six SR Key Diagrams, 22E-1-4000H, 22E-1-4000J, 22E-2-4000H, 22E-2-4000J, 22E-1-4000C, and 22E-2-4000C, had not been revised to show the addition of the SR degraded voltage relays which had been installed in mid-1980. The licensee issued PIF 96-1883 to address the issue. The team informed the licensee that failure to revise the six diagrams to show the SR degraded voltage relays is an example of an apparent violation of 10 CFR 50, Appendix B, Criterion V (295/96011-02E(DRS); 304/96011-02E(DRS)).

6. 50.59 SE Procedures

The NRC identified that weaknesses in the safety evaluation procedure wording (for both ZAP 100-06 and NEP 04-03) may allow a USQ to go unnoticed, because facility or procedure changes that "may increase the probability and consequences of malfunction of equipment important to safety" are specifically reviewed only if the change affects an analyzed accident. In response, Commonwealth Edison Company committed to change and clarify the procedures to separate the "malfunction of equipment" question so that it is also addressed with changes not associated with analyzed accidents. Further, a sample of previously completed 50.59 SEs was being reviewed to ensure that past facility changes appropriately addressed this issue.

7. Inadequate Emergency Operating Procedure

The team reviewed the Station Emergency Operating Procedures to determine if the VC system's required safety function as a penetration seal water system was incorporated in the procedures. This was needed to ensure that the VC pumps were not turned off when the seal water system was needed.

The team noted that Emergency Procedure ES 1.3, "Transfer to Cold Leg Recirculation," Rev. 18, failed to include guidance and instructions for the VC system, which was used as a penetration seal water system. This could have resulted in system operation being terminated and loss of the penetration seal. This is considered an example of an apparent violation of 10 CFR 50 Appendix B, Criterion V (295/96011-02F(DRS); 304/96011-02F(DRS)).

The licensee agreed to review this situation and update the procedures as required.

c. Conclusion

The team identified examples of failure to follow procedures and inadequate procedures. Also, electrical diagrams had not been revised to reflect as-built conditions.

The team concluded that contributing factors to the procedural problems noted included: (1) lack of clear management expectations; (2) lack of questioning attitude and attention to detail by engineering personnel in performing tasks; and (3) failure to follow procedures and inadequate quality of procedures.

E4 ENGINEERING STAFF KNOWLEDGE AND PERFORMANCE

E4.1 Root Cause Determination and Corrective Action Process

a. Inspection Scope

The team reviewed the licensee's root cause investigation process, which included reviews of PIFs, root cause investigations, and corrective actions taken on identified problems.

b. Observations and Findings

(1) Recent Root Cause Initiatives

The licensee recently implemented root cause investigation training initiatives aimed at event reduction by focusing on prevention, detection and correction. Implementation of these methods included formation of a dedicated multi-discipline root cause investigation team with its goal being to improve the quality of investigations, of trend analyses and to propose effective corrective action. The team concluded that Zion's attention to improving root cause investigations was necessary and was viewed as a good management initiative. However, the team noted that engineering corrective action efforts have failed to identify the root cause of problems noted. Technical documents and evaluations reviewed have been incomplete or narrowly focused. The following examples were identified.

(2) Inadequate Root Cause of Recurring Occurrences

The team reviewed several PIFs associated with instrument out of tolerance conditions for the Containment Spray (CS) system sodium hydroxide (NaOH) Spray Additive Tank level indication (PIFs 295-201-95-CAT4-1227, 295-201-96-CAT4-0010, 295-201-96-CAT4-0011, 295-201-96-CAT4-0916, and 295-201-96-CAT4-1044). The review determined that there were numerous instances of out of tolerance over the past two years. The PIFs associated with these instances were Category 4 PIFs, which meant that no root cause would be performed. The number of consecutive PIFs should have triggered a root cause PIF to identify the cause of the problem and rectify it. The licensee informed the team that there was no procedural number of consecutive Category 4 PIFs which would trigger a root cause evaluation. The team determined that this was a weakness in the PIF procedure. The team did note that the system engineer had initiated an Engineering Request to replace these level instruments prior to the inspection. No implementation date for the modification has been established.

The team identified one instance when both trains of the redundant level instrument were out of tolerance simultaneously (PIF 304-201-95-CAT4-2001, dated July 27, 1995). This constituted entry into a TS action statement requiring an alternate means of level indication within eight hours of the discovery. Contrary to this, the TS action statement was not entered until after eight hours had expired. The licensee initiated a PIF to investigate this incident and concluded that the out of service condition was not identified until some time after the initial event. Therefore, the licensee concluded that alternate level indication was established within the eight hour limit.

Failure to identify the root cause of the repetitive out of tolerance condition of the level instrumentation and implement appropriate corrective action to preclude repetition is considered an example of an apparent violation of 10 CFR 50, Appendix B, Criterion XVI (295/96011-07A(DRS); 304/96011-07A(DRS)).

(3) Repeat Failures of 4 kV Breaker Not Trended for Root Cause

The team reviewed recent problems associated with 4 kV breakers. The team noted repeat failures of 4 kV Breaker No. 1412 to close on demand following corrective maintenance activities. Although this breaker was classified by the licensee as NSR, it is the reserve feed breaker for Unit 2 Engineering Safeguards Feature (ESF) busses and could challenge the SR function of SR loads and busses. Failure of this breaker will require emergency diesel generator startup to feed the ESF busses. This issue was considered a potentially significant condition adverse to quality and measures were not established to assure that the cause of the condition was determined, nor was corrective action taken to preclude repetition. The breaker failed to close five times since September 1995. The failures were not being evaluated or trended for root cause determination and to prevent recurrence. A post-modification test was not always specified nor performed after the breaker was repaired and racked back into the cubicle. There was no procedural requirement to test breakers after they are racked back into the cubicle.

The No. 1412 breaker failed to close on September 22, 1995, during preventive maintenance activities. A control relay contact was found out of position. Following repair, the breaker remained outside bus 141 until December 1995, when it was installed in Main Feedwater Pump 1A, Cubicle 2 (swapped with the breaker in Cubicle 2). The breaker was not tested in the cubicle and failed to close again on January 3 and 4, 1996. On at least two instances, on January 3 and 4, 1996, operations attempted to reclose the breaker after replacement of the control relay contact block and before the system engineer completed his review of the work request packages. Post-modification testing was not specified by the engineer prior to closing the breaker. The breaker failed to close on both attempts. On April 25, 1996, the breaker failed to close again. A work request was written, but repair and root cause determination were not performed. The breaker failed again on July 21, 1996, when operations attempted to close it after it was swapped back into its original cubicle.

The team followed the licensee's troubleshooting on the 1412 breaker after it failed to close on July 21, 1996. Disassembly of the electrical contactor unit revealed that the support for the control relay contacts was broken. Further investigation showed that the striker lever, which was connected to a cam, was forcefully activated by the charging springs striking the contact activating arm with excessive force. The activating arm then struck the control relay contact support. This apparently resulted in the control relay contacts being misaligned and the broken support. The broken relay contact device was replaced and relative positions of the striker lever and activating arm were then adjusted to minimize the force. This appeared to be the cause of past breaker failures to close. It appeared that previous failures of the breaker to close had been corrected by replacing the damaged control relay contact block unit without determining the root cause.

The team also noted that the AP system engineer did not receive all of the PIFs issued on his system. This could be a contributing factor to the inadequate root cause determination on Breaker 1412.

Failure to identify the root cause of nonconforming conditions and implement appropriate corrective action to preclude repetition is considered an example of an apparent violation of 10 CFR 50, Appendix B, Criterion XVI (295/96011-07B(DRS); 304/96011-07B(DRS)).

The licensee subsequently issued PIF 96-2047 to address concerns noted in Sections E4.1.b(2) and (3) above.

c. Conclusions

The team evaluated the breaker problem and concluded that the apparent causes for the repeat breaker failures were: (1) incomplete root cause identification and corrective action; (2) inconsistent trending and prioritization; (3) a large engineering backlog; and (4) many equipment deficiency workarounds. Additionally, corrective action taken with the CS system NaOH Spray Additive Tank level indication was inadequate, no trending or root cause was initiated. The team considered this an example of lack of engineering staff and management attention to recurrent problems. Recent implementation of a root cause investigation team and event reduction training were considered positive management initiatives, but improvements were not yet clearly evident.

E4.2 Trending and Materiel Condition

a. Inspection Scope

The team reviewed the licensee's equipment trending program for the SI system, CS system, and RM system. The responsible engineers were interviewed.

b. Observations and Findings

The licensee had systems in place to assist department managers trend various indicators, such as overall numbers of problems, work backlog, and work completion. However, equipment performance trending by system engineers was inconsistent. Interviews with system engineers indicated that trending of system performance and materiel condition was not very effective. The team observed that RM system maintenance rework and monitor out of service time was trended monthly. Other systems had no trend analysis beyond what was performed by programs such as Vibration Monitoring and IST. Data from some programs, such as Lube Oil Analysis, were not consistently trended. In addition, the team's review of prioritization of engineering work indicated that due to the large load of engineering work, little prioritization was done.

c. Conclusions

The team concluded that the licensee's trending program was weak. In some cases, engineers did not perform trending analyses on their systems, such as out of service time, failure rates, and system performance indicators. Also, some important engineering problems appeared to not have received a high priority for resolution.

E4.3 Lube Oil Analysis Process and Packing Leaks

a. Inspection Scope

The team reviewed the licensee's Lube Oil Sampling and Analysis program for the SI and CS systems. The responsible engineers were interviewed and available sample results for motor and pump bearings were reviewed for the past three years.

b. Observations and Findings

The team noted that the responsibility for the Lube Oil Sampling and Analysis program was recently transferred from one lube oil coordinator to the various system engineers, each accountable for his own equipment. The engineers interviewed relied on the preventive maintenance engineer to notify them that samples were due and thus did not systematically track sample performance or receipt of results. The engineers did not maintain organized records, and in the case of the CS system, not all sample results requested by the team were available for review. The responsible system engineers did not have the expertise to analyze sample results, and in cases where the performing lab noted unacceptable results or made recommendations for further analyses, PIFs were not written and corrective action was not always taken.

The 2B SI pump bearing oil samples had high amounts of water and sediment at least since 1993 with no root cause analysis performed and no corrective action taken beyond changing the oil at the standard frequency. Review of the bearing

vibration measurements performed by the station on the 2B SI pump showed no degradation. Several samples in the CS system showed elevated levels of copper, iron and water. In one case, the lab's recommendation of ferrographic analysis was apparently not evaluated or followed. A PIF was not written for any of these problems. Some samples had been analyzed by the licensee's own lab, which provided a history with each sample, making trend analysis easy. Potentially contaminated samples were sent outside the company for analysis and results did not include any history. In this situation, trend analysis was not usually performed.

The team noted that all CS pump packing glands leaked excessively and repair efforts have not been effective. In one case, a packing replacement work package called for a new style of packing to be installed. However, due to oversight, the old style was installed instead. After adjustments, the old style packing was left installed.

c. Conclusions

The team concluded that the Lube Oil Sampling and Analysis program was weak. The responsible individuals did not track sample performance or receipt of analyses and sample results were not retained in a useable manner. The purpose of the system was defeated when no action was taken for unsatisfactory sample results. At the end of the inspection, the licensee informed the team that the lube oil coordinator position will be re-established.

E4.4 Auxiliary Power System Automatic Bus Transfer

a. Inspection Scope

The team reviewed the auxiliary power system automatic bus transfer logic to assess the potential impact on the SR loads connected to the 4 kV system busses, which were subjected to bus transfer.

b. Observations and Findings

The team was concerned that exposure to out-of-phase 4 kV bus transfer could potentially damage motors. During the review of the auxiliary power system's design bases document, DBD-EI-024, the team observed that no mention was made that the scheme for the automatic bus transfer (ABT) of 4 kV busses, including the 4 kV SR busses from their normal to alternate sources of power, was supervised by synchro-check logic to assure SR motors and their driven loads were not overstressed by transient torques resulting from exposure to out-of-phase bus transfer. Severe transients could cause immediate mechanical failure, while less severe transients could have a cumulative affect which, in turn, could lead to accelerated loss of qualified equipment life expectancy. ABT is reported by the licensee to occur during plant startup and planned or unplanned plant shutdown. As noted in Section 15 of ANSI C50.41-1977, "Polyphase Induction Motors for Power Generating Stations," such transient torques could range from approximately two to twenty times rated torque. To limit the possibility of damage to a motor or

driven equipment, or both, ANSI C50.41-1977 recommended "...that the power supply system be designed so that the resultant vectorial volts per hertz between the motor residual volts per hertz and the incoming source volts per hertz at the instant the transfer...is completed does not exceed 1.33 per unit volts per hertz on the motor rated voltage and frequency bases." When queried by the team, the licensee could not identify a study or calculation which demonstrated that the "1.33 per unit volts per hertz" criterion would not be exceeded during ABT at Zion and the criterion was not part of the station's design bases. Further, the licensee stated that the "1.33 per unit volts per hertz" criterion was not widely accepted and was under scrutiny for acceptability. The team disagreed, since the IEEE Paper 93 WM 033-1 PWRD, Motor Bus Transfer, which the licensee referenced in their response, states "...the ANSI C50.41 standard was the most common criterion for analyzing a bus transfer." Further, while the criterion may have been under scrutiny, resolution may prove that it is not tight enough for some drives, such as those with long shafts between the motors and driven loads, as is the case with some service water pumps.

c. Conclusion

The team was concerned that exposure to out-of-phase 4 kV bus transfer could potentially damage motors. Based on the team's concern, the licensee committed to evaluate the need to perform additional analysis and take corrective action if the evaluation concludes there was a potential to damage motors. This was acceptable to the team.

E4.5 Containment Spray System

The team determined that the design basis of the CS system was under review by the licensee and the NRC. Some outstanding issues and concerns include: (1) pH limit of spray; (2) total amount of NaOH required in sump; (3) presently no required surveillance to verify NaOH add flow; (4) environmental qualification of containment equipment; and (5) need for nitrogen blanket on spray add tank.

These issues are discussed in a separate NRC inspection report and will be followed and documented in URI 50-295/96006-08(DRP); 50-304/96006-08(DRP).

E4.6 General Conclusions (Sections E4.1 to E4.5)

The team concluded that the licensee's trending program was weak. Also, some important engineering problems appeared to not have received a high priority for resolution.

E5 ENGINEERING STAFF TRAINING AND QUALIFICATION

E5.1 Engineering Staff Training and Specialized Training

a. Inspection Scope

The team reviewed the licensee's engineering training program, including TPG-201, Rev.7, "Engineering Support Training," as well as qualification guides for engineering groups and individuals.

b. Observations and Findings

The engineering support training program, which applied to all engineering departments at Zion, consisted of four phases: (1) Initial (orientations/applications/intro to systems training); (2) Secondary (power plant operations/simulator); (3) Position Specific (selected topics/qualification guides based on department and position); and (4) Continuing Training (general/position specific).

The efficacy of Position Specific training specifically dealing with 50.59 SEs was of concern based on the findings in the 50.59 SE area. As part of continuous training, Zion has recently completed special training on the subject and has implemented mandatory continuous training requirements in order to maintain 50.59 SE preparer and reviewer qualification. The team reviewed 50.59 SE training course material and training records. A sample of system/design/maintenance engineering personnel records indicated that 50.59 SE training requirements were satisfactorily fulfilled. Nevertheless, based on the team's findings, the quality and thoroughness of safety evaluations was considered problematic, warranting further attention.

c. Conclusions

Overall, Zion had a well organized engineering training program; however, based on inspection findings, weaknesses were evident in the effectiveness of position specific (or specialized) engineering knowledge training, such as 50.59 SE training.

E6 ENGINEERING ORGANIZATION AND ADMINISTRATION

E6.1 Zion System, Design and Maintenance Engineering

a. Inspection Scope

The team verified whether System, Design and Maintenance engineering activities that support the plant were properly prioritized, coordinated and effectively implemented. The team examined engineering interface with other support groups and determined effectiveness of management's involvement in the engineering process. This was accomplished through review of engineering processes and interviews with engineers and management staff.

b. Observations and Findings

The Engineering Department at Zion consisted of three separate departments. Design Engineering, Maintenance Engineering and System Engineering. Design Engineering was primarily responsible for all issues associated with the design basis of the plant, including design changes, modifications and configuration management. Maintenance engineering was primarily responsible for all issues associated with technical support for maintenance activities, component failure troubleshooting and trending and testing programs (i.e., IST, In Service Inspection (ISI), Motor Operated Valve (MOV), etc.). System engineering was primarily responsible for all issues associated with technical support for operating activities, system performance trending, system problem troubleshooting and on-site review functions.

The Zion engineering organization appeared to be staffed with mostly experienced and knowledgeable engineers. The team observed that most engineers interviewed appeared well qualified for their work, were cognizant of the station's design bases and aware of nuclear plant design change practices. The team determined, however, that the technical knowledge and expertise of the mechanical and structural engineering staff appeared lacking in several instances. Also, management first line supervision and engineering involvement in the modification process, including 50.59 SEs, post-modification testing, modification closure and the resolution of engineering related issues, were considered weak. In addition, the corrective action program, the lube oil analysis program and the trending program exhibited weaknesses. The team also noted several instances where procedures were not being followed or were inadequate. Examples were noted where the required interface between design, system, and maintenance engineering was ineffective or nonexistent.

c. Conclusions

The team concluded that the Zion engineering organization appeared to be staffed with mostly experienced and knowledgeable engineers. However, increased management involvement was warranted to address the deficiencies in other sections of this inspection report.

E7 QUALITY ASSURANCE IN ENGINEERING ACTIVITIES

E7.1 Licensee Self Assessment Activities

a. Inspection Scope

The team reviewed the licensee's self assessment program to determine it's effectiveness. Various SQV and Independent Safety Engineering Group audits and surveillance reports were reviewed. In addition, corporate engineering self assessments were also reviewed.

b. Observations and Findings

Although the NRC's sample review of recent corporate and Zion engineering self assessments noted primarily compliance based findings, a positive trend towards more findings related to technical issues was also noted. For example, the findings in the corporate-sponsored Chief Engineer's reviews and in the assessments of ISI and MOV programs indicated that experienced auditors with good technical backgrounds were utilized. However, the team noted that corrective actions on findings and timeliness of closeout of findings were not consistent. For example, three of twelve engineering related findings from the 1994 audit were still open, yet a sample review of corrective actions on some closed items indicated that comprehensive follow-up action was taken.

A recent SQV audit, QAA-22-96-09, was considered to be good. The audit was thorough and self critical and identified deficiencies with maintenance rule implementation, operability assessments, UFSAR discrepancies, adherence to procedures, and 50.59 SEs. However, Zion's self assessment program had not identified many of the problems identified by the team.

c. Conclusions

Findings from audits and surveillance conducted on Zion engineering were generally compliance based, but increased technical findings were noted. Timeliness and comprehensiveness of corrective action taken was inconsistent. A recent SQV audit, QAA-22-96-09, was considered to be good; however, Zion's self assessment program had not identified many of the problems identified by the team.

E8 MISCELLANEOUS ENGINEERING TASKS

E8.1 Technical Specification Interpretations (TSI)

a. Inspection Scope

The team examined the licensee's TSI process. This included a review of existing TSIs.

b. Observations and Findings

The licensee had used TSIs as an addendum to TSs since 1979. Thirty of the thirty-six TSIs which had been issued were still active when the NRC began this inspection.

Procedure ZAP 130-02, "Technical Specification Interpretations," dated October 18, 1995, stated, in part, that, "A TSI shall not change the TS requirement or the intent of the applicable TS. The purpose of a TSI is to clarify not modify TSs." The team and the licensee determined that Zion had generated and could have used at least thirty TSIs that had potentially changed the TS requirements or intent. Additionally, ZAP 130-02 required that a 50.59 SE be included in and

distributed with the on-site review package. No provisions were included in ZAP 130-02 to review previously issued TSIs for conformance to the procedure requirements. For example, no 50.59 SEs existed for previous TSIs, nor were earlier, still active TSIs reviewed to verify that TS intent was not changed. The licensee stated that these TSIs will either be deleted or revised, 50.59 SEs will be performed on all existing TSIs, and prompt corrective action will be taken on all identified problems.

Subsequent to NRC raised concerns, the licensee conducted a thorough review of all TSIs. This resulted in identification of the following three categories of TSI deficiencies:

1. Inappropriate Use of TSIs to Amend TSs

In the first category, a change in the TS was warranted; however, Zion failed to change the TSs via an amendment, and instead, inappropriately attempted to "clarify" the TSs via a TSI. Four TSIs were used to interpret TSs that required amendments. Three TSIs appeared to be more conservative than the TS (TSIs 89-03, 94-02 and 95-01). One appeared to be less conservative (TSI 95-03). Zion was pursuing TS amendments for the four affected TS sections.

(a) TS 4.3.1.A.4.b, involving steam generator operability for Modes 1 and 2, was determined by the licensee to be incorrect, because it directed use of secondary side **wide** range steam generator water level instead of **narrow** range in determining reactor coolant loop operability. Use of wide range level was nonconservative, as it could result in insufficient inventory in the steam generator to ensure natural circulation. In lieu of correcting the discrepancy via TS amendment, Zion had addressed the discrepancy via TSI 89-03 (which was written for TS 3.3.1.A.5). Subsequent to the inspection, the licensee was pursuing a TS amendment. The team also noted that TS 3.3.1.A.5 was insufficient in that it failed to define "natural circulation." The licensee planned to revise TSI 89-03 to define "natural circulation;" however, it appeared to the team that a TS amendment was needed.

(b) TS 3.7-1 requires that 20 Main Steam Safety Valves (all) shall be operable whenever the reactor is heated above 350°F, unless the Power Range Neutron Flux High Trip setpoint is reset for the most restrictive loop in accordance with TS Table 3.7-1. TS Table 3.7-1 values for maximum Power Range Neutron Flux High Trip setpoints (when Main Steam Safety Valves are inoperable) were determined to be nonconservative based on Westinghouse and licensee analyses. The existing setpoints may allow a secondary overpressurization condition to exist. In lieu of amending the TS via TS amendment, Zion had provided the new setpoints via a revised table in TSI 94-02.

(c) TS 3.15.2.C footnote allows the common "0" diesel generator to be inoperable for up to seven days for maintenance or testing provided that one unit is in Mode 5 or 6 and three remaining diesel generators are operable. TSI 95-01 extended the Modes of applicability of the TS from Modes 5 or 6 to Modes 5 or 6 or defueled.

(d) TS 3.13.1.A.4 requires that at least one residual heat removal pump and heat exchanger shall be in operation during core alteration operations. The TSI was inconsistent with the TS in that TSI 95-03 allowed suspension of residual heat removal operation for up to one hour in an eight hour period during core alterations with water levels of greater than 22 feet above the top of the reactor pressure vessel flange. This TSI was less conservative than the TS.

2. TSIs To Be Revised

TSIs 89-02 and 91-05 changed the intent of the TSs and appeared to be less conservative than the TSs.

(a) TS sections 3.7.2 and 4.7.2 involve AFW flowrate requirements for all AFW pump and valve lineups while in Modes 1, 2, and 3. TSI 89-02 changed the TS intent by allowing verification of valve position in lieu of testing the "C" motor driven AFW pump to verify header alignment. This test would be required when AFW piping headers were divided. Subsequent to NRC queries, the licensee determined that this portion of the TSI was not needed since existing operating procedures required that this test be conducted whenever the AFW headers were manipulated.

(b) TSI 91-05 affected TSs 3.8.7.A, B, and C, which involved service water pump operability in various combinations, and allowed five hours to be in hot shutdown for a specific combination of operable/inoperable service water pumps. However, the TSI was in error, and changed the intent of TS, because it failed to note that TS 3.8.7.D only allowed four hours to hot shutdown for the same situation. The TSI was less conservative than the TS and the licensee stated it would be revised.

The licensee's subsequent review determined that the following TSIs also needed revision: TSIs 79-04, 89-03, 91-03, 91-04, 93-02, and 95-05. Zion planned to revise the TSIs to provide the needed clarification to the TSs.

3. TSIs To Be Deleted

TSIs 84-01, 86-03 and 92-02 appeared to be less conservative and changed the intent of the TSs. The licensee stated these will be deleted.

(a) TSI 84-01 was incorrect in that it allowed moving into modes beyond cold shutdown with an inoperable, but shut, main steam isolation valve. This differed from the intent and wording of TS 3.9.4, which required all main steam isolation valves operable unless the reactor was in cold shutdown, and was less conservative than the TS in that it would allow the station to operate outside the existing TS.

(b) TSI 86-03, interpreted TSs 3.22.1.A, 3.22.2.A, 4.22.1.A.3 and 4.22.2.A.3, and changed the TS intent by allowing post snubber failure engineering evaluations to be fulfilled by visual inspection only. Visual inspection alone may not be appropriate to determine if the system or component were affected by a snubber failure. Other evaluations such as pipe stress analysis may be required. This TSI

was considered to be less conservative than the TS, because it allowed potential circumvention of ASME Section XI requirements.

(c) TSI 92-02 allowed the licensee not to verbatim comply with TS surveillance 4.15.2.E when unit batteries were cross-tied. TS 3.15.1.E required that all 125 Vdc batteries and chargers in an operating unit be charged and in service in Modes 1 and 2. If one battery is inoperable, the proper actions are located in TS 3.15.2.E, which required either to shut down the affected unit (be in cold shutdown within 24 hours) or cross-tie one battery to a 125 Vdc operable battery of a unit that is already in shutdown or refueling mode. TS surveillance 4.15.2.E required that charger output voltage and current shall be checked and recorded immediately and once per shift thereafter until the cold shutdown condition is attained. However, TSI 92-02 allowed the licensee not to comply with TS surveillance 4.15.2.E, but rather to follow the requirements of TS surveillance 4.15.1.E, which was less restrictive and required weekly and quarterly battery checks.

Three TSIs to be deleted did not appear to affect the TSs conservatism (TSIs 79-05, 92-03, and 93-01).

The team informed the licensee that the issues documented in Sections 1(a) through 1(d), 2(a), (b), and 3(a), (b) and (c) above had modified the TS requirement or the intent and therefore, the licensee failed to follow the requirements of procedure ZAP 130-02 relative to use of TSIs. These are considered examples of an apparent violation of 10 CFR 50, Appendix B, Criterion V (295/96011-02G(DRS); 304/96011-02G(DRS)).

4. Concerns With TSI Administrative Controls

The team identified the following concerns. The methodology of controlling the copies of TSIs was ineffective, since the shift engineer's copy of TSs contained a signed TSI which was not listed on the index and was not in other copies. The extra TSI of TS 3.17.2.1 defined diesel generator ventilation system operability, and thus, diesel generator operability. A cross reference method of red stamping a reference to an applicable TSI on the appropriate TS pages was not complete and several pages were not stamped where the TSI was expected to be consulted.

c. Conclusions

The team determined that the licensee failed to follow the requirements of Zion's TSI procedures and failed to maintain sufficient management controls over the TSI process. The team concluded that the licensee had issued and used TSIs that were potentially inconsistent with the TSs.

E8.2 Radiological Protection Controls for Liquid, Gaseous Radwaste and Area Radiation Monitoring Systems

a. Inspection Scope

The licensee identified UFSAR discrepancies involving the Radiation Monitoring (RM) system and longstanding problems with certain of the Process Radiation (PR) monitors. As a result, the team performed an inspection to determine if these problems impacted on the licensee's ability to satisfactorily implement the liquid and gaseous effluent monitoring and dose assessment program. The team reviewed selected PR and Area Radiation (AR) monitor calibrations, portions of the licensee's liquid and gaseous radwaste program, instrument setpoint methodology and procedures, TS and offsite dose calculation methodology requirements, PIFs generated as a result of the identified UFSAR discrepancies, and walked down and observed PR monitors and skids.

b. Observations and Findings

Selected calibration and functional tests of some of the TS effluent monitors indicated they were performed in accordance with requirements and approved procedures. However, long term inoperability problems associated with the RM system continued to persist, causing reliability concerns with the system and continued need for compensatory actions. Over the past two years, there have been several TS and non-TS effluent monitors that were out of service for greater than 30 days. For example, one of the noble gas decay tank monitors, which has an isolation function, had been inoperable since January 1996 and had been routinely inoperable since installation in 1994. The nature of the problems associated with the RM system included detector, electronic circuit board, flow switch/indicator and sediment build up problems.

In addition, the team observed that the RMs had failed frequently and were in poor materiel condition. Operators were required to take extensive compensatory actions which added additional burden during routine operations, and complicated transient responses. The licensee had previously recognized the issue, developed a comprehensive program to correct it, but had made little progress fixing the problems.

The licensee recently identified over 100 UFSAR discrepancies with the RM system program. The majority of the discrepancies fell into the following categories:

- Discrepancies between the UFSAR and plant configuration - 30%
- Discrepancies between the UFSAR and plant procedures - 15%
- Discrepancies between different sections of the UFSAR - 32%
- Other plant documentation errors (e.g., drawing errors) - 10%

At the time of the inspection, corrective actions addressing these discrepancies were being developed.

c. Conclusions

Although there have been longstanding operability problems with certain of the effluent monitors and recently identified UFSAR discrepancies with the RM system, the licensee's program to assess dose to the public from radioactive effluents was effectively implemented. However, a comprehensive plan, which was developed about two years ago by system engineering to upgrade the RM system had not been fully implemented.

E8.3 Instrument Classification Upgrade Program

The team examined the recently initiated instrumentation classification upgrade program established to resolve potential discrepancies identified in the safety and seismic classification of instruments. This effort was considered to be a good initiative to improve the design bases at Zion. However, it was too early to determine the effectiveness of its implementation.

V. Management Meetings

X1 Exit Meeting Summary

The inspection results were presented to members of licensee management at the exit meeting on August 22, 1996. The licensee acknowledged the findings presented.

The team 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

J. Mueller, Vice President, Zion Station
J. Hosmer, Engineering Vice President
K. Schwartz, Station Manager
B. Giffin, Engineering Manager
J. Reiss, System Engineering Director
B. Fitzpatrick, Operations Manager
G. Vanderheyden, Training Manager
D. Farrar, Reg. Assurance Manager
M. Wiesneth, Regulatory Assurance Engineer
F. Gogliotti, Design Engineering Supervisor
D. Galanis, Design Engineering Supervisor
M. Burns, System Engineering, Supervisor
G. Wagner, Engineering Training Coordinator
D. St. Clair, Work Control Manager
L. Peterson, Design Engineer
P. Gazda, Design Engineer
B. McDonald, System Engineer

NRC

G. Grant, Director, Division of Reactor Safety, RIII
M. Ring, Chief, Lead Engineers Branch
L. Miller, Chief, Reactor Projects Branch 6
R. Westberg, Acting Senior Resident
D. Calhoun, Resident

Illinois Department of Nuclear Safety

J. Yesinowski, Illinois Resident Engineer

INSPECTION PROCEDURES USED

IP 37001	10 CFR 50.59 Safety Evaluation Program
IP 37550	Engineering
IP 37551	Onsite Engineering
IP 37700	Design Changes and Modifications
IP 37828	Installation and Testing of Modifications

ITEMS OPENED

50-295/304-96011-01 A thru D	VIO	10 CFR 50.59 Safety Evaluations
50-295/304-96011-02 A thru G	VIO	Procedures, 10 CFR 50, Appendix B, Criterion V
50-295/304-96011-03 A and B	VIO	Testing, 10 CFR 50, Appendix B, Criterion XI
50-295/304-96011-04	VIO	Operability Status, 10 CFR 50, Appendix B, Criterion XIV
50-295/304-96011-05	URI	VETIP Program
50-295-304-96011-06	URI	Safety Injection Balancing/Testing
50-295-304-96011-07 A and B	VIO	Corrective Action, 10 CFR 50, Appendix B, Criterion XVI

DEFINITIONS

Unresolved Items (URIs) - URIs are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. (URIs disclosed during the inspection are discussed in paragraphs E3.2.b and E3.3.b.3.)

LIST OF ACRONYMS USED

50.59 SE	10 CFR 50.59 Safety Evaluation
ABT	Automatic Bus Transfer
AP	Auxiliary Power
AR	Area Radiation
CS	Containment Spray
CVCS	Chemical and Volume Control System
DC	Direct Current
E&TS	Engineering and Technical Support
ECCS	Emergency Core Cooling System
ESF	Engineering Safeguard Feature
FCR	Field Change Request
HVAC	Heating, Ventilation and Air Conditioning
ISI	In Service Inspection
IST	In Service Testing
MOV	Motor Operated Valve
NED	Nuclear Engineering Department
NSR	Non-Safety Related
PiF	Problem Identification Form
PR	Process Radiation
RM	Radiation Monitoring
SAR	Safety Analysis Report
SBLOCA	Small Break Loss of Coolant Accident
SE	Safety Evaluation
SI	Safety Injection
SQV	Site Quality Verification
SR	Safety Related
SSC	Systems Structures and Components
TA	Temporary Alteration
TS	Technical Specification
TSI	Technical Specification Interpretation
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
USQ	Unreviewed Safety Question
VC	Volume Control
VETIP	Vendor Equipment Technical Information Program