

U. S. NUCLEAR REGULATORY COMMISSION

REGION II

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Licensee: Tennessee Valley Authority

Facility: Sequoyah Nuclear Plant, Units 1 & 2

Location: Sequoyah Access Road
Hamilton County, TN 37379

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EXECUTIVE SUMMARY

Sequoyah Nuclear Plant, Units 1 & 2
NRC Inspection Report 50-327/97-09, 50-328/97-09

This special team inspection included aspects of licensee operations, maintenance, and engineering related to effectiveness of licensee controls in identifying, resolving, and preventing problems. The report covers an assessment of the application of the licensee's corrective action program to three selected plant systems by a team of regional inspectors.

Operations

- The licensee conducted a comprehensive review of the systems selected for the special NRC corrective action inspection. (Section 07.1)
- The licensee's root cause analysis and implementation of corrective actions for the 120 VAC vital inverters was good, with one exception. The licensee had closed a commitment associated with a problem evaluation report (PER), and a previous NRC violation, based on issuance of a design change notice, without verification that drawings were updated as required. This problem was identified by the licensee and appropriate corrective actions were being taken to preclude recurrence. (Section 07.2)
- Overall, the licensee's root cause analysis and implementation of corrective actions for the EDG PERs were generally good. The licensee's extent-of-condition reviews were thorough. (Section 07.3)
- The deferral in implementing a successful resolution to an EDG day tank level switch issue continued to place additional burdens upon Maintenance, Engineering, Operations, and the corrective action program. (Section 07.3)
- The licensee had identified a number of performance-related problems associated with the auxiliary feedwater (AFW) system and was, in general, taking adequate corrective action. However, there were other matters associated with the AFW system that had not been identified by the licensee or the licensee's disposition was weak. (Section 07.4)
- A non-cited violation was identified concerning inadequate DCN impact reviews relative to the installation of air cylinders for operation of the turbine driven AFW level control valves during station blackout conditions. (Section 07.4)
- Licensee management, including the site Vice President, were taking an active part in reviewing site problems, from identification through determination of root cause(s) and corrective action(s). (Section 07.5)

Maintenance

- Work activities and the performance of surveillance activities were adequately performed. The licensee method for monitoring the degradation of the generator winding resistance was acceptable. (Section M1.1)

Engineering

- The licensee had done a good job of selecting motivated, knowledgeable system engineers, but appeared to have done a relatively poor job in the area of workload evaluation. The system engineer for the EDG systems appeared to be overloaded. (Section E4.1)

Report Details

The purpose and objective of this special team inspection was to review licensee actions in the identification of root cause determination for, and implementation of corrective actions for problems associated with selected plant systems. The three plant systems selected for review during this team inspection were:

- Vital Inverters (VI)
- Emergency Diesel Generators (EDG)
- Auxiliary Feedwater (AFW) Pumps and Control Valves

I. Operations

07 Quality Assurance in Operations

07.1 Licensee Review of Selected Systems

a. Inspection Scope

On July 8, 1997, a letter to the licensee announced this inspection and requested that the licensee provide selected information about the systems selected for review. The licensee provided the requested information prior to the inspection, as requested, but also assembled a team to perform an independent review of the requested data, including walkdown inspections of the selected systems.

b. Observations and Findings

The results of the licensee's review of the requested data, and walkdown inspection of the systems included the generation of a time line for each system showing when work requests, PERs, etc. were generated. Another result of the review was the generation of a number of new problem evaluation reports (PERs). These new PERs were provided to the team during the entrance meeting for the inspection. (A listing of the PERs is provided as an attachment to this report.)

The inspectors reviewed the time lines generated by the licensee's review, and discussed the work that had been done. The licensee's review team was still in the process of completing the assessment of the three systems during the inspection.

The inspectors reviewed the PERs that had been generated during the licensee's review and incorporated selected ones into the site inspection of the systems.

c. Conclusions

The licensee conducted a very comprehensive review of the systems selected for inspection by the NRC.

07.2 120 VAC Vital Inverters (VI)

a. Inspection Scope (IP 40500)

The inspectors reviewed various documentation associated with the operation and maintenance of the licensee's vital 120 VAC inverters. Documentation reviewed included quarterly system health reports, maintenance work orders (WOs), operating logs, design change notices (DCNs), problem evaluation reports (PERs), and preventive maintenance records.

b. Observations and Findings

Several equipment-related issues were identified during a review of the licensee's quarterly system health reports for the July-September 1994 through January-March 1997 quarters. Other than an October 1994 failure of a vital inverter output breaker, described in SQ940805PER, no significant failures had occurred during those periods. Unplanned availability losses and cumulative unreliability values had remained at zero for the last 24 months.

Issues noted during the review of the most recent system health report included the need to replace various fuses, capacitor banks, and circuit cards containing electrolytic capacitors due to component aging. In addition, the neon indicating lamps have continued to burn out prematurely. These lamps cannot be replaced with the inverter energized and replacement must be deferred until the inverter is removed from service. Replacement of the circuit breakers, capacitor banks and circuit cards were scheduled, and the licensee was evaluating the possibility of a design change to allow the use of incandescent style lamps for the indicating lights.

SQ971746PER (from the licensee assessment) identified that the original vital inverters installed in Unit 1 included Westinghouse type DA2400Wk circuit breakers for the AC output while on Unit 2, GE type TQD22Y225 non-automatic switches were used. This problem was originally identified by the licensee in SQ940805PER.

On October 2, 1994, during routine preventive maintenance on Vital Inverter 2-I maintenance personnel failed to recognize that a replacement AC output switch was actually a non-automatic switch and attempted to test the device as a circuit breaker which resulted in damage to the switch. Plant drawings had not clearly differentiated between switches and circuit breakers for this application. Violation 327.326/94-34-01 was issued for inadequate drawings and failure to follow procedure.

As the result of this violation, the licensee committed to revise plant drawings to differentiate between switches and circuit breakers. This was also identified as a corrective action item in SQ940805PER. Subsequent closure of this commitment was based on issuance of DCN N-11739-A, which was originally issued to allow replacement of the Unit 2

switches with Westinghouse circuit breakers identical to those used on the Unit 1 Inverters. The licensee subsequently determined that the Westinghouse type DA2400Wk circuit breakers were no longer available and the DCN was revised by issuance of DCN N-11739-B which allowed use of Westinghouse type DA2400N non-automatic switches as replacement devices. However, the licensee failed to update the appropriate drawings. This problem was identified by the licensee and appropriate corrective actions were being taken to preclude recurrence.

Corrective action planned by the licensee for SQ971746PER included revision of the appropriate drawings, an FSAR change to address actual configuration, and revision of the commitment closure process to include additional safeguards to ensure adequacy of closure.

The need for an FSAR change had been identified in SQ971244PER, which was issued to document that the FSAR had not matched the actual configuration in relation to the 120 VAC switch on the vital inverters. The FSAR stated that the inverters had molded case circuit breakers installed with overload protection; however, some inverters actually were supplied with molded case switches that did not have thermal protection. The licensee had evaluated this condition and determined that a breaker was not required and planned to revise the FSAR.

c. Conclusions

The 120 VAC vital inverters have not experienced any unusual number of failures or unavailabilities. Several vital inverter equipment-related issues were noted during the review; however, the licensee has scheduled appropriate maintenance and modification activities to address these issues.

The licensee's root cause analysis and implementation of corrective actions for the 120 VAC vital inverters was good, with one exception. The licensee identified that they had closed a commitment associated with SQ940805PER, and a previous NRC violation, based on issuance of a DCN, without verification that drawings were updated as required.

07.3 Emergency Diesel Generators (EDG)

a. Inspection Scope (IP 40500)

The inspectors reviewed various documentation associated with the operation and maintenance of the licensee's emergency diesel generators. Documentation reviewed included quarterly system health reports, maintenance work orders (WOs), operating logs, design change notices (DCNs), problem evaluation reports (PERs), and preventive maintenance records.

b. Observations and Finding

EDG day tank level

Based on a review of the licensee's quarterly system health report for the October-December 1995 through January-March 1997 quarters, several issues associated with level switches for the EDG day tanks (fuel oil tanks) were identified. The physical configuration is such that each diesel engine has a day tank with six level switches, which serve to start and stop primary and backup pumps, and actuate high and low level alarms.

The most recent system health report, issued for April-June 1997, identified an implementation date of fiscal year (FY) 2002 to change the level switch set points. This issue was originally described in QA Audit 900I01102, where it was noted that no margin existed between the low level alarm and the TS limit of 250 gallons for the day tanks. The audit noted that no response time existed for Operations to prevent an LCO entry. Based on this QA audit, the licensee initiated Master Issues List 91456, which proposed that the EDG day tank level switches' setpoints be changed such that the main control room alarm and pump-start be initiated prior to the day tank fuel oil level decreased below 250 gallons. The original implementation of this proposed resolution was 1992.

SQ920225PER identified an issue where the minimum fuel oil level for the EDG engine mounted day tanks can be less than the TS minimum prior to either automatic or manual replenishment of fuel. The condition was a result of the actual tank dimensions being different from the as-designed dimensions used to develop setpoints for pump-start and alarm setpoints. Based on this PER, the licensee revised the setpoint and scaling documents after actual tank measurements were taken. The licensee determined that the current setpoints were adequate to satisfy the safety limit of EDG operations for one hour.

SQ963245PER, initiated by the EDG system engineer on December 18, 1996, based on a review of work orders, identified a high failure rate and maintenance problems with fuel oil system level switches.

SQ970349PER initiated on February 15, 1997, identified that during the performance of 2-SI-OPS-082-007.A for the 2A-A EDG, the 2A2 day tank level was 245 gallons, which was below the 250-gallon TS 3.8.1.1.b.2 limit. After the surveillance, the level returned to greater than 250 gallons. The licensee identified a possible deficiency involving the level switches, the local tank indicator, an electrical component, insufficient pump flow performance, or instrument inaccuracies coupled with resolution error in reading the tank mounted level gauges.

Based on this issue, the licensee issued a caution order on all four EDG sets, such that whenever an EDG is started, an AUO was to be dispatched locally to ensure day tank level remains greater than the TS limit. The alarm response procedure O-AR-M26-C specified manual operation for the

fuel oil transfer pumps on receipt of low tank level alarm; this action is also identified as an operator work-around.

In response to this issue, the licensee was preparing DCN T-12942-A. Discussions with the system engineer indicated that this DCN is planned to be implemented during the upcoming EDG electrical maintenance outages scheduled for the first quarter of 1998, in lieu of the previous scheduled period of FY 2002 contained in the April-June 1997 health report.

SQ971819PER (from the licensee's assessment) was initiated by NA&L on August 1, 1997 due to a discrepancy between SQ970349PER and the licensee's commitment tracking system regarding reportability; and also because SQ970349PER did not reference or include action to implement a design change to change the day tank setpoints.

Based on the above issues, the inspectors noted that the problems associated with EDG day tank level switches were numerous and longstanding, dating back to 1990. The licensee's corrective action program has not resolved these longstanding problems to date, and the issues continue to require the attention of and place additional burdens on Maintenance, Engineering, Nuclear Assurance, and Operations personnel. However, the recent PERs have resulted in an improved schedule for completion of the necessary modifications to resolve this issue.

EDG governor actuator oil level

SQ970592PER documented a small oil leak at the bottom of the EDG governors' actuator, prior to startup of the 2-AA EDG after maintenance. On March 13, 1997, maintenance personnel and the system engineer identified the small oil leak, and initiated WR C351417 in response. On March 19, 1997, in preparation for monthly testing of another EDG, an AUO discovered that the 2A2 governors' actuator oil level could not be seen in the sightglass. The engine was declared inoperable, and the licensee replaced the hoses with flex hoses and new fittings.

The licensee's Management Review Committee upgraded this PER to level B, requiring root cause analysis, due to operability concerns. The licensee identified the cause to be an over-tightened, flex-hose, compression fitting. The tube fittings on the EDG get removed and retightened often as part of periodic maintenance and inspection. These actions cause the fittings to wear out sooner than normal.

The inspectors questioned Operations supervision regarding AUO rounds to determine if opportunities had existed to identify the issue sooner. The inspectors also reviewed Procedure 0-GO-14, Attachment 7, Rev. 4, "Outside AUO Inspection Round sheet," and noted that no specific observation requirement existed for AUOs to check the EDG governors' actuator oil levels. However, the Operations Superintendent provided lesson plans from AUO training which included oil levels of pumps and motors, and minimum oil levels in operating equipment. The Operations Superintendent also stated that when the AUO round sheets were revised

approximately three years ago, emphasis was placed on a reduction in the number of "required data" taken by AUOs to allow more time for observation.

EDG cylinder head failure

SQ970423PER documented that during the performance of surveillance 0-MI-MDG-082-004.0 on EDG 1A-1 on February 27, 1997, the Cylinder No. 8, piston-to-head clearance was found to be outside of the acceptance criteria. The top of the piston also appeared wet, which indicated that the fuel injector was providing excessive fuel. Two- and four-year maintenance outages were performed on all eight engines during the first quarter of 1997, at which time the clearance check was performed on all cylinders of all eight engines. No other problems were identified in meeting the acceptance criteria.

The licensee replaced the power pack assembly, and sent the removed assembly offsite (to the EDG vendor) for failure analysis. The analysis identified several cracks emanating from the injector bore outward to each valve seat. The cause was identified as stress cracking due to the thermal gradient across the cylinder head fire face and the high stress concentration at the injector bore. The vendor identified the cylinder head as a "diamond 3" type, which has higher stress concentrations at the injector well than those designed after 1978.

The licensee plans to implement the vendor's recommendations, which include inspection of all cylinders to determine the presence of "diamond 3" cylinder heads. Inspections are to be conducted for indications of water on the top of the piston; those found with water indications will be replaced. The licensee stated that these inspections would be conducted by minor work requests, to be completed by approximately October 1997. The licensee plans to replace all "diamond 3" cylinder heads, or resurface the cylinder heads, during the next EDG major maintenance outage (12 yr EDG outage, approximately the first quarter of 1999).

The inspectors reviewed licensee actions to be taken in the short term to monitor the engines for changes in performance if the development of additional cylinder head cracks were to occur. The licensee stated that prior to engine operation, the engines are manually rolled to observe any liquid in the cylinders. No observations of water in the air box or drains during inspections have been observed to date. Operations also monitors the engine water level during engine operation and in standby conditions to determine any loss of jacket water inventory. The inspectors considered licensee actions to address this issue to be acceptable.

EDG electrical problems

SQ971675PER documented the 2A-A EDG trip on July 2, 1997, due to an instantaneous overcurrent and generator differential automatic trip. The EDG was in service for routine monthly testing, tied to the shutdown board and fully loaded. The licensee conducted a barrier-analysis, root cause for the trip, and determined that the phase A insulation was

broken down by vibration and thermal movement against a rigid tie cord which was placed over the original insulation during the C phase lead replacement on February 1997. The tie cord, being harder material eventually caused degradation of the original insulation of the Phase A coil connection, resulting in weakened dielectric strength, which arced up through the tie cord to the repaired C phase lead connection. The damaged areas were reworked to original insulating requirements and all areas along the pigtail that required tying were reinforced with felt, over the original tapes and under the tie tape.

Corrective actions included revision of all plant procedures addressing the repairing of insulation systems to address attachments to existing insulation, resulting in attachments being made with a felt material. The 2A EDG was the only diesel that had rework affecting the ground wall insulation system and therefore the extent of condition was limited to the 2A EDG only. The inspectors considered the licensee's root cause and corrective actions for this issue to be thorough.

SQ951793PER identified that the 1A-A EDG output breaker was not located in the associated cabinet when licensee personnel attempted to restore the EDG to service to perform post modification testing. The licensee determined that the breaker had been removed from its associated cabinet to allow installation of a grounding device during switchgear modification activities.

The breaker had been removed to a nearby approved storage location and chained in place. Modifications personnel failed to return the breaker to its associated cabinet following removal of the grounding device. As corrective action the licensee counseled Modifications personnel on applicable configuration control requirements. The inspectors considered the licensee's corrective actions to address this issue to be appropriate.

SQ951864PER identified that the 1A-A EDG 86GA Lockout Relay had become difficult to manually reset. The licensee had verified that the condition was limited to this problem by successfully electrically tripping the relay and demonstrating continued problems with the mechanical reset. Additionally, the tripped position of the relay was the normal position for emergency operation of the EDG and no problems had existed with the electrical operation of the relay.

The licensee determined the apparent cause for this failure of the relay latch mechanism to be lack of lubrication or excessive wear. None of the other similar type relays used in EDG circuits had experienced resetting problems. Based on the vendor's recommendation, no lubricant was used on the relay and the relay was replaced. The inspectors considered the licensee's corrective actions to address this issue to be appropriate.

SQ951911PER had identified that all four EDGs had been operated for several hours, unloaded, at 900 RPM. This condition could have potentially caused excessive wear to the turbocharger gear drives and

caused an accumulation of combustibles in the turbochargers and exhaust stacks. The condition had occurred due to a component failure which caused a test delay while the EDGs were operating. Operations personnel had decided to continue operation of the EDGs rather than start and stop the engines. No procedure restrictions prevented this condition.

As corrective action the system operating instructions for the EDGs were revised to include a precaution to address these conditions. The inspectors considered the licensee's root cause analysis and corrective actions to address this issue to be acceptable.

SQ960143PER identified an uncontrolled loading problem on the 2B-B EDG during functional testing. The normal continuous load rating for the EDG is 4400 kW with a 4840 kW intermittent rating. Indicated loading momentarily peaked to 5300 kW before the EDG was emergency-stopped. The licensee attributed this failure to poor dynamic adjustment of the Type 2301A Woodward Governor during testing after initial installation in 1994.

This governor was installed and set up prior to availability of the new diesel generator-data acquisition computer (DG-DAC). The DG-DAC was procured to provide immediate data concerning the dynamic setup during governor testing. All subsequent governor testing required use of the DG-DAC. There have been no other similar failures on this EDG or the remaining three EDGs. The inspectors considered the licensee's root cause analysis and corrective actions to address this issue to be appropriate.

SQ960178PER identified fluctuation of the engine idle speed observed during the shutdown of 1A-A EDG. The licensee determined the problem was with an old style KPDB relay used in 1A-A control circuits. No previous similar events had been noted and this type relay had been replaced with a newer type relay on the other three EDGs. This relay was subsequently replaced with the new style relay. No additional actions were required. The inspectors considered the licensee's corrective actions to address this issue to be appropriate.

SQ971432PER identified an out-of-range high voltage condition during surveillance testing of the 1A-A EDG. The licensee emergency stopped the EDG and placed it out of service until troubleshooting was performed. The voltage regulator card was returned to the vendor for failure analysis. Testing by the vendor did not reveal any problem with the card.

Two possible causes were proposed; high contact resistance associated with 86LOR relay contacts, and positioning of the motor-operated rheostat such that the voltage regulator would produce the high voltage condition. Both components were checked by the licensee during troubleshooting and no conditions were identified which could have caused the problem. There had been no other similar failures on this EDG or the remaining three EDGs.

The overvoltage condition for the EDG was evaluated by the licensee's engineering organization and the licensee concluded that no significant consequences had resulted. The inspectors considered the licensee's root cause determination and corrective actions to address this issue to be appropriate.

c. Conclusions

Overall, the licensee's root cause analysis and implementation of corrective actions for the EDG PERs was good, with one exception as discussed below. The licensee's extent-of-condition reviews were thorough.

Although the EDG day tank level switch issue has not affected engine operability, the deferral in implementing a successful resolution continued to place additional burdens upon Maintenance, Engineering, Operations, and the corrective action program.

07.4 Auxiliary Feedwater System (AFW) Pumps and Control Valves

a. Inspection Scope (40500)

The inspectors reviewed the operating logs, machinery history and the majority of problem evaluation reports (PERs) associated with the Unit 1 and 2 auxiliary feedwater (AFW) systems for approximately the last three years. The inspectors conducted interviews with personnel from Operations, Maintenance and Engineering focusing on their involvement with the AFW system. The inspectors also performed walkdown inspections of a large portion of the piping and equipment comprising the AFW systems to ascertain whether existing material condition deficiencies had been identified by the licensee.

b. Observations and Findings

The licensee had identified a number of performance-related problems associated with the AFW system and appeared to be taking adequate corrective action. These problems are listed below:

Logkeeping

Prior to the inspectors' arrival a team of licensee personnel had reviewed a substantial amount of the same material reviewed by the inspectors. Based upon their review, SQ971550PER had been initiated on the subject of poor logkeeping. The inspectors identified this same issue, when noting that operator logs omitted key information associated with elevated suction and discharge pressure of the 1A-A AFW train on June 7, 1996. Consequently, the inspectors had to ascertain the actual pressure indicated by the pressure transmitters, and the satisfactory engineering disposition of this condition, through personnel interviews.

AFW pump performance

The licensee had properly identified AFW pump performance deficiencies through multiple PERs. Following the completion of a vertical slice audit by the licensee's quality assurance organization and the issuance of SQ962767PER, the collective motor-driven-pump problems were raised to the highest level. Corrective actions included installing a rebuilt pump with a newly designed pump bearing at each refueling outage starting with Unit 2 in the Fall of 1997. PERs had been initiated on high vibrations exhibited by the turbine driven AFW pumps. Pump overhaul work conducted during the Spring 1997 Unit 1 refueling outage was effective in reducing vibration readings to normal for that unit's pump. Present management attention and corrective actions were appropriate for the identified performance problems.

AFW pump oil level

During an interview the inspectors ascertained that low oil level had recently been identified by the system engineer on one of the AFW pumps and a PER had been initiated regarding the circumstances surrounding this discovery. In follow up on this PER the inspectors ascertained that operator rounds only determined whether there was oil in a sight glass versus oil within a specific band on the sight glass. The inspectors noted that the PER scope included determining the appropriate level band for all pump sight glasses and not just the AFW pumps.

Maintenance Human Performance

Maintenance related human performance errors which included repetitive pump casing leaks due to personnel not properly torquing the applicable stud bolts and installing a pump bearing backwards had impacted availability and reliability of the AFW trains. The licensee had initiated PERs to address these performance weaknesses and implemented additional task oriented training in the areas of bolt tightening and bearing installation.

There were other matters associated with the AFW system that had not been identified by the licensee or the licensee's disposition was weak. These issues are listed below:

DCN impact review

The licensee had not identified inadequacies in the impact review for two design change notices (DCNs). During a system walkdown the inspectors inquired whether the instrument air check valves, upstream of the attached instrument air cylinders for operating the turbine driven AFW level control valves, were periodically tested. The response was negative. Also, the inspectors observed only 50 psig on the downstream side of one of the air cylinders.

Following these discussions the licensee provided DCNs M9198A and M10298A which authorized and directed installation of the air cylinders. The air cylinders provide motive force to operate the turbine driven AFW level control valves during a station blackout. The impact reviews of March 1994 for these DCNs failed to prescribe:

- Changes to the testing program to periodically verify that the check valve in the instrument air line upstream of backup air cylinder connections would close under reverse flow.
- Changes to the operator rounds sheets to routinely verify that adequate air pressure was being maintained downstream of the air bottle regulator.

Procedure SSP-9.3, "Plant Modifications and Design Change Control," Appendix Q, step 2.c. required each responsible reviewer to review the DCN and determine any effects on procedures/manuals, new/revised preventive maintenance tasks, testing, training and/or other effect on plant operability. However, prior to the inspectors' identification of this particular situation, the licensee had identified other inadequate impact reviews and initiated SQ970642PER in March 1997. Following licensee management review committee deliberation in May 1997, the PER was designated as requiring a root cause evaluation and determination of the extent of condition. Corrective actions to the PER included:

- Performing a 10% sample review of DCNs implemented between March 6, 1996, and July 8, 1997, to ensure proper design requirement translation into procedures, via the impact reviews, by December 19, 1997.
- Revising SSP-9.3 to require impact review completion prior to DCN closure.
- Transferring impact review responsibility to system engineering following the next Unit 2 refueling outage.
- Performing a 100% review of DCNs implemented during the next Unit 2 refueling outage to ensure proper design requirement translation into procedures, via the impact review, by September 30, 1997.

In addition, the licensee incorporated the inspectors' findings regarding the two inadequate impact reviews into a revision to the PER, SQ970642PER; initiated a work order to adjust the pressure regulator of air cylinder 1-PCV-32-1974H; initiated actions to revise the augmented check valve program by December 19, 1997; and revised the operator rounds sheets to include the downstream side of the air cylinders for periodic observation. Consequently, this non-repetitive, licensee-identified violation is being treated as a Non-Cited Violation, 50-327, 328/97-09-01, "Inadequate DCN Impact Reviews," consistent with Section VII.B.1 of the NRC Enforcement Policy.

Also, design drawings indicated that the lowest acceptable pressure downstream of an air cylinder regulator was 45 psig. Therefore, the actual condition observed by the inspectors on cylinder 1-PCV-32-1974H did not render the cylinder incapable of performing its design function.

TDAFW pump

Resolution of SQ940910PER was weak. On March 1, 1996, the Unit 2 turbine driven AFW governor stuck closed during periodic testing, and SQ960500PER was initiated. After the root cause evaluation determined that the linkage contained a sticky substance, probably grease, the governor's maintenance procedure was revised to designate the type of lubricant and exactly where the lubricant was to be applied. However, SQ940910PER had previously identified the need to properly maintain the governor, with special emphasis on lubrication. Therefore, the corrective actions to that PER did not preclude the 1996 failure.

Check valve inspection results

The licensee had not identified an apparent procedural deficiency that resulted in corrective maintenance check valve inspection results not always being forwarded to the check valve coordinator to ascertain whether the scope of check valve inspections should be expanded. Specifically, the inspectors identified that corrective maintenance was performed on suction check valve 1-VLV-3-805 and minimum recirculation check valve 1-VLV-3-814 for the 1A-A AFW pump, without the necessary information being forwarded to the coordinator.

Subsequently, the licensee initiated SQ971857PER and reviewed four systems encompassing 264 check valves (approximately 25% of the program's scope) with one more deficiency of this nature identified. None of the deficiencies warranted an increase in check valve inspection scope. Failure to forward the information to the coordinator was a weakness.

Scaffolding

During a system walkdown, the inspectors observed a scaffolding support tied off to a portion of the Unit 2 AFW system. Follow up revealed that the licensee may not have fully evaluated the ramifications of horizontal interactions between the scaffolding and the piping. Therefore, licensee engineering personnel inspected the scaffolding and determined the configuration to be acceptable. The licensee indicated that Procedure SSP-7.55, "Guidelines for the Erection of Scaffolds and Ladders including those in Seismically Qualified Structures," which is the procedure authorizing scaffolding installations of this nature, would be reviewed for enhancements.

TDAFW throttle valve

SQ961773PER documented the June 17, 1996, failure of FCV 1-51, trip and throttle valve for the Unit 1 TDAFW pump, to meet its ASME stroke time acceptance criteria. Troubleshooting of the valve was performed which involved taking motor current readings while stroking the valve. No problems were identified and subsequent stroke tests met the acceptance criteria.

There were weaknesses in the licensee's disposition of this condition. First, the PER discussed the possibility that the operator's finger slipped from the push-button causing the one slow valve stroke. This explanation was invalid; had this occurred, the valve would have stroked in a far longer period of time due to the electrical circuit design.

Second, although quarterly valve stroke time tests continued to be performed, the licensee failed to perform additional monitoring of valve performance during subsequent pump tests. On February 2, 1997, the valve failed again to meet its ASME stroke time acceptance criteria. After the second failure the licensee took adequate long term corrective actions by rebuilding the valve during the refueling outage that began less than a month after the second test failure.

c. Conclusions

The licensee had identified a number of performance-related problems associated with the AFW system and, based on the inspection results, was in general, taking adequate corrective action. However, there were other matters associated with the AFW system that had not been identified by the licensee or the licensee's disposition was weak

A non-cited violation was identified concerning inadequate DCN impact reviews relative to the installation of air cylinders for operation of the turbine driven AFW level control valves during station blackout conditions.

07.5 Management Review Committee (MRC)

a. Inspection Scope (IP 40500)

Licensee managers conduct a daily meeting to review problem evaluation reports (PERs). The inspectors observed the activities of the licensee's MRC during two daily meetings.

b. Observations and Findings

The meetings observed by the inspectors were divided into two parts. During the first part of the meeting, the managers reviewed root cause analysis results and corrective actions for completed or nearly completed PERs. The second part of the meeting was a review of new PERs.

The review of completed, or nearly completed, PERs was done by having the assigned staff member from the "responsible organization" make an oral presentation to the MRC. (These presentations are required for all level A and B PERs, and the MRC also requests presentations on selected level C PERs.) The presentation to the MRC typically included a discussion of the root cause analysis and corrective actions. The members of the MRC actively questioned the speakers and discussed the presentations among the committee. In a number of the cases, the speakers were assigned additional actions to include in the corrective actions. For the most part, the assignments were to ensure that the corrective actions were not too narrowly focussed.

New PERs are required to be presented to the MRC within three days of initiation. The new PERs were presented to the MRC by the manager of

the initiating organization. The MRC discusses the recommended level of the PERs and assigns a "responsible organization" for level A and B PERs.

During the two meetings attended by the inspectors, it was noted that all PERs presented to the MRC were actively discussed by most members of the MRC. The result of these discussions included closing of PERs which were determined not to be non-PER conditions, changing of assigned level of PERs, and assigning special review responsibility when the MRC noted similarities between several PERs.

c. Conclusions

Licensee management, including the site Vice President, were taking an active part in reviewing site problems, from identification through determination of root cause(s) and corrective action(s).

II. Maintenance

M1 Conduct of Maintenance (61726)

M1.1 Emergency Diesel Generator (EDG) Testing

a. Inspection Scope

The inspectors observed portions of the following work activities and/or surveillances:

- 2-SI-OPS-082-007.B Electrical Power System Diesel Generator 2B-B
- SI-102 M/M Diesel Generator Monthly Mechanical Inspections
- MMI-4.2.3 Monthly Preventive Maintenance of Diesel Generator

b. Observations and Findings

The inspectors noted that the work activities and the performance of surveillance activities were adequately performed. During observation of the above activities the inspectors noted that a large portion of the air flow from the HVAC System fans was directed toward the generator such that it was difficult to verify adequate application of space heating for the generator. The HVAC fans are designed to automatically operate any time outside temperature is above 85 degrees whether or not the EDG is operating. Because space heating is important for control of moisture buildups in electrical equipment, the inspectors questioned the adequacy of this design.

The inspectors were informed that this was an outstanding issue which had received significant attention by the licensee. The inspectors

determined that the licensee had routinely performed resistance testing of the generator windings including trending of the polarity index. The inspectors were further informed that the values taken during routine polarity index measurements were acceptable with some undesirable decreases during the humid summer months. Since this indicator provides an acceptable method of monitoring for grounding and degradation of winding resistance, the inspectors concluded that this issue was being adequately addressed by the licensee. Additionally, the inspectors determined that the licensee was evaluating the possibility of changing the HVAC fan logic to start only when the EDG starts.

c. Conclusions

Work activities and the performance of surveillance activities were adequately performed. The licensee method for monitoring for degradation of the generator winding resistance was acceptable.

III. Engineering

E4 Engineering Staff Knowledge and Performance

E4.1 System Engineers

a. Inspection Scope (IP 40500)

During the inspection, the inspectors conferred with the system engineers for the selected systems, to evaluate their knowledge of the assigned systems. The licensee procedure for these engineering activities is SSP-8.50, "Conduct of Systems Engineering" Revision 11.

b. Observations and Findings

The inspectors found that the systems engineers for the selected systems were knowledgeable about their systems. For the most part, they provided excellent assistance during walkdown inspections.

During the review of the EDG system, the inspectors learned that the assigned system engineer had been assigned to the EDG system early in fiscal year 1997. In an interview with this system engineer and his supervisor, the inspectors learned that he had apparently been assigned to System 82, (EDGs) and System 18, (EDG Fuel Oil) because he had done an excellent job with System 57, (Main Generator) and System 35, (Main Generator Auxiliaries) when those systems were perceived to have serious problems.

Further discussion with the system engineer and his management revealed that when he had been assigned to Systems 18 and 82, because of perceived problems with those systems, he had not been relieved of his previous assignments. These system assignments not only included Systems 35 and 57, discussed above, but also included System 302 (Penetrations), System 361 (Cables), System 362 (Conduits & Raceways)

and System 363 (described to the inspectors as Miscellaneous Electrical).

While the interviews and other interface activities showed that the system engineer was extremely knowledgeable about the EDG and EDG fuel oil systems, they also showed that because of his assigned workload he was not able to keep up-to-date, detailed system notebooks, as described in SSP-8.50.

In defense of the assigned workload, the inspectors were informed that, for the most part, Systems 302, 361, 362, and 363 were considered to be passive systems which did not require much attention, and Systems 35 and 57 were running smoothly because of past efforts and also did not require much of the engineers time. The inspectors could not fully agree with this assessment because of the numerous requirements that impact these systems, such as fire protection, environmental qualifications, and maintenance and containment rule requirements.

c. Conclusions

The licensee has done a good job of selecting motivated, knowledgeable system engineers, but appeared to have done a relatively poor job in the area of workload evaluation. The system engineer for the EDG systems appeared to be overloaded.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on August 8, 1997. The licensee acknowledged the findings presented.

On August 19, 1997, the inspectors conducted a telecon re-exit to discuss the decision to consider the inadequate DCN impact reviews, discussed in paragraph 07.4, to be a non-cited violation.

PARTIAL LIST OF PERSONS CONTACTEDLicensee

*R. Alsup, Quality Assessment Supervisor (Operations)
 *M. Bajestani, Site Vice President
 *J. Bajraszewski, Site Licensing
 *C. Burton, Engineering & Support Manager
 *M. Fecht, Nuclear Assurance (NA) & Licensing Manager
 *E. Freeman, Maintenance and Modifications Manager
 *J. Herron, Plant Manager
 *M. Lorek, System Engineering Manager
 *R. Norton, NA Quality Assessment Supervisor
 *J. Patrick, Maintenance/Methods Group Manager
 *P. Salas, Licensing and Industrial Affairs Manager
 *J. Summy, Assistant Plant Manager
 *J. Valente, Engineer and Materials Manager

NRC

*P. Fredrickson, Maintenance Inspection Branch Chief, RII
 *J. Johnson, Reactor Projects Division Director, RII
 *D. Seymour, Resident Inspector
 *D. Starkey, Resident Inspector

* Attended exit interview

INSPECTION PROCEDURES USED

IP 40500: Effectiveness of Licensee Controls In Identifying, Resolving, &
 Preventing Problems
 IP 61726: Surveillance Observations

ITEMS OPENED, CLOSED, AND DISCUSSEDOpened

<u>Type</u>	<u>Item Number</u>	<u>Status</u>	<u>Description and Reference</u>
NCV	50-327,328/97-09-01	Opened/Closed	Inadequate DCN Impact Reviews (Section 07.4).

PERs GENERATED FROM THE LICENSEE'S ASSESSMENT

- SQ9716 PER Identified a problem with tags identified in the field that were not entered or appropriately marked in the field.
Level C Walkdown identified
- SQ971743PER Deficiencies in the EDG air start systems (relief valve setpoints above acceptable limits/values) Problems were originally identified as a violation in NRC inspection report 96-11 and addressed by SQ962742PER and SQ962775PER. These PERs were closed referencing Work Requests that were subsequently canceled or misplaced.
Level B Identified in Site Quality Assessment NA-SQ-97-52
- SQ971746PER Addresses documentation problems related to SQ940805PER concerning a problem with vital inverter AC molded case circuit breakers and switches.
Level C Review of documents
- SQ971747PER Addresses repeat problems with nuisance rectifier alarms that have not been resolved with previous corrective action.
Level C Review of documents
- SQ971748PER Was initiated to investigate the vital battery room ambient temperature of 86° F. Vendor recommended exposure is 82° F.
Level C Walkdown identified
- SQ971751PER A review of Work Request indicated a potential trend associated with EDG instrumentation.
Level C Review of documents
- SQ971752PER Brush marks appearing on EDG slip rings. Previously identified on SQ951924PER.
Level C Ineffective CA Review of documents
- SQ971753PER Initiated to document ineffective corrective action to previous concern about excessive running of EDGs without loads. (ref. SQ951911PER)
Level C Review of documents

PERs GENERATED FROM THE LICENSEE'S ASSESSMENT

(continued)

- SQ971761PER Documentation of a problem with procedure fuel pressure parameter too low in operations test procedures. Problem identified during system reviews and procedures corrected.
Level C Review of documents
- SQ971764PER Initiated to resolve low oil level problem on U1 TDAFW pump.
Level B Walkdown identified
- SQ971770PER Level control valves 1-LCV-3-172 & 174 were in contact and rubbing against each other.
Level B Identified in Site Quality Assessment NA-SQ-97-52
- SQ971780PER Documentation that 2BB EDG day tank pump vibration was in the alert range.
Level C Review of documents
- SQ971781PER Documents the use of a "pink tag" to identify temporary alterations to the spare EDG battery charger.
Level C Walkdown identified
- SQ971782PER Documents the use of plastic signs on the "480 boards" that do not meet the requirements of SSP 12.1.
Level C Walkdown identified
- SQ971783PER Identified a scaffold that was not secured, in the area of the 1-AA MAFW pump.
Level B Identified in Site Quality Assessment NA-SQ-97-52
- SQ971784PER Written to evaluate the calibration and material traceability of an instrument with an M&TE sticker dated 1/3/94.
Level C Walkdown identified
- SQ971788PER Corrective action for SQ961653PER did not address the concern that the hand switch's position for 2A EDG Room Exhaust Fan was difficult to determine due to its position and lighting.
Level C Repeat Review of documents

PERs GENERATED FROM THE LICENSEE'S ASSESSMENT
(continued)

SQ971819PER EDG 2-A2 day tank below minimum level. SQ970349PER appendix "E" was marked yes on reportability and operability; however, system engineer stated that problem was not reportable. Also corrective action was to change limit switches per a TDCN, but no action to implement the TDCN was mentioned.

Level B Identified in Site Quality Assessment NA-SQ-97-52