U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Facility:	Dresden Nuclear Station Units 2 and 3
Location:	6500 North Dresden Road Morris, IL 60450
Dates:	June 25 through August 12, 1999
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EXECUTIVE SUMMARY

Dresden Nuclear Station Units 2 and 3
NRC Inspection Report 50-237/99012(DRP); 50-249/99012(DRP)

This inspection included routine resident inspection from June 25, 1999, through August 12, 1999.

Operations

- The overall condition of the high pressure coolant injection system and the isolation condenser system on both units appeared acceptable. The status of the systems was correct for the mode of operation. (Section 02.1)

- Divergence between the local sight glass and the remote control room indications for torus level caused operators to enter and execute the Dresden Emergency Operating Procedures. (Section O2.2)

- Failure of Unit 3's isolation condenser reactor return valve (3-1301-4) to open during valve cycling caused the isolation condenser to become inoperable. The inspectors concluded that the operators performed well during the performance of the single loop operation. (Section O2.3)

  Radwaste operators demonstrated a heightened level of awareness by identifying increased unknown inputs into the floor drain collector tank. A leak in the containment cooling service water piping was subsequently located. The licensee responded well by planning and executing a replacement of the leaking pipe within the time allowed by Technical Specifications. (Section O2.4)

- The performance in operations was acceptable. Good monitoring, briefs, and communications were evident throughout the period. The licensee identified some minor issues regarding activation of the shift technical advisor and use of short duration time clocks during surveillance testing. (Section O4.1)

Maintenance

- Due to the degraded condition of the 2A feedwater regulating valve actuator, the valve was oscillating up to 12 percent. The licensee carefully planned and executed the on-line repair of this actuator. (Section M2.1)

- A non-cited violation was identified which was due to maintenance personnel not properly verifying that the motor pinion gear key for the isolation condenser return valve motor actuator was staked in place. The isolation condenser reactor return valve failed and caused the isolation condenser to be inoperable. This resulted in the licensee having to enter single recirc loop operation and perform a drywell entry to repair the valve. (Section M2.2)

- The material condition of the reactor water cleanup system hampered smooth reactor operations. Also, failures of the suction and discharge valves caused the auxiliary reactor water cleanup pump to be isolated. This issue caused a delay in the licensee's

attempt to enter single loop operation; therefore, increasing the time in which the isolation condenser was unavailable. (Section M2.3)

- Maintenance department personnel performed well during the performance of both routine and emergent tasks. The Outage Control Center personnel performed in a well organized and deliberate fashion. This resulted in the licensee successfully responding to challenges such as the unplanned Technical Specification required limiting conditions for operation for the isolation condenser and containment cooling service water. (Section M4.1)

Engineering

- Inspectors were concerned with the recent high frequency of failures experienced by the station black out diesels during surveillance tests. The licensee's investigation showed that a lack of software controls caused another licensee's backup software to be used to reconstitute Dresden's station blackout diesel control logic during a Y2K upgrade. Additionally, inadequate design of the diesel's ventilation system and an inadequate review of the vendor's recommendation for control power cooling caused the operators to trip the station blackout diesel during surveillance tests.

Plant Support

- Overall, the licensee's radiation protection staff enforced the plant's radiological control standards. The inspectors observed "As-Low-As-Reasonably-Achievable" briefings being held before workers entered areas where the dose was elevated. The inspectors also observed radiation protection staff in the field directing other radiation workers to low dose areas. (Section R1.1)

Report Details

Summary of Plant Status

Unit 2 started the period at full power. On July 10, 1999, power was reduced to 670 MWe to support repairs on the 2A feedwater regulating valve air actuator. The unit was returned to full power by July 11, 1999.

Unit 3 started the period at full power. On July 17, 1999, unit load was dropped to 125 MWe to repair the isolation condenser inboard isolation valve.

For both units, from July 22 to early August 3, 1999, load was significantly curtailed (as low as 360 MWe on Unit 2 and 400 MWe on Unit 3) to maintain the river discharge temperature below 93°F. Local air temperatures were nearly 100°F, and the warm weather caused unusually warm river water in the plant intake bay.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

Using Inspection Procedure 71707, the inspectors conducted frequent reviews of ongoing plant operations. In general, the conduct of operations was professional and safety-conscious; specific events and noteworthy observations are detailed in the sections below.

During the inspection period, three events occurred that required prompt notification of the NRC per 10 CFR 50.72 or licensee event reports (LERs) per 10 CFR 50.73. The events are listed below.

July 10, 1999 Accident Mitigation. Unit 3 Isolation Condenser failed due to isolation condenser reactor return (3-1301-4) valve failing to open during surveillance test.

July 24, 1999 Offsite notification. Illinois Environmental Protection Agency was notified that a lightning strike caused a loss of cooling lake lift station and resulted in unanticipated lake-bypass.

July 30, 1999 Offsite notification. Illinois Environmental Protection Agency notified that station cooling water effluent exceeded river discharge temperature limits.

O2 Operational Status of Facilities and Equipment

O2.1 Routine System Walkdown

a. Inspection Scope (71707)

The inspectors reviewed the status and availability of selected equipment through panel monitoring, system walkdowns, and review of logs.

b. Observations and Findings

The inspectors reviewed the high pressure coolant injection system and the isolation condenser system on both units. The inspectors noted no plant activities that adversely affected the operability of these safety-related systems. The inspectors also noted that the licensee had properly identified degraded components, such as leaking valves, with action request tags. The general material and safety condition of both systems was acceptable.

As part of the evaluation of the operability of the high pressure coolant injection systems, the inspectors monitored a Unit 2 high pressure coolant injection system surveillance test, and noted that the system showed no water or steam leaks while operating.

For the isolation condenser systems, the inspectors verified that accessible valves in the main system flow path were in their correct positions. Power supplies and breakers were correctly aligned, functional, and available for components that must activate on receipt of an initiation signal. Major system components appeared correctly lubricated, cooled, ventilated, and free of leakage, and able to ensure fulfillment of their functional requirements. However, as discussed in Section M2.2, the Unit 3 isolation condenser failed during this period due to failure of a valve in the drywell.

The inspectors noted one problem with a leaking room cooler. The licensee was aware that the cooler leaked, and had staged catch basins under it; however, the basins were inadequate. The licensee informed the inspectors that repairs would not be made to the room cooler until the outage. Subsequently, the inspectors noted that Problem Identification Form (PIF) # D1999-02699 documented that the Unit 2 west corner room cooler was leaking and spraying over main steam line instrumentation. The PIF went on to state that water was inside a main steam line differential pressure sensor. This differential pressure sensor was found out of tolerance by maintenance staff. Through interviews with the licensee, the inspectors concluded that due to the small amount of water found, and the location of water in the differential pressure sensor (collected at the bottom), the out-of-tolerance condition was not due to the water. A short time later, the catch basins were adjusted to properly retain any leakage.

c. Conclusions

The overall condition of the high pressure coolant injection systems and the isolation condenser system on both units appeared acceptable. The status of the systems was correct for the mode of operation.

O2.2 Unit 2 Torus Level Indication

a. Inspection Scope (71707)

On July 1, 1999, a non-licensed operator performing a surveillance test identified that the Unit 2 torus water level indication was outside of the required band. The inspectors assessed the licensee's investigation into the issue.

b. Observations and Findings

On July 1, 1999, a non-licensed operator identified that the local torus level sight glass indicated torus level to be -1.375". The control room indication, which is Technical Specification (TS) required torus level indication, showed a torus level of -2.6". Dresden TS 3.6.K.1, Action 1, required that the reactor be shutdown within 1 hour if torus level was greater than -1.5". After discussing the discrepancies between the local sight glass indication and the control room indication, the operators decided to entered the TS limiting condition of operation (LCO). Immediately after entering the TS, the operators pumped down the torus to the condenser hotwell, thus exiting the TS. The operators used Dresden Emergency Operating Procedure (DEOP) 0200-01 to accomplish this activity.

Instrument maintenance staff subsequently found that the sight glass level markings were shifted down by 0.5", thus giving false high readings. The inspectors reviewed the logs and noted that the local sight glass was found to be 0.2" higher than the control room indication on May 28, June 2, and again on June 3. On June 19, 1999, the logs recorded that local torus water level and control room indication were the same.

On August 5, 1999, the control room and local indications were again found to be divergent. The control room showed -2.5", while the local sight glass showed -0.9". This divergence was greater than any previously recorded. The unit supervisor's logs for August 5, recorded that the local torus sight glass was mounted 0.5" lower than indicated on the prints, and the procedures needed revision.

At the end of the inspection period, the licensee was still investigating why the non-TS sight glass was diverging from the control room indication. The licensee was also considering adding the sight glass to the calibration program.

Station senior management correctly noted that the operators had entered the emergency operating procedures based on an indicator that was not in the station calibration program and that was not required by TSs (see Section O4.1 for more on this issue).

c. Conclusions

Divergence between the local sight glass and the remote control room indications for torus level caused operators to enter and execute the DEOP.

O2.3 Isolation Condenser

a. Inspection Scope (71707)

The inspectors monitored the licensee's response to the failure of the Unit 3 isolation condenser reactor return valve.

b. Observations and Findings

On July 10, 1999, during quarterly valve time testing, the isolation condenser reactor return valve (3-1304-4) failed to open. This valve has to be open for the isolation condenser to perform its safety-related function. In accordance with Dresden TS 3.5.D,

the operators entered a 14-day LCO based on having the isolation condenser inoperable. No other emergency core cooling system equipment was inoperable. Following the discovery of this issue, the licensee commenced planning for repairs and discussing various possible methods of failure.

The plans for troubleshooting and repairing the valve included a load reduction to operate the unit with a single loop of reactor recirculation and an entry into the drywell to get to the inoperable valve. The single loop operation was performed to reduce radiation exposure to maintenance personnel while working in the drywell on this valve. On July 17, 1997, both actions were completed. See Section M2.1 for details of the maintenance staff's findings and repair effort.

The inspectors noted that the operators' response to this issue was good. The appropriate TS entries were made and the appropriate support organizations were actuated. The inspectors also noted that the single loop operation evolution was well controlled.

c. Conclusion

Failure of Unit 3's isolation condenser reactor return valve (3-1301-4) to open during valve cycling caused the isolation condenser to become inoperable. The inspectors concluded that the operators performed well during the performance of the single loop operation.

O2.4 Containment Cooling Service Water Supply Line Leakage

a. Inspection Scope (71707)

The inspectors assessed the licensee response to leakage on the Unit 2 containment cooling service water supply line to the 2A low pressure coolant injection heat exchanger.

b. Observations and Findings

On August 5, 1999, while performing panel walkdowns in the radwaste control room, radwaste operators noted abnormal inputs into the floor drain collector tank. The operators also noted that the 2B and 2D floor drain pumps were operating continuously. The licensee discovered that the containment cooling service water supply line from the 2A and 2B containment cooling service water pump to the 2A low pressure coolant injection system heat exchanger had developed a severe leak. The leak was found at a wall penetration between the reactor building equipment drain tank room and the torus basement area. A total of approximately 14,000 gallons of water leaked from the piping at close to 15-16 gallons per minute. The line was 16-inch diameter schedule 30 (3/8-inch nominal) A106 Grade B piping.

Following the discovery, the licensee declared Division 1 of containment cooling service water inoperable and entered Dresden TS 3.8.A, Action 1.c., which stated "with one containment cooling service water subsystem otherwise inoperable, restore the inoperable subsystem to OPERABLE status with at least one OPERABLE pump within 72 hours or be in at least HOT SHUTDOWN within the next 12 hours and in Cold Shutdown within the following 24 hours."

Following the licensee identification of the leakage, the licensee staffed the outage control center with an event response team. The response team members promptly developed a game plan that included mobilizing metallurgy experts to perform in-place pipe diagnostic activities, organizing the service groups to build scaffolding and procure needed material for pipe replacement, and engaging radiation protection staff members in the work planning process due to the radiation level concerns in the reactor building equipment drain tank room. This was particularly notable because at the time of the event, most of the station's senior management personnel were offsite, yet these activities were executed effectively without impacting other ongoing activities on either unit.

The licensee removed an 8-foot long section of the piping. This cutaway section of piping included a 90-degree elbow along with an approximate 6-foot run of horizontal piping. A through wall hole was observed on the horizontal section of the pipe removed from the wall. This horizontal section was downstream of the 90-degree elbow. The hole was at approximately the 6 o'clock position. The size of the elliptical hole was 7/16 inch in the circumferential direction and 1/4 inch in the longitudal direction.

The licensee then did a visual inspection of the inside of the open pipe ends. This visual inspection revealed tubercles in the pipe. Tubercles are small knob-like protrusions that developed in the piping due to a build up of corrosive products on the inner surface. Preliminarily, the licensee concluded that the tubercles developed due to under-deposit corrosion and not to microscopic corrosion. The supply source for this system was, until 2 years ago, untreated service water drawn from the circulating water bays. The tubercles were between the 3 o'clock and the 8 o'clock position on the horizontal section of the pipe and were uniformly distributed on the vertical end of the piping coming off the elbow. Most of the tubercles were in the horizontal section of the piping.

Measurements taken by the licensee showed that the nominal heights of the tubercles were 1.5-2 inches high and 2-2.5 inches in width. The cut surface of the pipe cross section did not show any evidence of localized penetration; also there was no evidence of wall thinning. To confirm this, the licensee measured the pipe wall thickness with an ultrasonic digital thickness gauge. The measurements showed that the thinnest areas on the horizontal pipe left in-place were 0.357 inches and 0.350 inches on the vertical section of the pipe (nominal 0.375 inches).

Towards the end of the inspection period, the licensee was in the process of sending the 8-foot section of piping offsite to have an examination performed on it to determine an exact cause of the failure. The licensee developed an action item to use the results of this examination to determine if there are possible ways to improve the erosion/corrosion program. This type of under-deposit pitting phenomena was difficult to detect using the ultrasonic measurement and examination techniques used at the site presently, since the wall thickness was well within its design specification.

The inspectors were concerned about this event because the failure was potentially a common mode type failure. Several other service water supply systems take suction from this water supply. According to licensee records, the three other suction lines for the containment cooling service water are the same vintage piping for both Unit 2 and Unit 3. The licensee indicated that operator in-plant monitoring frequency of these piping systems would be increased until corrective actions could be developed. Also, the engineering staff developed calculations showing that the leakage flow rate due to

this failure was well below the overall flow rates in the containment cooling service water system.

In 1997, the licensee began a program to treat the water in the circulating water bay. The program included adding chemical inhibitors to the bay to combat and disperse silt, corrosion products and biological matter.

c. Conclusion

Radwaste operators demonstrated a heightened level of awareness by identifying increased unknown inputs into floor drain collector tank. A leak in the containment cooling service water piping was subsequently located. The licensee responded well by planning and executing a replacement of the leaking pipe within the time allowed by TS.

O4 Operator Knowledge and Performance

O4.1 Routine Operations

a. Inspection Scope (71707)

The inspectors evaluated the performance of the operators. The evaluations were based on routine monitoring of control room performance, accompanying non-licensed operators during in-plant activities, and monitoring of self-assessments and assessments by Nuclear Oversight.

b. Observations and Findings

The performance of the operators was acceptable. The inspectors noted good panel monitoring, log keeping, and awareness of plant status. The shift turnover meetings were informative and thorough.

The inspectors identified no problems during routine operations and surveillance tests. Field performance during surveillance tests, such as the high pressure coolant injection system test, was adequate. The inspectors verified correct performance of removal of "Out of Service" cards.

During this inspection period, there were several events and situations that required a significant response by operators. The repair of the failed Unit 3 isolation condenser required operators to drop power and secure a recirculation pump. The hot summer temperatures required operations staff to perform many power increases and decreases. The operators' performance in response to various challenges was acceptable.

Nuclear Oversight staff identified that the operators failed to follow all requirements during entry into the DEOP due to high indicated torus water level. The faulted torus sight glass, discussed in Section O2.1 of this report, caused operations staff to enter and execute the DEOP. This revealed two issues related to operator performance. First, the operators executed the DEOP based on the data from the sight glass, but the sight glass was not a calibrated instrument. Station management correctly was concerned about running the plant based on indications from instruments not normally used. The inspectors noted, however, that the operators' logs had recorded that the

sight glass had matched the control room indication just about 2 weeks before the event, thus giving operators some level of confidence that the sight glass was showing the true level of the torus (although, in retrospect, the sight glass was not showing the true level). Second, Nuclear Oversight personnel identified that the operating crew chose not to activate the shift technical advisor position. Staff from the Nuclear Oversight group identified that the choice was incorrect. Procedure CWPI-NSP-OP-1-13 required that the individual designated as the shift technical advisor shall assume that role during entry into any emergency operating procedure. The Nuclear Oversight personnel documented this in PIF D1999-02655. The operators were unaware of the requirement, and had erroneously believed that activation of the shift technical advisor was optional, based on the complexity of the event. The operating crew had discussed activating the shift technical advisor, but chose not to because of the relative simplicity of pumping down the torus in response to the high torus water level.

The inspectors noted that the operating crew correctly activated the shift technical advisor during a subsequent entry into the emergency operating procedures based on high area radiation levels during a fuel pool cleanup system resin transfer.

The inspection period was mostly free from problems related to the use of the TS. On July 20, 1999, operators self-identified the incorrect use of "Short Duration Time Clocks" during surveillance tests for the scram discharge volume high level rod block. This issue was documented in PIF D1999-02851.

The "Short Duration Time Clock" is a Dresden administrative process that helps operators track when TS required instrumentation is being tested. It allows individual inputs into a trip channel to be tested without placing the channel in a tripped condition for up to 2 hours.

Dresden TS 3.2.E covering rod blocks, Action 2, states that with the number of channels less than required, take the action required by Table 3.2.E-1. Table 3.2.E-1 directs the operators to trip the associated channel within 1 hour. There is only one input per channel for scram discharge volume high rod block circuitry. Therefore, when that input is being tested the channel is inoperable, and the channel should be tripped within 1 hour. An alert reactor operator, who had recently been trained on the short duration time clocks, questioned the use of the process for the scram discharge volume rod block. The licensee followed up and found the operator to be correct, and the procedure that listed the surveillances covered by short time clocks to be incorrect. However, a subsequent review by the licensee showed that all of the surveillances performed since the implementation of the short duration time clocks process had been completed within about 40 minutes. Therefore, the licensee had remained in compliance with the TS.

c. Conclusions

The performance in operations was acceptable. Good monitoring, briefs, and communications were evident throughout the period. The licensee identified some minor issues regarding activation of the shift technical advisor and use of short duration time clocks during surveillance testing.

O8 Miscellaneous Operations Issues (92700)

O8.1 (Closed) Inspection Followup Item 50-237/97012-01: Not Entering TS 3.0.C During High Pressure Coolant Injection Planned Maintenance. On June 19, 1997, during the startup of Unit 3 from a refueling outage, the operators performed high pressure coolant injection surveillance testing in accordance with Dresden TS 4.5.A.2.c. Dresden TS 4.5.A.2.c, required that the licensee perform a surveillance to verify appropriate high pressure coolant injection system flow within 12 hours of reaching a steam pressure of 920 psig. The licensee reached 920 psig reactor pressure and entered the 12-hour LCO to complete high pressure coolant injection testing. The licensee was unable to complete the surveillance test successfully due to leaking isolation valves for the high pressure coolant injection room sump. The licensee declared the high pressure coolant injection system inoperable and went from a 12-hour LCO to a 14-day high pressure coolant injection LCO. The licensee then continued with power ascension and testing activities.

In Inspection Report 97012, the inspectors expressed concern with the licensee's approach since the licensee had modified the feedwater system during the refueling outage and it was untested at the time the high pressure coolant injection system was technically inoperable. The licensee's justification for continued power ascension was that the TS only required for the system to be tested within 12 hours and there was no stipulation for high pressure coolant injection passing the surveillance test other than entering the limiting operating condition stated in 4.5.A. Condition 4.5.A stated that in operation Mode 1, with high pressure coolant injection inoperable, restore high pressure coolant injection to operable status within 14 days or be in hot shutdown within 12 hours. Which, as stated above, the licensee did. Eventually, operators successfully completed the high pressure coolant injection system surveillance and subsequently declared the system operable on June 21, 1997.

Following discussion with other NRC representatives and the licensee, the inspectors have concluded that the licensee's interpretation of the TS was valid. This issue is closed.

O8.2 (Closed) LER 50-249/97002-00: Licensed Operators Fail to Perform TS LCO Required Surveillance Due to Programmatic Failure in Task Methodology and Human Error.

The LER reported that on March 23, 1997, during a review of previous shifts' log book entries, an operator recognized that surveillance tests required by Action Statement 2.a. of Dresden TS 3.9.A., had not been performed within the required intervals. Action Statement 2.a. stated that with one of the required diesel generators not operable, a demonstration to show that the offsite power sources were operable was to be complete within 1 hour after the diesel was declared inoperable and every 8 hours thereafter. Contrary to this, the licensee failed to perform the required tests. This Severity Level IV violation is being treated as a **Non-Cited Violation (NCV 50-249/99011-01(DRP))**, consistent with Appendix C of the NRC Enforcement Policy.

This issue is in the licensee's corrective action program as LER 50-249/97002. Additionally, the inspectors verified that the corrective actions for this issue were in place. The inspectors also reviewed control room operator log entries for subsequent diesel generator outages and found that the operators had appropriately performed the TS required surveillance test.

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments

The inspectors monitored routine maintenance activities, observed meetings between maintenance and operating personnel, and reviewed the results of maintenance performed during this inspection period. The maintenance activities directly observed by the NRC were performed correctly. The workers practiced good communication and good radiation worker practices.

The inspectors also noted that several emergent maintenance issues arose during this inspection period. Despite the number of issues, the maintenance organization's overall response to these issues was good. When activated, the Outage Control Center was well organized and did a good job of controlling the activities for each evolution.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Unit 2 Feedwater Regulating Valve

a. Inspection Scope (62707)

The inspectors evaluated the licensee's response to an oscillating feedwater regulating valve.

b. Observation and Findings

On June 22, 1999, the operators noted that the 2A feedwater regulating valve was oscillating. The feedwater regulating valve position indication meter in the control room showed that the valve oscillated up to twelve percent. The operators immediately reduced feedwater to control the effects of the flow oscillations on the reactor.

During follow-up investigation of this issue, operators identified air leaking from the lower end of the valve's actuator at the stem entry. Following this identification, the licensee did a failure analysis for the actuator that determined the sealing O-ring had worn and degraded due to a lack of lubrication on the stem. This analysis also showed that failure of the valve would occur gradually, not catastrophically, thus allowing continued operation of the plant, with increased monitoring of the system.

The licensee reported that in 1997, this same issue occurred with the upper end of the actuator. At that time the licensee replaced the actuator with a new one.

On July 4, 1999, the licensee reduced Unit 2 power and took the oscillating feedwater regulating valve out-of-service. The licensee then performed an online replacement of the feedwater regulating valve actuator. The inspectors noted that this work was carefully planned and executed.

c. Conclusion

Due to the degraded condition of the 2A feedwater regulating valve actuator, the valve was oscillating up to 12 percent. The licensee carefully planned and executed the on-line repair of this actuator.

M2.2 Isolation Condenser

a. Inspection Scope (62707)

The inspectors monitored the licensee's response to the failure of the Unit 3 Isolation Condenser. The inspectors also reviewed the LER regarding this issue.

b. Observations and Findings

As discussed in Section O2.4, during quarterly valve time testing, the isolation condenser reactor return valve failed to open. Following the failure, the licensee commenced planning for repairs and discussing various possible methods of failure.

After completing a failure analysis, the licensee made a drywell entry on July 17, 1999, to perform troubleshooting and repairs. The licensee removed the motor from the valve actuator to perform a visual inspection of the actuator's internals. During this visual inspection, the licensee identified that the motor pinion gear was loose on the motor shaft and the drive had fallen out of the keyway. The licensee replaced the drive key and reinstalled the motor pinion gear. Following the replacement of the motor pinion gear, the key and the pinion gear were staked to ensure that the key would not fall out again.

Following completion of this maintenance activity, operators restored the unit back to dual loop operation and proceeded to test the valve. The valve tested satisfactorily and operators declared the isolation condenser operable.

The licensee's investigation concluded that the root cause for the event was that the motor pinion gear was not properly staked following the previous maintenance performed on the valve. Maintenance records showed that the last maintenance done on the valve actuator was during the past refueling outage (D3R15) in February 1999. The valve had experienced over thrust conditions during diagnostic testing, and the licensee refurbished the actuator.

On August 8, 1999, the licensee submitted LER 50-249/99005-00, which described this incident, to the NRC. In this LER, the licensee stated that the root cause of the valve's failure to operate properly was that the work instructions contained in the outage work package were not completed properly.

The specific work package covered Task 2 of work request (WR) 990012898. Licensee staff showed the inspectors that the step which directed the worker to verify that the motor pinion gear was staked following valve refurbishment, was signed off as completed.

The licensee explained to the inspectors that the maintenance worker signed the step off as completed under the impression that the verification was already completed under

an earlier task. As evidence, the licensee showed the inspectors a copy of the actual procedure used for verifying the pinion gear was staked. The procedure contained a handwritten note initialed by the worker. The note read, in part, all gears were verified, but could not check motor pinion gear. The note continued stating, motor pinion gear verification will be completed in Task 1 of the same work request. After reviewing the work package in Task 1, the licensee could not find information stating that the motor pinion gear was verified staked. The assumption that the pinion gear had been verified staked earlier in the process was a mistake on the part of the maintenance worker.

Dresden TS 6.8.A stated that written procedures shall be established, implemented, and maintained covering the activities recommended in Appendix A of Regulatory Guide 1.33. Regulatory Guide 1.33 recommends that maintenance that can affect the performance of safety-related equipment should be properly preplanned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances. Contrary to the above, on February 17, 1997, maintenance workers failed to verify that the motor pinion gear of the isolation condenser reactor return valve (3-1301-4) was properly staked in accordance with Dresden Electrical Procedure (DEP) 40-09 "Limitorque Valve Operator Maintenance." This was a violation. This Severity Level IV violation is being treated as a **Non-Cited Violation (NCV 50-249/99012-02(DRP)),** consistent with Appendix C of the NRC Enforcement Policy.

The inspector's reviewed the corrective actions presented in the LER and concluded that they were adequate. These corrective actions included plans to review work packages for Limitorque SMB-3 Actuators that had been worked during D3R15 to see if any other similar problems associated with securing motor pinion gears existed. Based on the licensee's corrective actions **LER 50-249/99005-00** is closed.

c. Conclusion

Due to maintenance personnel not properly verifying that the motor pinion gear key was staked in place, the isolation condenser reactor return valve failed, which caused the isolation condenser to be inoperable. This resulted in the licensee having to enter single recirculation loop operation and perform a drywell entry to repair the valve.

M2.3 Unit 3 Reactor Water Clean Up

a. Inspection Scope (71707, 62707)

During this inspection period a number of issues related to the operational status of the reactor water cleanup system occurred. The inspectors monitored the performance of the Unit 3 reactor water clean-up system.

b. Observations and Findings

On July 11, 1999, operators placed the 3B service unit (demineralizer bed) in service and were in the process of taking the 3C demineralizer bed out-of-service as part of planned maintenance. The operators noticed that the reactor water sulfate concentrations had increased dramatically. This issue was the result of two process issues. The first process issue was that the 3B demineralizer bed was air fluffed prior to its return to service. Air fluffing is a process of creating small voids in the demineralizer

bed material to create a flow path through the resin media. This may have caused impurities, which were mixed throughout the bed, to be transferred to the reactor. The second was that the demineralizer bed was back washed on-line to lower the differential pressure across the bed. The licensee's corrective actions for both of these were to not air fluff or backwash the demineralizer bed online.

Also, during this inspection period the reactor water clean-up auxiliary pump suction and discharge valves (3-1201-3 and 4) failed and were declared inoperable. This resulted in the reactor water cleanup system being isolated. One of these failures occurred just before planned single loop operation to repair the isolation condenser reactor return valve. This delayed the single loop evolution because operators conservatively wanted to have the auxiliary pump available for use in case the reactor had to be shutdown.

With this pump inoperable the operators would not be able to use the reactor water cleanup system for level control at very low power operations. The reactor water cleanup system provides the normal means of draining the vessel. The flow is directed through a drain flow regulator to one of two places, the main condenser hotwell or to the radioactive waste system.

c. Conclusions

The material condition of the reactor water cleanup system hampered smooth reactor operations. Also, failures of the suction and discharge valves caused the auxiliary reactor water cleanup pump to be isolated. At one time, this issue caused a delay in the licensee's attempt to enter single loop operation, therefore, increasing the time in which the isolation condenser was unavailable.

M4 Maintenance Staff Knowledge and Performance

M4.1 Maintenance Staff Performance

a. Inspection Scope (62707)

The inspectors assessed maintenance staff performance through direct observation and through monitoring the effectiveness of maintenance performed during both routine and non-routine activities.

b. Observations and Findings

During observations of maintenance performance in the field, the inspectors noted that workers were all knowledgeable of their work. The inspectors noted that the workers had the correct work materials with them and properly followed the procedures. The inspectors also noted good communications and coordination between maintenance and operations personnel during more involved maintenance activities. In all cases observed, the maintenance staff kept the plant clean and exercised proper controls to prevent the spread of contamination.

During emergent work, such as the isolation condenser valve maintenance and containment cooling service water line leak, maintenance personnel responded well. The planning and execution for the repair of these issues was done through the licensee's outage control center.

During these events the outage control personnel demonstrated good control by engaging the appropriate resources and ensuring that the right people were assigned to the right tasks.

c. Conclusions

Maintenance department personnel performed well during the performance of both routine and emergent tasks. The Outage Control Center personnel performed in a well organized and deliberate fashion. This resulted in the licensee successfully responding to challenges such as the unplanned TS required LCO for the isolation condenser and containment cooling service water.

M8 Miscellaneous Maintenance Issues (92902)

M8.1 (Closed) LER 237/97009-00: Source Range Monitor Surveillance Performed at Incorrect Frequency Due to Human Error During TS Upgrade Project. This LER documented the discovery on April 16, 1997, that the source range monitors were not calibrated within the frequency required by the Unit 2 TSs. On April 16, 1997, while performing a TS review for the 24-month fuel cycle project, the licensee noted a discrepancy between the Source Range Monitoring System surveillance frequency and the TS requirement. It was determined, that as a result of having the incorrect frequency within the computerized tracking network (Predefines), the Unit 2 TS surveillance frequency, as listed in Table 4.2.f-1, had been exceeded by 39 days. The cause for the noncompliance was personnel performance errors within the surveillance frequency change approval process which had occurred when the surveillance frequency of DIS 0700-10, source range monitor rod block calibration was amended from quarterly to once every 18 months. As a result of this discovery, the station decided to revisit this issue during the TS Upgrade Program implementation to assure that the proper surveillance frequencies have been created to meet TS requirements, and to assure that the involved individuals understand their responsibilities during task performance. The safety significance of this event is considered minimal. This event was reported per 10 CFR 50.73(a)(2)(i)(B), as an operation prohibited by TSs.

The source range monitor had to be calibrated to an 18-month frequency for normal operation and control rod block requirements, but needed a more frequent quarterly calibration to satisfy the requirements of accident monitoring. The person who made the change overlooked the more-stringent requirement. Also, the same person signed for two separate roles in the review process. Although this was procedurally permitted, it removed a barrier from the review process. During review of other changed surveillance tests, the licensee found additional examples of the same people signing for multiple reviewers. The remaining workers who reviewed and approved the change in frequency did not realize the conflict with the accident monitoring specification.

The licensee performed the surveillance test following the discovery that it was overdue. The source range monitors were responding correctly and did not need adjustment. The safety significance of this event was low.

Corrective actions included the aforementioned calibration, counseling of the individuals involved, and a change in how frequency changes were processed that forced multiple reviewers.

Technical Specification Table 4.2.F-1, required a quarterly surveillance frequency for the source range monitors. Contrary to the above, on April 16, 1997, the licensee exceeded the requirement by 39 days. This Severity Level IV violation is being treated as a **Non-Cited Violation (NCV 50-237/99012-03(DRP))**, consistent with Appendix C of the NRC Enforcement Policy. This violation is in the licensee's corrective action program as LER 50-237/97009-00.

M8.2 (Closed) LER 50-249/96014-00: Electromatic Relief Valves 3-0203-3B and D Pressure Switches Found out of Tolerance Due to Setpoint Drift. This LER documented the discovery on October 18, 1996, that two valves' pressure switches were out of tolerance. The switches had drifted below the +/- 1 percent tolerances specified in the TSs. The drift was minor. The licensee attributed the drift to an unusually long period between calibrations; the calibration was done at refueling, and the refueling outage had been extended. Corrective actions included implementing a shorter calibration period. Subsequently, the NRC approved a change to the TSs that removed the lower limit. This LER is closed.

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Station Blackout Diesel Generators (Unit 2, 3)

a. Inspection Scope (62707)

The inspectors monitored the licensee's response to a variety of problems associated with the station blackout diesel generators. The review included discussions with engineering and operations staff and review of logs.

b. Observations and Findings

The licensee experienced a variety of problems when trying to perform surveillance tests on the station blackout diesel generators during this inspection period. The following is a summary of the issues.

Unit 3 Station Blackout Diesel Issues

Following the initial software upgrade for issues related to handling the rollover from the year 1999 to the year 2000 (Y2K issues), the station black out diesel digital control system, which is in the main control room, locked up during a test run of the Unit 3 station blackout diesel. Results of an investigation into this issue by the licensee, revealed vendor control issues in the area of software.

During the reconstitution of the software program the vendor used backup data from the Quad Cities Nuclear Plant. The vendor was also tasked with upgrading the station black out diesel's software for that station. The vendor had also toggled two input/output jumpers (letterbugs) 3T and 3U in the wrong position during installation of the upgraded equipment for the blackout diesel. The Y2K upgrades also resulted in anomalous alarms regarding 125VDC uninterruptible power indications (PIF D1999-02779) and alarms (D1999-02780). The licensee corrected each of these issues following their identification.

Also, during a surveillance test, the station blackout diesel did not reach 90 percent of rated frequency and voltage within the procedurally required time. The station blackout diesel took approximately 3 minutes over the required time to reach rated conditions. At the end of the inspection period the licensee was determining whether the acceptance criteria was valid or necessary.

* * * *

During a surveillance test on July 14, 1999, there were indications of high generator temperature on the "A" bearing and the operators tripped the diesel. An engineering review determined that the cause of the high temperature was inadequate air flow. To correct for this lack of air flow the licensee installed a temporary modification in the system. The temporary modification was two large fans placed on the inboard and outboard sides of the bearing.

Another issue related to ventilation occurred during this inspection period due to the failure of the ventilation system's exhaust damper. During a surveillance test the damper went from the fully opened position to approximately the 45 percent open position. The operator immediately gagged open the damper to the full open position. This was accomplished using the licensee's urgent modification process.

* * * *

During a surveillance test the station black out diesel would not automatically synchronize on BUS 71 to BUS 34 breaker. While troubleshooting this issue the licensee found that all components in this circuit were within their specifications and operating properly. After the engineers completed troubleshooting, the station black out diesel was re-run and the system synchronized on the first attempt. On that occasion, the operators were directed to place the synchronization switch at the same phase reading as the voltage sensing relay in the automatic synchronization. The licensee rewrote the procedure to tell the operators to select the BC phase reading when operating the station black out diesel. Previously, the procedures did not inform the operators that the station blackout diesel used only the BC phase to synchronize.

* * * *

On August 3, the station black out diesel had to be tripped again due to loss of control power. A licensee investigation found that the 24-volt power supply for the gages and relays had tripped on thermal overload. The system engineer informed the inspectors that further investigations into this incident revealed that the power supply was designed to have 50 cfm of air always blowing across it. The engineering investigation also showed that the vendor designed the power supply for an environment in which temperatures do not go above 40 degrees-Celsius. This information was readily available in the vendor's manual. However, it was never incorporated in the design of this station black out diesel. The licensee installed a fan to blow directly across the power supply as a temporary modification and reran the Station black out diesel. No other problems with control power were noted.

* * * *

During another station black out diesel run the "B" engine high vibration annunciator activated repeatedly. The control system showed vibration data 0.3 mils/sec to 0.45 mils/sec. Vibrations higher than 0.39 mils are considered high. According to the engineer, a vibration analysis was done. The analysis found that the engine vibration level was actually 0.09 to 0.15 mils, which is within the vibration specifications stated in the procedure. This was also verified using a portable stroboscope on a subsequent station black out surveillance test run. Using this information, the licensee concluded that the vibration sensors were faulty, thus causing the vibration annunciator to alarm. The licensee replaced all the vibration sensors on the station black out diesel.

Unit 2 Station Blackout Diesel

When the Unit 2 station black out diesel was operated in late July, the "A" generator high vibration annunciator activated. The operators aborted the surveillance test and the diesel was shutdown. Vibration readings were 0.42 mils/sec. The vibration data from a previous run indicated vibrations were 0.41 mils/sec. The licensee reported that when the engine was secured the vibration gage was reading 0.4 mils/sec. The vibration transducer was replaced with a new calibrated transducer. The station blackout diesel indicated vibrations tested normal following the replacement.

c. Conclusions

Inspectors were concerned with the recent high frequency of failures experienced by the station black out diesels during surveillance tests. The licensee's investigation showed that a lack of software controls caused the wrong backup software to be used to reconstitute Dresden's station blackout diesel control logic during a Y2K upgrade. Additionally, inadequate design of the diesel ventilation system and an inadequate review of the vendor's recommendation for control power cooling caused the operators to trip the station blackout diesel during surveillance tests.

E8 Miscellaneous Engineering Issues (92902)

E8.1 (Closed) LER 249/95017-00: Unit 3 Scram From Main Generator Load Reject Due to a Failed Resistor in the Voltage Regulator. This LER documented that on September 28, 1995, at 2157, while Unit 3 was at 615 MWe, with a 10 Mwe/hour ramp up rate to 650 MWe, Unit 3 scrammed from the Main Generator Load Reject due to a Generator trip on Loss of Generator Field current. A resistor was found open circuited in the voltage regulator circuit. During followup from the scram, an improperly set relief valve on the Reactor Water Cleanup System hampered attempts to establish vessel blowdown.

The LER stated that the cause of the resistor failing in the voltage regulator circuit was unknown at the time. The licensee subsequently sent the resistor to ComEd's Central Receipt Inspection and Test facility for analysis. The laboratory concluded that the root cause of the failure was due to a manufacturing defect of the terminal to wire connector. The analysis noted that the resistor was installed for 26 years, but concluded that the failure did not manifest itself earlier due to the non-steady-state operation of the circuit. Corrective actions included creation of "predefines" or repetitive work requests to replace the resistor every three refueling outages.

The LER discussed an improperly set relief valve on the reactor water cleanup system which complicated level recovery. The licensee developed a program to validate other relief valves' settings. This historical event had low safety significance. The NRC has documented relief valve setpoint issues in reports issued after this September of 1995 event (e.g., Inspection Report 96201), and taken enforcement actions as necessary. Therefore, no additional information or other licensee response is needed concerning this item. This issue is closed.

E8.2 (Closed) LER 237/96016-00: Reactor Water Clean Up Pressure Control Valve PCV-1217 Configuration Outside Licensing Basis Requirements Due to Inadequate Modification Design. This report documented the following:

During engineering design review activities, it was identified [on October 8, 1996] that the reactor water clean-up (RWCU) pressure control valve 2(3)-1217 would not provide the necessary pressure drop as indicated by the Final Safety Analysis Report. The RWCU system was isolated and a temporary alteration was installed to mechanically limit the valve stroke such that the pressure drop in the failed open position would prevent overpressurization of downstream piping and components. The cause of the event was the failure to identify licensing basis requirements during the design of plant modifications. The safety significance of this event was minimal.

The licensee traced the cause to poor design work performed at the station in 1992 and 1993. Improvements in the design process at the station since 1992 included the establishment of a design engineering group.

The licensee identified past failures of the pressure control valve that resulted in a reactor water clean up system relief valve lifting prior to exceeding 150 psig. These relief valve lifts were used as empirical evidence that the failure of the pressure control valve would not actually overpressurize the piping, and the reactor water clean up systems were placed back in service. The long-term actions determined from the design review were to make the temporary alterations permanent.

This historical event had low safety significance. The NRC has documented similar design issues in previous reports (e.g., 96201), and taken enforcement actions as necessary. Therefore, no additional information or other licensee response is needed concerning this item. This issue is closed.

E8.3 (Closed) LER 50-237/249/97003-01: Containment Penetration Outside Design Basis Due to Analysis of Thermal Induced Post Accident Over-Pressure.

In response to issues described in NRC Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions," regarding thermally induced over-pressurization of containment penetration under post-accident conditions, the licensee performed a detailed review of containment penetrations and their associated systems and components at its facility on September 30, 1996. On January 27, 1997, because of this detailed review and the completion of several operability determinations, the licensee determined that several containment penetrations and plant systems and components were outside the design basis.

In this LER, the licensee reported that twelve containment penetrations were potentially susceptible to the over-pressurization conditions discussed in GL 96-06 for Unit 2 and eleven for Unit 3. The inspectors verified that the corrective actions discussed in the LER for each of these penetrations were completed or near completion. Mostly, corrective actions involved the licensee installing over-pressurization protection in each affected penetration. This over-pressurization protection included installation of bypass lines and relief valves. Based on the licensee response to this issue, this LER is closed.

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 General Comments (71750)

During routine inspections in radiologically controlled areas, the inspectors assessed licensee performance. Overall, the licensee's radiation protection staff enforced the plant's radiological control standards. The inspectors observed "As Low As Reasonably Achievable" briefings being held before workers entered areas where the dose was elevated. The inspectors also observed radiation protection staff in the field directing other radiation workers to low dose areas.

When questioned by the inspectors, the workers in the radiologically controlled area were aware of dose rates and administrative protection requirements.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management on August 12, 1999, following the conclusion of the inspection period. The licensee acknowledged the findings presented.

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

PARTIAL LIST OF PERSONS CONTACTED

Licensee

J. Almon, Training Manager
D. Ambler, Regulatory Assurance Manager
K. Dryier, Safety Manager
T. Fisk, Shift Chemical Supervisor (Acting)
B. Hanson, Shift Operations Supervisor
J. Harlach, Site Services Manager
R. Kelly, Regulatory Assurance NRC Coordinator
W. Lipscomb, Jr., Site Vice President, Executive Assistant
J. Mosier, Radiation Protection
M. Pacilio, Work Control Management
P. Planing, Unit 1 Plant Manager
R. Rybak, NLA Dresden Nuclear Power Station
W. Stoffels, Maintenance Manager
J. Stone, Nuclear Oversight Manager
P. Swafford, Station Manager
D. Willis, System Engineering Manager
T. Yarbrough, Site Vice President Staff

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 61726:	Surveillance Observations
IP 62707:	Maintenance Observations
IP 71707:	Plant Operations
IP 71750:	Plant Support Activities
IP 92700:	Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities
IP 92902:	Followup Maintenance

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-249/99012-01	NCV	Failure to perform TS required tests
50-249/99012-02	NCV	Maintenance workers failure to follow work instructions on Limitorque valve actuator work
50-237/99012-03	NCV	Failure to perform TS required surveillance for source range monitors

Closed

50-249/99012-01	NCV	Failure to perform TS required tests
50-249/99012-02	NCV	Maintenance workers failure to follow work instructions on Limitorque valve actuator work
50-237/99012-03	NCV	Failure to perform TS required surveillance for source range monitors
50-237/97012-01	IFI	Not entering TS 3.0.C during high pressure coolant injection planned maintenance
50-249/97002-00	LER	Licensed operators fail to perform TS LCO required surveillance due to programmatic failure in task methodology and human error
237/97009-00	LER	Source range monitor surveillance performed at incorrect frequency due to human error during TS upgrade project
50-249/96014-00	LER	Electromatic relief valves 3-0203-3B and D pressure switches found out of tolerance due to setpoint drift
249/95017-00	LER	Unit 3 scram from main generator load reject due to a failed resistor in the voltage regulator
237/96016-00	LER	Reactor water clean up pressure control valve PCV-1217 configuration outside licensing basis requirements due to inadequate modification design
50-237/249/97003-01	LER	Containment penetration outside design basis due to analysis of thermal induced post accident over-pressure
50-249/99005-00	LER	Accident mitigation Unit 3 isolation condenser failed due to isolation condenser reactor return (3-1301-4) valve failing to open during surveillance test

Discussed

None