U.S. NUCLEAR REGULATORY COMMISSION

REGION III

REPORT NO. 50-255/95011

FACILITY
Palisades Nuclear Generating Plant

LICENSEE
Palisades Nuclear Generating Plant
27780 Blue Star Memorial Highway
Covert, MI 49043-9530

DATES
August 22 through October 11, 1995.

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APPROVED BY

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Reactor Projects Branch 3

11-2-95
Date

AREAS INSPECTED

A routine, unannounced inspection of operations, engineering, maintenance, inservice testing, and plant support was performed. Safety assessment and quality verification activities were routinely evaluated.

## SUMMARY OF INSPECTION RESULTS

The following **material condition problems** occurred during this inspection period which **resulted in plant transients** that challenged the plant operators:

- On August 30. a power reduction was performed in order to facilitate repairing switchyard motor operated disconnects. Thermography results had indicated significant hot spots. Operator actions were good; however, some weaknesses were noted in three-way communications.

- On September 3, operators experienced a loss of load on the main generator when the number two governor valve failed closed. The problem was identified as a broken wire on the number two governor valve linear variable differential transformer (LVDT).

- On September 11, operations identified broken connections between the main generator and isophase bus. The discovery of the problem by operations personnel was considered good.

- On September 18, two cooling tower fans lost fan blades which caused the tripping of two other cooling fans and damage to some deluge piping Also the vibration trip for one cooling fan did not work.

**Other material condition issues** identified during this inspection were:

- On September 6, the variable speed charging pump was taken out of service to repack the plungers. The problem of short packing life expectancy continued, even though engineering had placed significant resources to resolving the issue.

- During the plant shutdown evolution on September 11, one of the atmospheric steam dump valves used to maintain primary coolant system temperature, failed to open.

- The inspectors noted the number of rags to catch oil throughout the plant was considered excessive, and was another indicator of plant material condition.

**Management response** to these material conditions was considered **conservative**. However, based on the number of material condition issues identified soon after a refuel outage, **material condition remains an area of concern.**

**Control of foreign material continued to be a weakness.** Several examples were detailed in the previous inspection report 50-255/95009. The inspectors were concerned with the uncontrolled use of rags with motors in the plant. Examples of continued FME problems are:

- On September 13, during decontamination of charging pump 55A, a rag was sucked into the motor.

- On October 3, a rag was found in the auxiliary feed pump, P-8C. The licensee could not determine when this may have occurred.

- The unexpected control rod drive mechanism (CRDM) withdrawal which occurred in the previous inspection period, was caused by an unattached wire lug found lodged between two terminal strip connections. The mechanism was worked on during the outage.

## ASSESSMENT BY FUNCTIONAL AREA

**OPERATIONS** (section 1.0).

- Operations performance in response to several events that occurred during the inspection period was good.

- Minor weaknesses in three-way communication were identified.

- Operations management made conservative decisions in response to the events.

- During routing sampling of the safety injection tank, the operators failure to open the fill valve and his subsequent unauthorized actions to remedy the situation compounded the problem resulting in exceeding the one hour sampling time.

**MAINTENANCE** (section 2.0).

- When a contract valve technician was injured during maintenance on the moisture separator drain tank level control valve, the inspectors noted no formal administrative measures were instituted to avoid similar occurrences in the future.

- Poor worker practices from a safety and radiological stand point were identified by the inspectors. Some of these examples occurred during the refuel outage, and others were from this inspection period.

- The material condition problems with the cracked generator isophase bus connectors and motor operated switchyard could have been detected prior to the refuel outage. Both of these problems led to plant shutdowns.

**ENGINEERING** (section 3.0).

During this inspection, the inspectors noted the following with engineering evaluations:

- Several submittals for a relief request to a Code alternative for the core spray and low pressure safety injection pumps failed to have the required technical justification and properly interpret 10CFR 50.55 a guidance.

- Progress appeared adequate on the P-55A charging pump packing problem with management involvement being evident. The inspectors noted good oversight of the job by engineering personnel.

- Engineering resolution to a problem with bowed swithchgear cubicles was weak. This problem, identified a few years ago, led to station power breaker 252-201, failing to close in.

The inspectors had the following observations pertaining to system engineering:

- During a plant tour, the inspectors noted the motor heater for the high pressure system injection (HPSI) pump was not functioning. This was brought to the system engineer's attention. The system engineer was unaware of the existence of the motor heaters. The system engineer decided to check all safety-related pumps.

- During the check of the status of motor heaters, the system engineer found a rag in the air intake of the motor driven auxiliary feedwater pump, P-8C. The inspectors felt this was a good example of thorough followup of an issue.

**PLANT SUPPORT** (section 4.0).

The inspectors identified the following concerns:

- The licensee experienced numerous challenges during the outage in controlling station radiation dose and radiation worker practices, as well as the pre-outage planning of ALARA packages.

- Communication of management expectations appeared weak in the area of radiological protection.

- During this inspection period, the residents also continued to identify poor radiation work practices.

Summary Of Open Items

Violation: One violation was identified. The violation described in paragraph 2.3.3 of the inspection report involved the failure to obtain NRC approval of relief request number 4, which established alternative vibration acceptance criteria for the low pressure safety injection and containment spray pumps (255/95011-01).

## INSPECTION DETAILS

### 1.0 OPERATIONS

NRC Inspection Procedures 71707 were used in the performance of an inspection of ongoing plant operations.

### 1.1 Switchyard Motor Operated Disconnect Repairs

On August 29, 1995, the licensee was notified of the results of thermography testing performed in the switchyard. Thermography results indicated significant hot spots (high resistance) on the "X" and "Z" phases of the motor operated disconnect (26H5 MOD) in the switchyard from the main transformer. The thermography results noted the temperature to be 120° C. above ambient on the "z" phase. Normal expected temperature is approximately 10° C. above ambient. The licensee's Lab Services Division recommends that the plant take action to correct the problem when the temperature is greater than 40° C. above ambient. The main disconnects are unisolable from the switchyard without taking the generator off line. At midnight on August 30, 1995, the licensee initiated a power reduction to 50 percent power. At this power level the temperature dropped to less than 53° C. above ambient temperature. The vendor recommendation for continuous operation is less than 53° C. Plant operators commenced a further power reduction on September 1, 1995, in preparation for taking the unit offline. The main generator was taken offline on September 2, 1995. The licensee completed the necessary repairs to the motor operated disconnects in the switchyard along with a short forced outage repairs and returned the unit back to service on September 2, 1995.

### 1.2 Damaged Isophase Bus Connectors

On September 11, 1995, the licensee reduced power to two percent and took the main generator off-line after discovering some damage to a isophase bus flexible connector. The connector was one of eight for each phase which linked the main generator to the bus. Each connector was comprised of 44 individual copper sheets which were layered to form a single bus bar. The licensee discovered that six of the layers were completely severed on the damaged connector and that a seventh layer was cracked. The licensee inspected the other connectors and discovered cracks on one located on a different phase. The licensee attributed the damage to vibration-induced fatigue. Analysis of the connectors by the licensee's laboratory is still pending.

Due to the unavailability of replacement parts, the licensee performed a temporary repair of the damaged connectors. The licensee removed the severed layers and installed stainless steel hardware on both ends of each connector to aid in relieving stresses at those areas. Following the repairs, the licensee returned the unit to service on September 13th. The licensee intended to replace all of the connectors during a future forced outage. In the meantime, the licensee was performing

periodic inspections of the connectors to ensure that further damage does not develop. The inspectors expressed concern that not all connections can be visually checked during operation.

### 1.3 Station Power Breaker Trip

On September 13, 1995, while transferring the 4160V non-safeguards bus 1B from startup to station power, breaker 252-201 failed to close during the initial two attempts. The feed from start-up power remained closed during the attempts, which prevented de-energization of the bus. The licensee determined that the cause of the problem was vibration induced during breaker closure due to bowed metal on the bottom of the cubicle. The vibration was transmitted to the breaker's foot pedal which impacted the trip latch. As corrective action, the licensee temporarily installed some vice grips to secure the pedal in place during the breaker closure. The licensee intends to install a temporary modification to bolt the pedal in place during a future activity requiring operation of the breaker.

During follow-up discussions with the system engineer, the inspectors determined that the condition did not affect the auto-trip function of the breaker. In addition, the system engineer was not concerned about a spurious trip of the breaker, which would result in a reactor trip, due to the magnitude of vibration required to trip the latch.

The inspectors also discovered that the licensee had identified the problem with the bowed cubicle a few years ago after experiencing some problems with other breakers located adjacent to 252-201. The licensee determined at that time that the cause of the bowed cubicles was water intrusion from outside a turbine building roll-up door located near the cubicles. As corrective action to this condition, the licensee bolted down the bowed cubicles during the last refueling outage. However, this action did not prevent the latest problem with breaker 252-201. The inspectors will review the licensee's investigation of C-PAL-95-1387, which was initiated to document the condition, to ensure that actions are taken to prevent recurrence.

## 2.0 MAINTENANCE

NRC Inspection Procedures 62703, 61726 and 73756 were used to perform an inspection of maintenance and testing activities.

### 2.1 Maintenance Activities

Portions of the following maintenance activities were observed or reviewed:

- Repair of CV-0608, heater drain valve
- Repair of motor operated disconnect (26H5 MOD)
- Temporary repair of damaged isophase bus connector
- Troubleshooting boric acid pump piping heat tracing
- Governor valve no. 2, repair broken wire

- Installation of 3/4" drain line on P-55A, charging pump
- Installation of seal water filter and flow regulating valve on P-55A
- Cooling tower fan failure (B9 & B11)

2.1.1 Technicians Injured During Valve Troubleshooting

A contract valve technician was injured during maintenance to repair a flow problem on moisture separator drain tank (MSDT) level control valve CV-0608. Maintenance technicians were troubleshooting CV-0608 to investigate the reason why the valve would not automatically control MSDT level. The upstream and downstream manual isolation valves were closed; however, the isolation valves were known to have seat leakage. Further, there was no vent path to relieve internal system pressure prior to starting work. Workers were aware that the piping adjacent to CV-0608 was pressurized prior to working the valve. The work plan instructed maintenance workers to adjust the valve's position to allow the V-Ball inside CV-0608 to pass full flow when actuator was in the full open position. The intent and nature of the work was not to breach the pressure boundary. However, during the initial disassembly to adjust the position, the valve stem unexpectedly ejected from CV-0608, allowing water at approximately 300 °F and 500 psig in the adjacent piping to escape and flash to steam. The worker closest to the valve received serious burns; two others received less serious injuries. All three workers were treated at area hospitals.

The licensee's initial investigation found that the split ring and retaining rings on both ends of the valve stem were missing. The split and retaining rings would have held the stem in place during the position adjustments. The licensee concluded that the rings were gradually worn away during plant operation, probably since 1988, when maintenance was last performed on CV-0608. The root cause of the missing rings was indeterminate at the close of the inspection period.

The inspector found that the licensee's immediate response of taking care of the injured workers and quarantining the area around the valve was satisfactory. The licensee's followup actions to replace CV-0608 with a new valve, and to modify the adjacent piping by installing a vent, were acceptable. The licensee decided not to initiate a work request to repair the leaking isolation valves. This was based on the installation of the vent, and the size of the leak, which was determined to be fairly small. The licensee is continuing to work with the vendor to further investigate this event.

2.1.2 Poor Worker Practices

During troubleshooting of the boric acid pump system line heat tracing, an inspector observed a worker in a designated contaminated area without rubber booties, only cloth booties. Also the same worker was observed stepping on heat traced piping, rather than using a ladder to work on a junction box.

The inspector monitored installation of a modification to the P-55A charging pump. The modification involved installation of a filter to the seal water line and rerouting of the seal drain line. A worker came down to discuss problems being encountered during the modification without a hard hat and ear plugs.

During decontamination activities on the "A" evaporator, a worker was observed leaving the immediate area with his dosimetry and TLD on the stepoff pad, to get poly bags for tools and trash, rather than keeping his dosimetry with him.

## 2.2 Surveillance Activities

Portions of the following surveillance activities were observed or reviewed:

- SOP-3, Safety Injection Tank Boron Sample
- MI-43, Reactor Vessel Level Monitoring System Channel Check
- NMS-I-7, ExCore Monitoring Calibration

### 2.2.1 Safety Injection Tank (SIT) Sampling

On September 15, 1995, control operators initiated a routine sampling of SIT-82A per Standard Operating Procedure (SOP-3). During sampling, the SIT pressure and level dropped below technical specification (TS) values as expected, resulting in the licensee entering a one hour TS LCO. After obtaining the SIT sample, control operators attempted to restore the tank level and pressure by refilling the tank utilizing the high pressure safety injection (HPSI) system. Operators were unable to achieve a normal fill rate and noted a slow rise in both tank level and pressure, but observed that relief valve RV-3161 had lifted. Operators throttled MO-3068 in an attempt to keep RV-3161 closed. In an attempt to facilitate the fill, the control operator reduced T-82A pressure to increase the fill rate. During the fill, it was observed that the SIT fill and drain valve, CV-3039, was closed. SOP-3 was reviewed and CV-3039 was opened in accordance with procedure steps. Level was restored at the normal fill rate. Level was restored to within the TS value within the required time limit of one hour; however, due to the venting of T-82A pressure by the operator, nitrogen addition was required to restore nitrogen pressure to normal. The subsequent nitrogen addition exceeded the TS limit and resulted in the licensee entering a more restrictive TS LCO. TS 3.3.2 requires that if the SIT is not restored to service within one hour, that the reactor be placed in hot shutdown within 12 hours. The operators subsequently restored pressure within the following 14 minutes (total LCO time 74 minutes). Although the licensee determined that a violation of TS did not occur, the failure of the operator to follow SOP-3 caused the licensee to exceed the one hour TS LCO. In addition, the shift's action to remedy the situation further complicated and extended the out of service time, resulting in exceeding the one hour LCO. This licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII of the NRC Enforcement Policy.

## 2.3 Inservice Test Program (IST)

The inspectors noted that the second 10-year IST interval ended in May 1995, and the licensee commenced the third 10-year program when they exited the refueling outage in August 1995. The second 10-year program was based on the 1983 edition of the ASME Code, while the new program was based on the 1989 edition (OM standards). The new program was not yet approved by the licensee or submitted to the NRC, although test procedures were being revised to incorporate the new testing requirements prior to their performance.

The inspectors reviewed the Safety Evaluation Report (SER) for the second 10-year IST interval, dated April 20, 1995, to determine the status of relief requests that need approval prior to implementation. Relief request number 4 was approved to use OM-6 for the second 10-year IST interval; however, it denied the alternative to the Code vibration limits for the containment spray (CS) and low pressure safety injection (LPSI) pumps. The licensee; however, previously implemented the revised vibration limits for these pumps without prior NRC approval.

### 2.3.1 Background

The licensee initially requested relief to use velocity versus mils for vibration measurements in a submittal dated June 28, 1991. The relief stated prior NRC approval was not required as it met the guidance in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Test Programs." However, this issue; was not addressed in the GL as stated in a SER dated July 15, 1992. The SER also denied this request based on lack of information on the pumps, such as specific velocity ranges for which this relief request applied. Based on a misunderstanding that prior approval was not required, the licensee had previously implemented this relief request.

The relief request was resubmitted on December 29, 1992, which identified the CS and LPSI pumps as the components that required the relief and provided specific velocity ranges. The alert and required action ranges for these pumps exceeded the OM-6 absolute limits, which were approved for use by ASME Code Case 465 and 10 CFR 55.55a. As discussed above, this relief was also denied. The SER stated that the licensee must continue to meet the Code requirements for these pumps. The SER further stated that if the licensee believed additional information would support approval of an increased alert range (required action range maintained at OM-6 limits), a relief request should be submitted with the third 10-year program; however, submittal with the third ten-year interval program did not imply that the requirement to meet the Code in the interim was not required. The licensee revised the test procedures to incorporate the OM-6 required action range; however, in most cases the alert ranges were deleted or exceeded the OM-6 absolute limits. A relief request, however, was not submitted requesting approval to use this alternative, yet the alternative was implemented by the licensee.

2.3.2 Discussion

The licensee believed that changing Code acceptance criteria was allowed by 10 CFR 50.55a(f)(5)(iv) since it was impractical to meet the Code limits during low flow testing. The use of impracticality in this context was incorrect, as impractical conditions apply to physical design constraints or high dose rate due to design configurations, and not to elements of the required testing, with possible exceptions where physical constraints actually limit the licensee's ability to perform elements of the test. This was not the case in the specific testing, as the options open to the licensee included placing the pumps on an increased testing frequency during an interim period while awaiting NRC approval of the requested alternative. The establishment of less conservative vibration limits than required by the Code would constitute an alternative to the Code and required prior NRC approval before implementation. The NRC issued guidance on implementing alternatives to Code requirements in Section 6 of NUREG-1482.

2.3.3 Conclusion

Since implementation of the Code alternative was not authorized prior to implementation, this is considered a violation (255/95011-01) of 10 CFR 50.55a(3). The licensee did not identify any additional relief requests for the third 10-year interval that required prior NRC approval.

The licensee submitted a revised relief request, dated September 18, 1995, that proposed an alert limit established based on past pump history for each bearing direction. The required action range for the pumps would not exceed the OM-6 absolute limits. Until this relief is approved by the NRC, the licensee stated alert limits would be in accordance with OM-6 and increased testing would be performed as necessary to meet the Code requirements.

2.4 Action on Previous Inspection Findings

2.4.1 (Closed) Unresolved Item 50-255/92028-01: This item concerned the adequacy of low flow inservice test (IST) of the P-8B auxiliary feedwater pump (AFW) to ensure the pump's operational readiness. Based on discussions with NRR, it was concluded that the flow rates used for IST could be determined by the licensee as the ASME Code only specifies a repeatable value for the test. The licensee; however, must ensure that the testing used to verify the pump's operational readiness was acceptable to meet design requirements. The licensee performed the full flow special test T-187, "AFW Turbine K-8 and Pump P-8B Performance," on a 10 year frequency or following major maintenance. Although the pump performance was less than the original pump curve during the tests performed in 1990 and 1991, the pump still met the design requirements. Based on the 1991 test results, the pump has a 50 gpm margin. The licensee also performed a correlation of the design requirements and the acceptance criteria established in the IST. The IST acceptance criteria appeared to provide sufficient assurance that the licensee would be able to verify AFW pump degradation. This item is closed.

2.4.2 (Closed) Violation 50-255/92028-02: This item concerned the inadequate acceptance criteria for testing the low pressure safety injection (LPSI) and primary coolant system (PCS) loop check valves to the full open position. QO-8B, "ESS Check Valve Operability Test," was revised to incorporate the design required flow rate of 1601 gpm for the LPSI check valves as determined by engineering analysis EA-E-PAL-93-004E-01. The valves successfully met the acceptance criteria during subsequent tests. The PCS loop check valves were full stroked per RO-105, "Full Flow Test for SIT Check Valves and PCS Loop Check Valves," with the use of non-intrusive testing techniques during the 1995 refuel outage. The PCS loop check valves were also partially stroked per QO-8B on a cold shutdown frequency.

The licensee also reviewed other check valves in the IST program to ensure test procedures contained adequate acceptance criteria to verify the full open stroke test. Several discrepancies were identified and in most cases adequately resolved. However, the resolution identified in E-PAL-93-004-D for check valves CVC-2099 and CVC-2105 did not appear appropriate. The maximum accident flow the valves were required to pass was 40 gpm; however, the test procedure, QO-17, "Inservice Test Procedure: Charging Pumps," acceptance criteria was based on the acceptance criteria for the positive displacement pump, which could be as low as 35.1 gpm. This did not meet the guidance in Generic Letter 89-04, Position 1.

The licensee previously performed non-intrusive testing (NIT) on these valves, which indicated the valves would open at the lower flow rate. The NIT was going to be performed on a refueling outage frequency (one valve every other outage). NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," section 4.1.2, stated that a sampling program for NIT could be used; however, the sampling must be performed based on the testing frequency. Since the valves were tested on a quarterly basis, the NIT must also be on one of the valves each quarter. The licensee indicated the procedure would be revised to include NIT on a quarterly sampling basis. This item is closed.

3.4.3 (Closed) Violation 50-255/94014-29: This item concerned the failure to test check valves CVC-2138 and CVC-2139 to the full open position. Surveillance procedure QO-18, "Inservice Test Procedure: Concentrated Boric Acid Pumps," was revised and the valves tested in May 1994. This item is closed.

## 3.0 ENGINEERING

NRC Inspection Procedure 37551 was used to perform an inspection of engineering activities. The findings showed performance was good.

### 3.1 Unexpected Control Rod Withdrawal:

On August 17, 1995, during low power physics testing, the licensee experienced a control rod drive mechanism (CRDM) withdrawal demand when a CRDM insertion demand was initiated. The control room operators were

inserting the Group 4 control rods (38, 39, 40 and 41), when a rod deviation alarm was received. Subsequent checks determined that control rod 40 was greater than 4 inches higher than the other Group 4 control rods and had traveled in the opposite direction. CRDM-40 was declared inoperable and the reactor was borated to a shutdown condition for troubleshooting (see LER 255/95011).

The licensee replaced CRDM-40 and determined that a foreign material exclusion (FME) problem caused the CRDM-40 failure. Visual inspection of CRDM-40's motor junction box, revealed that the "up" and "down" limit switches (LS-40/1 and LS-40/2, respectively) were shorted by an unattached wire lug. The unattached wire lug was found lodged between the LS-40/1 and LS-40/2 terminal strip connections. Several CRDMs were worked on during the recent outage; however, the exact time when the wire lug was introduced into the motor junction box could not be determined. The licensee speculated that the FME problem was probably introduced during earlier maintenance work.

CRDM ground detection troubleshooting isolated a 45-50 Vac (400 Hertz) ground in CRDM-15. The CRDMs power source was ungrounded and the circuitry did not contain a ground detection system. As a result, ground detection troubleshooting was performed to determine if CRDM-40 was masking an additional problem. Troubleshooting isolated the ground to CRDM-15, which was removed and subsequently replaced with the original retested CRDM-40.

The inspectors concluded that the licensee's investigation, evaluation and resolution of the CRDM withdrawal problem was good. A team approach was taken for coordination of the conducted activities. Engineering directed troubleshooting efforts to isolate and evaluate the problem. Operations was actively involved in the engineering directed effort. Steps were taken to ensure that all personnel were aware of their assigned tasks. The licensee issued an informational licensee event report (LER) 255/95011, which identified the proposed long term corrective actions.

3.2 Action on Previous Inspection Findings

3.2.1 (Closed) LER 255/92026-01: The licensee failed to ensure changes to station operating procedures did not conflict system configuration requirements identified in the licensee design basis documents. The affected operation was revised. The licensee follow up actions were considered adequate. This LER is closed.

3.2.2 (Closed) LER 255/94006: February 1994 through-wall leak of containment sump check valve CK-ES3166. The plant was taken to cold shutdown and actions were initiated to identify the failure mechanism, the extent of degradation, repair method, and actions required to prevent recurrence. Metallurgical analyses and nondestructive examination techniques were used to identify the failure mechanism as intergranular attack (IGA) due to sensitization in a weld-repaired region of the valve casting. These welds were made during the time of original plant construction.

The repair consisted of a weld overlay on the check valve (and also, conservatively, on the opposite train valve, CK-ES-3181) per ASME Code Case N504-1. The repair efforts were reviewed by both NRC Region III and NRR cognizant engineers and were found to be satisfactory. The repair process and actions taken are described in further detail in inspection report 50-255/94004.

To prevent recurrence, Palisades reassessed stainless steel weld practices to ensure controls exist to minimize corrosion stemming from IGA, performed a historical review of modifications to identify high risk susceptible components, and completed further destructive metallurgical exams to evaluate the prevalence of IGA on susceptible components. The destructive testing was conducted on similar check valves that were used in a similar service and environment that were replaced in 1995. No IGA or cracking was observed. These actions were reviewed by the NRC and found acceptable. This LER is closed.

3.2.3 (Closed) Unresolved Item 50-255/92028-03: This item concerned the capability of the fire water system to provide a backup water supply to the AFW system. The licensee developed engineering analysis EA-A-PAL-94-095 that verified the fire water system would be able to provide sufficient net positive suction head (NPSH) to the AFW pumps as required by Technical Specifications. This item is closed.

3.2.4 (Closed) Inspection Follow-up Item 50-255/94014-26: This item concerned the component cooling water (CCW) heat exchanger differential pressure and CCW flow correlation to determined flow rate from special test T-213 used in the CCW pump tests. The DET also identified that during a licensee review in late 1993, two questions were identified with the curve developed by T-213. These were documented on D-PAL-93-272 in January 1994. First, the curve did not take the expected hyperbolic shape, but was more of a straight line. The second question concerned the lack of verification of valve positions in the test flow path.

The licensee conducted T-213 during the recent refueling outage. The test ensured valves in the test flow path were in the open position prior to performance. The curve produced by test, when extrapolated, produced the expected hyperbolic shape. The licensee was still reviewing the test results to determine if any changes needed to be made to the IST pump test. Based on these results and intended actions, this item is closed.

3.2.5 (Closed) Inspection Follow-up Item 50-255/94014-27: This item concerned the root cause of a stroke time increase for motor-operated valves MO-3064 and MO-3066. The valves' gear ratios were modified in the 1993 refuel outage. The next two ISTs showed no change in the valve stroke times and as such, the valves' reference values were not changed. The stroke time in December 1993, and subsequent test data increased from the previous measurements. The licensee contributed the stroke time increase to the gear change modification, although initial testing did not indicate an increase in the stroke time. The licensee was unable to determine why the stroke times did not increase initially with the gear

change modification. Test results since December 1993 remained consistent. Based on the consistent test results, there did not appear to be a problem with the valves. This item is closed.

3.2.6 (Closed) Inspection Follow-up Item 50-255/94014-30: This item concerned the testing of manual valve FW-150, which was relied on in emergency operating procedures to be used as a backup steam supply regulator for the AFW turbine driven pump. Based on the plant's design basis, the licensee concluded that the valve did not meet the criteria for inclusion in the IST program; however, a periodic predetermined activity control (PPAC) was developed to lubricate and stroke the valve on a yearly basis. The inspectors considered this acceptable. The PPAC, however, was not performed as scheduled during the recent refuel outage. A corrective action document was initiated to address the missed PPAC. The valve was successfully exercised on September 18, 1995. This item is closed.

3.2.7 (OPEN) LER 50-255/95006: Inadequate auxiliary feedwater pump low suction pressure trip setpoints. Originally identified on condition report C-PAL-95-0877, the design of the AFW pump suction did not adequately consider pump protection form air entrapment at low condensate storage tank levels. Inspectors reviewed the corrective actions specified for the AFW system and concluded that they were acceptable. The LER also raised a concern with the suction from the safety injection and refueling water tank (SIRW) and concluded that it was acceptable based on engineering judgement. Further evaluation was planned for the SIRW and other large pumps; therefore this LER is open pending completion of the licensee's evaluation.

## 4.0 PLANT SUPPORT

NRC Inspection Procedure 83750 was used to perform an inspection of Plant Support Activities, with an emphasis on outage activities. The level of performance in radiological protection was considered adequate. No single finding was considered significant; however, the licensee experienced numerous challenges during the outage in controlling station radiation dose and radiation worker practices, as well as the pre-outage planning of ALARA packages. The underlying weakness appeared to be ineffective communication of management expectations in the area of radiological protection.

### 4.1 External Exposure Control

The licensee completed the outage on August 17, 1995 with an outage dose of 348 person-rem (3.48 person-sievert), versus an outage ALARA goal of 286 person-rem (2.86 person-sievert). The outage dose was based upon electronic dosimeter (ED) readings. Actual reported doses will be based upon thermoluminescent dosimeter (TLD) readings and will be 10 to 14 percent higher. The reason for the higher TLD readings is discussed below in Section 4.4. Notwithstanding the higher TLD readings, the licensee experienced several challenges in meeting its outage ALARA goal. Two primary reasons for this were poor radiation worker practices

and mixed performance during the prejob ALARA reviews. Both of those challenges were discussed in Inspection Report 50-255/95008(DRP) and additional information is provided below.

4.2 Pre-Job ALARA Planning

The licensee's performance during the completion of pre-job ALARA reviews was mixed. Although some reviews exhibited excellent performance and vigilance on the part of ALARA planners, such as the I-24, or reactor vessel internals inspection project, the planners showed poor performance in others, namely, the Alloy 600 project. The initial dose projections indicated 32 person-rem for the I-24 project. A majority of the work was to be performed by workers standing on the edge of the reactor vessel over a dry cavity. The ALARA group rejected that dose projection and sent the package back to the project engineers for dose savings techniques. Through various changes to the work package, including the use of a mock-up and partially filling the cavity, the revised dose projection was 4.8 person-rem. The actual total dose for the project was 4.2 person-rem. The licensee's challenges with regard to the Alloy 600 project are fully described in Inspection Report 50-255/95008(DRP). In summary, due to equipment clearance constraints and the erroneous use of the vendor's time estimate to complete the project, the licensee's total dose for the Alloy 600 inspection project was 23 person-rem, versus an ALARA projection of 11 person-rem.

4.3 Radiation Worker (Radworker) Practices

Inspection Report 50-255/95008(DRP) described inspector observations of poor radworker practices during the performance of two projects with high radiological significance; the removal of the Core Support Barrel and the Transfer of the Incore Detector Cask. During both projects, the inspectors observed radworkers loitering in areas with elevated dose rates. In neither case were the workers' behavior challenged, suggesting a lack of aggressiveness by the licensee in reducing individual dose. Although these two projects are the only ones observed by the inspectors that involved poor radworker practices, other information was available to suggest that these were not isolated cases. During the review of personnel contamination incidents (PCIs), the inspector observed an adverse trend in the number of PCIs early in the outage. At the end of the outage, the licensee had recorded approximately 1000 PCIs. Although none of the PCIs were radiologically significant to the contaminated individuals, they do suggest unchecked poor radworker practices in contaminated areas. The licensee acknowledged this possibility and was in the process of developing plans to limit PCIs and correct the poor radworker practices. Details of those plans were not immediately available, but will be reviewed during future inspections prior to the next outage.

## 4.4 Electronic Dosimeter/TLD Discrepancies

Personnel radiation dose received during the second quarter of 1995, as determined by TLD, exceeded the dose recorded by electronic dosimetry (ED). Prior to the outage, the licensee changed vendors for the supply and processing of TLDs, the primary source of recording exposure. Due to differences in the processing technique of each vendor, the average TLD dose deviation between the two vendors was 12 percent. The previous vendor, actually the Consumers Power Co. laboratory, consistently reported doses that were approximately 4 percent lower than the expected dose on spiked TLDs. The new vendor, a laboratory independent of Consumers Power Co., reported doses that were approximately 8 percent higher that the expected dose on spiked TLDs. Differences of 10 percent are acceptable for NVLAP accreditation. Since the EDs were calibrated against expected TLD results from the former processor, this resulted in them reading less than the TLD results from the new processor. Thus, the outage dose, as reported to date via ED results, will be adjusted higher approximately 12 percent, based on actual TLD readings, which are reported quarterly, when they become available. The adjusted exposure results will not result in anyone receiving a reported dose in excess of NRC regulatory, or licensee administrative, dose limits.

## 5.0 PERSONS CONTACTED AND MANAGEMENT MEETINGS

The inspectors contacted various licensee operations, maintenance, engineering, and plant support personnel throughout the inspection period. Senior personnel are listed below.

At the conclusion of the inspection on October 11, 1995, the inspectors met with licensee representatives (denoted by *) and summarized the scope and findings of the inspection activities. The licensee did not identify any of the documents or processes reviewed by the inspectors are proprietary.

R. A. Fenech, Vice President, Nuclear Operations
*T. J. Palmisano, Plant General Manager
*K. P. Powers, Nuclear Services General Manager
G. B. Szczotka, Nuclear Performance Assessment Manager
R. M. Swanson, Design Engineering Manager
*D. W. Rogers, Operations Manager
*D. J. Malone, Chemical & Radiological Services Manager
S. Y. Wawro, Planning & Scheduling Manager
*R. B. Kasper, Maintenance & Construction Manager
*C. R. Ritt, Administration Manager
J. P. Pomaranski, Deputy Maintenance & Construction Manager
H. L. Linsinbigler, Projects & Contracts Manager
D. P. Fadel, System Engineering Manager
*D. W. Smedley, Licensing Manger
*R. A. Vincent, Licensing Supervisor