U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/91005(DRP)

Docket No. 50-255 License No. DPR-20

Licensee: Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Facility Name: Palisades Nuclear Generating Plant

Inspection At: Palisades Site, Covert, Michigan

Inspection Conducted: February 19 through April 5, 1991

Inspectors: J. K. Heller, Senior Resident Inspector
E. R. Schweibinz, Senior Project Engineer
R. L. Bywater, Reactor Engineer
D. G. Passehl, Resident Inspector
D. L. Waters, Consultant to NRC

Approved By: B. L. Jorgensen, Chief
Reactor Projects Section 2A

4/19/91
Date

Inspection Summary

Inspection on February 19 through April 5, 1991 (Report No. 50-255/91005(DRP))
Areas Inspected: Routine unannounced inspection by resident and regional inspectors of actions on previously identified items, plant operations, surveillance, maintenance, design changes, and regional initiatives. No Safety Issues Management System (SIMS) items were reviewed.
Results: No violations or deviations were identified.

The strengths, weaknesses and Open Items are detailed in Paragraph 8, "Management Interview." In summary:

Strengths were noted in conservative actions to shut down the unit or limit power level in order to resolve problems. Operations management involvement, and department professionalism and ownership of plant evolutions and problem resolution were generally strong.

Weaknesses were noted in development and implementation of some special test procedures, including integration of these with routine tests. Examples of these problems caused a grouping of reportable events which were the subject of a licensee-initiated phone conference with NRC Region III.

Minor maintenance planning and work control problems were noted. Also, modifications were sometimes done using deficient procedures or exhibited inadequate preparations or inattention to detail during development and implementation.

DETAILS

1. Persons Contacted

Consumers Power Company

*G. B. Slade, Plant General Manager
*R. M. Rice, Plant Operations Manager
D. J. VandeWalle, Technical Director
*R. D. Orosz, Engineering and Maintenance Manager
*J. L. Hanson, Operations Superintendent
R. B. Kasper, Mechanical Maintenance Superintendent
*K. E. Osborne, System Engineering Superintendent
K. A. Toner, Plant Projects Superintendent
*T. J. Palmisano, Administrative and Planning Manager
*R. M. Brzezinski, I&C Superintendent
*J. G. Lewis, Steam Generator Replacement Project Licensing Director
*R. E. McCaleb, Quality Assurance Director

Nuclear Regulatory Commission (NRC)

*J. K. Heller, Senior Resident Inspector
*E. R. Schweibinz, Senior Project Engineer

Parameter Inc.

*D. B. Waters, Consultant to NRC

* Denotes some of those present at the Exit Interviews on March 15, 1991, or April 16, 1991.

Other members of the plant staff and the Jackson Engineering offices were also contacted during the inspection period.

2. Actions on Previously Identified Items (92701, 92702)

a. (Closed) Open Item 255/90039-02(DRP): The licensee was asked to determine if the performance characteristics of the new steam generators varied sufficiently from the old steam generators to warrant natural circulation testing during the restart program.

The licensee evaluation (RLB90-014) stated that natural circulation was enhanced by the replacement steam generators because system flow resistance (number of plugged tubes) was greatly reduced. Other key factors which influenced natural circulation - such as elevation and temperature differences between the heat source and heat sinks, maintenance of subcooled coolant conditions, and absence of non-condensible voids in the coolant loop - remained essentially unchanged from previous plant operating conditions. The licensee referenced a natural circulation event which occurred on July 14, 1987, as additional basis for expectations of proper natural circulation performance post-steam generator replacement.

The inspector reviewed natural circulation Emergency Operating Procedures, natural circulation training conducted on the simulator, and conformity of simulator modeling to the modified steam generator flow and heat transfer characteristics. The inspector concurred with the licensee's justification that additional natural circulation testing was not required.

b. (Closed) Open Item 255/90039-03(DRP): The licensee was asked to evaluate their plans regarding water hammer testing of the main feedwater and/or auxiliary feedwater systems during the steam generator replacement restart program.

In response, the licensee documented a justification (RLB90-014) for not performing water hammer testing. This justification was based on the design characteristics of the replacement steam generators which reduced the probability of water hammer occurrence compared to the original steam generators. These characteristics included separate main feedwater and auxiliary feedwater injection points, "J-tubes" on the main feedwater ring to prevent draining of the ring when flow is lost, lowering of the auxiliary feedwater nozzle and internal goose neck to below normal water level, welding of the goose neck to the auxiliary feedwater piping to minimize draining and steam bubble formation, and an administrative control program to monitor AFW piping for check valve backleakage. Many of these improvements were incorporated prior to the replacement of the steam generators due to water hammer events during the plant's operating history.

The inspector discussed the response with system engineers and plant operations personnel and observed auxiliary feedwater testing during startup activities at flow rates exceeding the normal automatic injection rate. The inspector concurred that additional water hammer testing was not warranted.

c. (Closed) Open Item 255/90039-04(DRP): The licensee was asked to determine if thermal expansion and contraction measurements are necessary during the first cooldown following startup to assess the impact of the replacement project on the primary coolant system and attached piping.

In response, the licensee stated that the nuclear steam system supply (NSSS) vendor requirements provided for setting support gaps cold and checking them hot during startup to assure binding of the PCS did not occur. The inspector observed the gap measurements and reviewed the results of the measurements. The anticipated movement, both in direction and relative amount, of the steam generators, primary coolant pumps, and reactor vessel were all within expected ranges. The licensee also performed walkdowns of piping and hangers associated with modifications to the blowdown and auxiliary feedwater systems; no significant deficiencies were found.

d. (Closed) Open Item 255/90039-05(DRP): During a management meeting on November 28, 1990, the licensee discussed resolution of a leak from the safety injection and refueling water storage tank at the

penetration to floor plate weld. The leakage was the result of floor plate flexing during draining and filling operations associated with refueling outages. During the discussion, the licensee was asked to determine if the seismic qualification of the tank was affected.

The licensee evaluation (RBJ 05-91) concluded that the seismic loadings are a small percentage of the water weight. The tank and building will tend to move integrally as a result of the anchoring mechanisms. The evaluation concluded that the seismic qualification was not affected. The evaluation was reviewed by a Region III Division of Reactor Safety specialist, who concluded that the overall seismic qualification did not appear to be affected.

e. (Closed) Open Item 255/90031-02(DRP): The licensee was asked to determine if 10 feet of water shielding was provided while conducting Steps 3.3 to 3.5 of CL 28.2 "Spent Fuel Pool Elevator Inspection". The licensee determined that 10 feet of water was maintained; however, the acceptance criteria of CL 28.2 was not appropriate. CL 28.2 was changed to reflect the correct acceptance criteria. The evaluation was documented in Engineering Analysis EA-KFK-90-01.

f. (Closed) Open Item 255/90018-5a(DRP): Facility Change (FC) 906, "Containment High Pressure Trip For Feedwater Valves" implemented a single train isolation signal for closure of the feedwater valves. This was justified by reference to an NRC approved Safety Evaluation Report issued February 28, 1986, that justified use of a single train isolation, for another portion of the same system. This was based on the low probability of an accident and the high cost required to provided dual train isolation. This open item documented that the safety evaluation for FC 906 did not address the cost of the modification when authorizing single versus dual train isolation.

The licensee evaluation (RAV 90*058) acknowledged that the cost was not documented in the FC 906 safety evaluation but still concluded that the single failure isolation signal was valid. This was the result of a PRA failure mechanism study for the system which concluded that system failure was dominated by mechanical failures and not isolation signal failures. As a result, a favorable cost-benefit would not be realized by a dual train isolation signal. Based on this evaluation, FC 906 implemented the appropriate isolation.

g. (Closed) Open Item 255/90018-5b(DRP): Facility Change 906, "Containment High Pressure Trip for Feedwater Valves," used a previously NRC approved safety evaluation for the containment to justify single failure isolation of the feedwater valves. This open item asked if the licensee was obligated to notify the NRC that the safety evaluation was used to justify additional modification of the system addressed by the safety evaluation. The 10 CFR 50.59 review processes provided the licensee with the NRC notification/approval threshold. In this case, that threshold was not exceeded.

No violations, deviations, unresolved or open items were identified.

3. Operational Safety Verification (71707, 71710, 42700, 60705, 61701)

Routine facility operating activities were observed as conducted in the plant and from the main control room. Plant startup, steady power operation, plant shutdown, and system(s) lineup and operation were observed as applicable.

The performance of Reactor Operators and Senior Reactor Operators, Shift Engineers, and Auxiliary Equipment Operators was observed and evaluated. Included in the review were procedure use and adherence, records and logs, communications, shift/duty turnover, and the degree of professionalism of control room activities.

Observations of the control room monitors, indicators, and recorders were made to verify the operability of emergency systems, radiation monitoring systems, and nuclear reactor protection systems. Reviews of surveillance, equipment condition, and tagout logs were conducted. Proper return to service of selected components was verified.

a. General

The plant began the reporting period in cold shutdown. The licensee completed the post-outage testing required to return the plant to service. At the conclusion of this reporting period, the plant was in power operation at 100 percent power.

b. Plant Shutdown

The unit was removed from service, March 24 - March 25, because of a failed level float switch for the "C" Safety Injection Tank. The failed switch was identified while resolving a ground. The licensee found that the float to tank cover developed a boric acid leak at a metal to metal seal. This leak eventually resulted in a corroded switch. The licensee decision to shutdown the plant was conservative because the redundant level monitoring system tends to drift with changes in containment temperature. Evaluation of this repair is discussed in Paragraph 5.c "Maintenance".

c. Criticality

The inspector observed the licensee make the unit critical on March 10. This completed the steam generator replacement and started the low power physics testing portion of the startup program. The inspector's observations pertaining to low power physics testing will be discussed in a future inspection report. In addition, the inspector watched the licensee return the unit to service following the outage discussed in the previous paragraph. For both criticalities, the estimated critical rod height and boron concentration were within the predicted target band.

d. 50.72 Notifications

(1) On February 24, the licensee informed the NRC that during the performance of a special test, a safeguard bus low voltage occurred that resulted in an auto start of a diesel generator. See Paragraph 4.s "Surveillance" for a discussion of this event.

The inspector had no additional questions. This event will be reviewed when the associated Licensee Event Report is evaluated.

(2) On February 25, an unplanned reactor trip signal occurred while performing QO-23, "Auxiliary Hot Shutdown Panel Instrument Checks." At the time, all rods were fully inserted into the core. See Paragraph 4.r "Surveillance" for a discussion of this event.

The inspector had no additional questions. This event will be reviewed when the associated Licensee Event Report is evaluated.

(3) On February 22, the licensee reported that a personnel error while performing test RT-08C, "Engineered Safeguards System - Left Channel," resulted in a failure of the diesels to start when the wrong fuses were pulled. Internal corrective action document E-PAL-91-008 addressed corrective action for this event. The licensee subsequently determined that this event did not meet the reporting requirements of 10 CFR 50.72, 10 CFR 50.73 or NUREG 1022, "Licensee Event Report System." As a result, the licensee retracted the 10 CFR 50.72 notification on March 25. The inspector has no additional questions pertaining to reportability.

The inspector did review the personnel error aspects of this item and agreed with the licensee conclusion that the personnel error was the result of an inadequate review of the procedure or not having the procedure "in-hand" when performing this step. The licensee corrective action was addressed in corrective action document E-PAL-91-008. Additional discussion is contained in Paragraph 4.q "Surveillance" of this report. The inspector had no additional questions.

The three notifications occurred in a relatively short time frame and carried a common theme in that they occurred during testing. The licensee corrective actions appeared appropriate for each item. In addition, the plant general manager initiated a conference call, on February 27, with Region III Division of Reactor Projects management to discuss the events, to discuss corrective actions and to resolve any questions.

e. Low Flow Pretrip

During the power increase, a number of Primary Coolant System (PCS) low flow pretrip actuations occurred above 90 percent power. The licensee secured the power increase at 93.5 percent power and evaluated two potential causes. The first was movement or vibration of the core barrel. During the first operational cycle, core barrel

movement resulted in similar actuations. Performance of an incore vibration monitoring surveillance eliminated this from consideration. The second was evaluation of the low flow setpoint methodology. The new steam generators (SGs) have less flow restriction. This markedly reduces the differential pressure (DP) across the SGs which is the system parameter used to indicate PCS flowrate. The past methodology established the DP equivalent to 100 percent PCS flow at the PCS average temperature (Tave) for zero reactor power. This was an added conservatism by the licensee due to SG DP decreasing as Tave increases with increasing reactor power. Momentary fluctuations (noise) in the PCS flow signal had previously been only a small portion of the total flow signal. Now, it constitutes a much larger proportional change which was causing erratic low flow pretrip signals. The licensee has revised RI-94, "Reactor Protective System - Low Flow Trip Calibration" to recalibrate the low flow trips at 100 percent power or whenever the pretrips alarm. The inspector reviewed the safety evaluation (dated 04/02/91) associated with RI-94 and verified that the new methodology was addressed. The inspector had no additional questions.

f. Zebra Mussels

During the steam generator replacement outage, a small number of zebra mussels were found in the intake piping from the lake to the service water bay. None were found in the bay. During the outage, selected systems that use service water were examined with no fouling identified. On April 1, the licensee applied for a permit to continuously chlorinate the bay (the bay was previously chlorinated minutes per day). In addition, the licensee requested permits to use Betz Clam Trol CT-1 and Nalco Anti-brom.

g. Tours

(1) The inspector routinely toured the containment during the outage and after the containment was certified ready for plant heatup. Some tours were performed with members of the plant staff and one tour was performed with NRC Region III Division of Reactor Projects (DRP) management. Most observations were minor and were resolved when identified. However, the inspector found that tape was used to patch a small crack in the reactor head area ventilation duct. The tape was removed and then reinstalled when it was believed to be part of the ventilation boundary. This was discussed with the operations superintendent, who ensured that the tape was removed. An evaluation was performed to determine if repairs were required immediately or could be delayed to the next outage. The repairs were deferred to the next outage.

During one tour, the inspector noted some dirt/dust below a grating next to the "C" primary coolant pump and in other places throughout the containment. The dirt looked like some oil may have been spilled and mixed with it. This was discussed with the licensee at the exit interview, with the suggestion that this be considered during future cleanup activities.

(2) Tours of the auxiliary and turbine building were routinely performed. Most were performed without the presence of the licensee staff. On separate occasions, tours were conducted in company with the Region III Regional Administrator, the Director of the Division of Reactor Projects, the DRP Section Chief, the DRP Branch Chief, and the Nuclear Reactor Regulation Region III Project Director. Minor observations were identified and resolved. On one occasion, the inspector found an ungrounded extension cord plugged into electrical outlet "EL 35-15," located on the 611 ft. level of the auxiliary building next to the chemistry lab. This was identified to the shift supervisor who had the extension cord unplugged. The next day, the inspector again found the extension cord in use at the same outlet. The inspector discussed this with the safety office, who had a ground plug installed on the extension cord. This was discussed at the exit interview.

h. System Walkdown

The inspector walked down portions of the auxiliary feedwater system using checklist 12.5 and 12.6; fuel oil system using checklist 22.2; and, diesel generator system using checklist 22.1. No items were found that degraded any of the systems. The inspector did notice that two maintenance supports (one located on the floor and one mounted to the wall) were in place at the "A" fuel oil pump. Neither appeared to serve a structural purpose. In fact, neither was in direct contact with the piping. The licensee was asked if the supports should be removed.

No violations, deviations, unresolved or open items were identified.

4. Surveillance (61726, 42700)

The inspector reviewed Technical Specifications (TS) required surveillance testing and special tests conducted during the cold shutdown, hot shutdown, critical operations at low power and power ascension portions of the restart. The review confirmed that testing was performed in accordance with adequate procedures, that test instrumentation was properly calibrated, and that the Limiting Conditions for Operation were met. Additionally, removal and restoration of the affected components were properly accomplished, and test results conformed with TS and procedure requirements, except as individually noted. The results were reviewed by personnel other than the individual directing the test and deficiencies identified during the testing were properly reviewed and resolved by appropriate management personnel.

The following activities were inspected:

a. T-302 Emergency Diesel Generator 1-1 Overspeed Trip Setpoint Verification

b. MO-7A-2 Emergency Diesel Generator 1-2

c.	MO-38	Auxiliary Feedwater System Inservice Test Procedure
d.	SO-04A	Personnel Air Lock Penetration Leak Test
e.	RT-70F	Primary Coolant System (Hydrostatic Test)
f.	RT-57	Reactor Coolant Pump Delta P Measurement Test
g.	T-304	Pressurizer Spray Valve Flow Test
h.	T-305	Atmospheric Dump Valve (ADV) Operational Impact at Hot Shutdown Conditions
i.	T-306	Step Increase in Power Level
j.	RT-74	High Pressure Safety Injection (HPSI) and Redundant High Pressure Safety Injection (RHPSI) System Functional Leak Test.
k.	MSE-E-21	VOTES Diagnostic System Operating Procedure for testing and surveillance of motor operated valves MO-3041, MO-3045, and MO-3052.
l.	T-305	Atmospheric Dump Valve (ADV) Operational Impact at Hot Shutdown Conditions Test.
m.	T-246	Blocked Load Shed on Switchgear Bus 1C when Supplied by Diesel Generator 1-1
	T-247	Blocked Load Shed on Switchgear Bus 1D when Supplied by Diesel Generator 1-2

During the performance of T-247, the licensee found that the breaker for the 1-2 Diesel Generator (DG) would not remain in the test position. The test procedure did not correctly specify the electrical circuit lineup that was required to perform the test. The test procedure was revised and the test completed satisfactorily. The companion test T-246 for the 1-1 DG was subsequently performed, with the result that the running Component Cooling Water pumps P-52A and C and the running Service Water pump P-7B tripped off when the DG breaker was placed in the test position. As in the previous test, it was determined that the test procedure did not correctly specify the lifted leads or circuit links required to complete the test. The procedure was modified and the test completed satisfactorily.

The inspector was concerned with the adequacy of the procedure development process since both procedures exhibited inadequacies and the steps required to isolate the loads were different between the tests. The licensee issued deviation report D-PAL-91-037 to determine the cause for the problems experienced in T-246. Testing had been successfully conducted with the test procedure in February 1987, with no unintended breaker actuations. Subsequent to that time, Facility Change 800 was implemented which altered the wiring for the load shed circuits of both Buses 1C and 1D. Initial

review by the licensee of the revised wiring diagrams indicated that no modifications to the test procedure were required for isolating the breakers from a load shed trip. However, this was not true, as confirmed by further investigation following the performance of the testing.

n. QO-28 Auxiliary Feedwater System Cold Shutdown, Inservice Test Procedure

During the performance of QO-28 on "A" and "C" AFW pumps, the inspector walked down Attachment 2 of the procedure, steps for isolating ISI test gauges, with an Auxiliary Operator. The following discrepancies were noted:

(1) On page 2, Attachment 2, the wrong room was designated for location of instruments 727F and 749C. They were actually located in the CCW pump room rather than in the AFW pump room. A procedure change was initiated to correct the error.

(2) While the instrument isolation valves were correctly labeled per the attachment, the vent valves were incorrectly labeled and the instrument was not labeled. This was later corrected by the system engineer when temporary labels were attached to the valves and the instruments until permanent labels were obtained.

(3) The performance run of the "C" pump was satisfactory, but the initial run of the "A" pump was secured due to overheating of packing during venting evolutions. Following packing adjustments, the test was successfully performed.

o. T-303 Emergency Diesel Generator 1-2 Overspeed Trip Setpoint Verification

The inspector observed attempts to perform T-303 along with additional steps which were incorporated to allow decreasing engine RPM from 900 to 400 to obtain engine compression readings. The compression readings were deemed necessary to diagnose differences between cylinder pressures observed during firing pressure tests over the past several years. The following problems were noted:

(1) Several temporary changes were required to ensure that procedure requirements could be followed step-by-step.

(2) On initial decrease of engine RPM, the engine trouble alarm illuminated at about 650 RPM, due to lube oil pressure falling below 60 psi. The operators could not find the controlled copy of the alarm response procedure in its designated position adjacent to the DG rooms, and had to retrieve a copy from the control room. The controlled copy was subsequently found and returned to its correct location.

(3) Following resolution of the alarm condition, the engine RPM was again decreased. When the engine reached about 500 RPM, it

tripped due to a low lube oil pressure trip (§40 psi). No further attempts to conduct the low RPM portion of test were made.

The overspeed portion of the test was continued and was successfully completed.

The inspector addressed the following concerns to the licensee:

Why was compression testing required?

Why did the Minor Revision Notice to the procedure which incorporated the low RPM testing not state the reason for including low RPM test?

Was the licensee's technical review process for the revision adequate in light of the problems experienced during the test and the additional temporary changes required to enable test performance?

The licensee informed the inspector that compression testing was considered in discussions between the system engineer and the vendor. Problems concerning out-of-specification cylinder pressure differences were noticed during previous firing pressure testing, and other engine analyses had proven to be inconclusive. The low RPM testing was considered as a means to provide additional data for assuring engine integrity, and was best performed in conjunction with the overspeed testing. The licensee indicated that inadequate consideration was given to the other effects on engine performance by RPM reduction.

The licensee believed that some of the firing pressure differences were due to vibration of a previously-used compression gauge, and had recently bought a new gauge to minimize this problem. Readings taken during the subsequent performance of MO-7A-2 using the new gauge were found to be within the specified pressure difference.

p. RT-013A Normal Shutdown Sequencer Tests - Left Channel

RT-013B Normal Shutdown Sequencer Tests - Right Channel

During the performance of RT-13A, the first attempt to complete the test was unsuccessful. The control operator did not fully understand that Step 5.3.2 required placing and holding the sequencer test switch in position until all loads were confirmed started. The inspector observed that an explanatory note could have assisted the understanding of the operators. The test was subsequently performed correctly by the operators, but difficulties were experienced with the data acquisition test rig. This resulted because a drawing, used to connect the test rig, incorrectly identified the polarity for pickup of DC signals. The wiring error was corrected and the test completed. The system engineer determined that the same error existed for obtaining signals for RT-13B.

The performance of RT-13B was observed to be conducted satisfactorily.

q. RT-08C Engineered Safeguards System - Left Channel
RT-08D Engineered Safeguards System - Right Channel

The inspector observed the pretest briefing and control room activities for RT-08C. The test coordinator was the shift engineer. Two control operators (COs) were involved with portions of the test to confirm actuation of the battery charger alarm. Additionally, they were to perform a switch manipulation in the control room back panels in accordance with the test procedure. Originally, one of the two COs was designated to perform the removal of fuses in breaker panel 152-108 outside of the control room to initiate the test. Just prior to that step, the test director changed the assigned action to a third CO. The inspector subsequently observed that this operator was inadequately briefed and did not review the test procedure, especially Step 5.3.4, which specified the fuses to be pulled. The operator was accompanied by the electrical test engineer, who assumed responsibility for indicating which panel and which fuses were to be pulled. However, neither the test engineer nor the operator possessed a copy of the procedure. The engineer remembered that he was told to pull the fuses in panel 152-105, rather than in the correct panel 152-108. The inspector did not observe him reviewing the test procedure. When the operator pulled the fuses in panel 152-105, a safeguards actuation occurred, as expected, but not due to a loss of offsite power. The 1-1 diesel did not start as expected by the test procedure. All pumps and equipment responded normally but the item was later deemed reportable because the occurrence was outside the expected test parameters. The licensee issued event report E-PAL-91-008 to determine the root cause of the event and specify corrective action. The inspector observed that this was a failure to follow procedure along with a loss of the command and control function by the Operations organization. The subsequent performance of the test was satisfactory, as was the performance of the companion test for the other channel, RT-08D.

r. QO-23 Alternate Hot Shutdown Panel Instrumentation Checks

During the performance of QO-23 at cold shutdown conditions, an unplanned reactor trip occurred due to low PCS flow. Two reactor coolant pumps were operating at the time, and the Reactor Protective System (RPS) had been reset to allow turbine testing. The licensee issued event report E-PAL-91-007 to investigate the incident. The trip occurred because QO-23 did not specify that the low flow RPS trips must be bypassed. The procedure inadequacy resulted from the neutron monitoring system engineer's inattention to detail in communicating the effect of FC-829, "Nuclear Instrumentation RG 1.97 Upgrade," to procedure sponsors. It was not recognized that the low flow trip bypass was required to perform the testing with less than four reactor coolant pumps operating. Procedures were revised to avoid recurrence of the conditions and operator training will be conducted to provide understanding of the circumstances of the event.

s. QO-21 Auxiliary Feedwater System Valves, Inservice Test Procedure
T-297 Diesel Generator 1-1 Load Reject

T-298 Diesel Generator 1-2 Load Reject

During the integrated performance of tests QO-21, T-297 and T-298, the inspector observed local pump, valve, and instrumentation performance and response. Significant cycling of AFW control valves occurred during portions of the testing which hampered acceptability of control room data for flows. This occurred due to difficulty in setting controller response for this condition of high flow and low steam generator pressure. The test was partially performed again during hot shutdown, with acceptable performance from the controllers and instrumentation.

The integrated performance of QO-21 and T-297 required starting the "A" motor-driven auxiliary feedwater pump following the loading of the "C" bus onto the 1-1 diesel generator. When this was performed, a momentary undervoltage occurred on "C" bus, due to the existing load of approximately 1100KW on the bus. The undervoltage condition was low enough to start the opposite train 1-2 diesel and swapover of the Y-01 instrument bus to its emergency supply. During the sequence, the Volume Control Tank outlet valve closed but the suction valve to the charging pumps from the Safety Injection and Refueling Water (SIRW) tank did not open. This resulted in the trip of one charging pump on low suction pressure before the SIRW tank valve could be opened by the operator. Operator responses to the unanticipated events were satisfactory. A rerun of T-297 for this portion of the test was performed and initial conditions were duplicated except for placing 1-2 diesel in a run condition. Data recorders and test personnel were stationed to observe events and operators were prepared to take necessary compensatory actions. The results of the earlier event were duplicated. The overspeed portions of the T-297 testing were performed satisfactorily.

The licensee evaluated the problems noted during the performance of T-297 under event report E-PAL-91-005. The key findings were as follows:

(1) The voltage drop measured during the test was consistent with calculations for the loading conditions.

(2) The start of DG 1-2 and the transfer of Y-01 was consistent with the measured bus "C" voltage drop.

(3) Deenergization of Y-01 results in de-energization of relay 63X/LS-0204, which caused the VCT outlet valve MO-2087 to close and the SIRW tank to charging pump suction valve MO-2160 to open. The relay was normally energized with the contacts for both valves in the open position.

(4) Troubleshooting of valve MO-2160 opening circuitry and relay operation confirmed no abnormalities.

The licensee concluded that de-energization of Y-01 during the transfer was long enough for the VCT outlet valve contacts to close and "seal-in." However, the contacts for the SIRW valve did not

close prior to the relay being re-energized following the transfer. Since the potential existed for the observed problem during any automatic or manual transfer of Y-01, the licensee replaced relay 63X/LS-0204 with two relays. These have a time delay of approximately 2 seconds such that activation would not occur during a transfer of Y-01 power sources. Two time delay relays were required instead of one since a single time delay relay with sufficient contacts could not be found prior to startup. The relays were installed under a Specification Change (SC), SC-91-044.

The licensee also addressed problems with failure of charging pump P-55C to trip on low suction pressure during the original test (pump P-55-B did trip). Troubleshooting activities indicated inconsistent time delays for the P-55-B suction pressure trip switch; it was replaced. The "C" pump pressure switch operated within specifications.

The corrective action review board (CARB) requested System Engineering to evaluate other circuits involved in the Y-01 transfer to determine if any others are subject to misoperation of equipment due to momentary deenergization during the transfer.

t. RO-12 CHP Spray System Tests

During the performance of test RO-12, seven components were found in an improper position after the first test on the left channel. The test was continued and proper test results were obtained during left channel test two through test six and during a repeat of test one. The seven components were reviewed in accordance with deviation report D-PAL-91-047. They were not designed with internal "seal-in" circuitry to keep them in the closed position once the pressure on the pressure switches dropped. "Seal-in" of the relays for these and other components requires both the activation of a "seal-in" circuit on the relays and closed contacts on the containment high pressure reset switch. The reset button is pushed after each test. The licensee speculated that the pushbutton contacts did not pass current during the initial test but did during subsequent tests. The corrective action consisted of replacing the pushbutton switch for the left channel containment high pressure reset function.

u.
T-186	Auxiliary Feedwater Turbine K-8 Overspeed Trip Test and Governor Setting
T-187	Auxiliary Feedwater Turbine K-8 and Pump P-8B Performance
T-203	Auxiliary Feedwater Turbine Inlet Pressure Control
QO-29	P-8B Auxiliary Feedwater System Pump and Valves Inservice Test Procedure

The inspector observed the performance of T-186, T-187, T-203 and QO-29 for pump P-8B, the Turbine Driven Auxiliary Feedwater (TDAFW) pump. The tests were conducted successfully. The performance was satisfactory to meet test acceptance criteria. The testing involved feeding steam generators at high flow rates for several minutes to gather the required data. The inspector noted that this led to difficulties in maintaining primary system temperature and pressurizer

pressure due to the steam required to run the TDAFW pump and injection of cold water into the SGs. At one point, during the performance of T-203, pressurizer level decreased to the pressurizer heater trip setpoint of 36 percent level (from a starting point of 42 percent). During subsequent testing with the same operator crew, the inspector observed that pressurizer level was increased prior to test initiation in preparation for the primary system shrink. Additional attention was also given to charging pump flow rate and secondary system steam discharge (MSIV bypass valves, SG blowdown, etc.) during the testing. However, during testing performed several days later, the inspector observed that another shift crew did not prepare the primary system for the shrink. This resulted in pressurizer level decreasing to the point where heater trip was experienced. The inspector discussed the advisability of adding a precautionary note to the procedures with the plant operators and the system engineer. This would draw attention to the primary system shrink and possible preparations to counteract its effects on equipment operability. A test procedure improvement form was initiated by the licensee to incorporate such advisory notations.

v. Summary

(1) The inspectors observed control room and field activities, shift turnover and shift briefing activities, and coordination of test activities by Operations test directors. Additionally interactions between Operations test personnel and system engineering test engineers, and the performance of Operations personnel during evolutions were observed. The problems noted with command and control, adherence to procedures, and attention to procedure details occurred during the early phases of testing at cold shutdown conditions. These types of problems did not occur during subsequent phases of testing. Indeed, the Operations staff overall exhibited a high degree of professionalism and "ownership" of plant equipment and evolutions. The inspector observed the Plant Operations Manager reviewing the weaknesses observed during the above mentioned events. He then communicated his expectations for safe and deliberate operations with each oncoming shift at shift briefings. Following these briefings, the inspector observed heightened attention to detail by operators in the conduct of subsequent tests.

(2) A self-assessment of diesel generator testing and maintenance practices (discussed in Paragraph 5e "Maintenance") was undertaken by the licensee. Weaknesses were also identified in recognizing the impact of plant modifications on special test procedures and Technical Specification surveillance procedures as described in Paragraphs m. and r. above. The licensee concurred with the need for additional attention to this aspect of test performance and was in the process of addressing a QA audit finding of a similar nature.

(3) One factor in the difficulties observed during the cold shutdown testing phase was the integration of special testing with Technical Specification surveillance testing. The specification

of integration points between test procedures was performed on the shift where the testing was to be conducted. This would more properly be accomplished earlier during the planning phase for the testing. The licensee stated that this consideration would be addressed in future test planning.

No violations, deviations, unresolved or open items were identified.

5. Maintenance (62703, 42700)

Maintenance activities in the plant were routinely inspected, including both corrective maintenance (repairs) and preventive maintenance. Mechanical, electrical, and instrument and control group maintenance activities were included as available.

The focus of the inspection was to ensure that the maintenance activities reviewed were conducted in accordance with approved procedures, regulatory guides, industry codes or standards, and in conformance with Technical Specifications. The following items were considered during this review: Limiting Conditions for Operation were met while components or systems were removed from service, approvals were obtained prior to initiating the work, activities were accomplished using approved procedures, and post maintenance testing was performed as applicable.

The following activities were inspected:

a. The inspector performed a review and walkdown of maintenance activities associated with replacement of the K-8 steam turbine driver for the "B" Auxiliary Feedwater Pump under SC-90-083 and WO 24801746. The work was performed under one work order which was open for approximately six months. The licensee indicated that, for future work of this magnitude, consideration would be given to dividing the work into discrete phases. This would allow for easier following of various phases of the project.

   The inspector found that come-alongs had been used to align the steam inlet pipe with the turbine inlet flange. The system engineer explained that adjustment of line hangers (spring cans and rigid turnbuckles) was subsequently performed to bring them within specification and minimize undue stress on the turbine flange. No further concerns were identified.

   During hot shutdown testing activities, the turbine driver appeared to perform properly, requiring only minor adjustments. During the performance of T-186, leakage occurred at a connection on the turbine casing drain line to valves MV-FW 510 and MV-FW 861. Additionally, the pipe union to steam trap ST-0512 was loose. The pipe union was successfully tightened, but the threaded joint in the drain line could not be tightened due to the downstream piping being welded. A work order was initiated to repair the leaking joint, and subsequent operation was successful.

b. The inspector conducted a walkdown of the 1-2 DG during the 8-hour run associated with MO-7A-2. Several vibrating nuts and bolts on

cylinder connections to exhaust manifolds were observed. This was identified to the auxiliary operator, who contacted maintenance personnel to review the deficiency for operational impact. Work Request (WR) 256345 was initiated to tighten and torque the observed loose bolts. The WR only identified loose bolts on 3R and 4R cylinders, while three were observed (3R, 4R, 1L) by the inspector following shutdown of the engine. A fourth suspected loose bolt on cylinder 9L was also not identified. Subsequent review of WO 24101068, after its initial planning, revealed that only the 3R and 4R bolting was addressed. Review of maintenance records back to 1980 for the 1-2 diesel found that no work had been performed on the subject cylinders or exhaust manifolds. However, a loose bolt had been found previously on 1-1 diesel (WO 24901312, March 1989) which had been replaced. Review of the tech manual for the engine revealed no requirements for periodic tightness check of exhaust manifold bolting.

The inspector identified the planning deficiency in WO 24101068 to maintenance personnel. In conjunction with the system engineer, they expanded the scope of the work to include all exhaust manifold bolting on both diesels. This satisfactorily resolved the concerns of the inspector. This appeared to be an isolated instance where generic consideration of corrective actions was not applied to other similar equipment during the planning phase.

c. "C" Safety Injection Tank (WO 24101704) did not alarm at the low level setpoint.

While evaluating a ground, the licensee determined that the low level float switch for the "C" Safety Injection Tank was inoperable. Boric acid had leaked past a metal to metal seal and eventually corroded the switch. A "blue" check identified insufficient seating surface. The float switch was replaced. A "blue" check of the new float switch revealed sufficient seating. The licensee examined the other tanks and confirmed that there was no leakage. During the evaluation, the licensee identified that the work group installing new low level float switches had questioned the fitup of the float to the tank. The work group had addressed the questions to the engineer staff, who eventually authorized installation of the float. This was a line item for evaluation on internal corrective action report D-PAL-91-066. This is an open item pending the licensee's evaluation to determine engineering involvement (Open Item 255/91005-01(DRP)).

d. Air Line to CV-510, "Main Steam Isolation Valve" was leaking (WO 2401854).

During auxiliary operator rounds, the operator found a leak at a joint in the copper air line to the air accumulator for CV-0510. The licensee determined that a temporary repair was required since loss of air to the accumulator could result in valve closure and a plant trip. The licensee installed a temporary patch and brace and successfully secured the leak. Initially, the WO had authorized the installation of a form and the injection of sealant to stop the air leak. This was deleted when the patch and brace were found acceptable. The sealant uses heat to solidify and since the air system is at

ambient room temperature an external heat source would be required. The maintenance procedure - MSM-M-25, "Repair of Gas or Liquid Leaks on Non-Q listed Equipment" - does not have an applicable section that covers this application. In fact, MSM-M-25 only addressed repair of steam leaks. The WO modified MSM-M-25 to use external heat and specified a maximum temperature of the form and adjacent pipe. This was not a procedure change method that was recognized by Administrative Procedure 10.41, "Procedure on Procedures". The inspector considered this a potential violation of the administrative requirement on procedure changes. However, by the time the inspector had reviewed the WO, the repairs had been stopped. This was identified to the maintenance department, who modified MSM-M-25 to include this type of repair. The maintenance department indicated that this was the only example of a WO making a procedure change. The inspector provided this example to the NRC inspectors performing a maintenance team followup inspection. In addition, this was discussed at the exit interview. The licensee was encouraged to review the planning for the repair activity and to ensure that work planning was not making unauthorized procedure changes.

e. The inspector met with plant management on February 22, to discuss the diesel generator maintenance and testing program. Recently, the inspector had observed a number of indicators which may indicate a declining trend. These were:

(1) Return to service of Diesel Generator 1-2 with a cylinder fuel rack disengaged. (Reference Inspection Report No. 50-255/90039(DRP) - Paragraph 4.d.)

(2) Difficulty in setting cylinder timing for Diesel Generator 1-2 and the return to service of Diesel Generator 1-2 without priming the fuel line.

(3) Testing problems associated with both diesel generators while performing T-246 and T-247. (Reference Paragraph 4.m, "Surveillance" of this report.)

(4) Incorporation of the requirement into T-303 to obtain engine compression readings without considering the effect on the machine. (Reference Paragraph 4.o, "Surveillance" of this report.)

As a result of this meeting and other observations made by the licensee, a task force was formed to provide an independent assessment of recent diesel generator maintenance and testing practices. The primary results were discussed with the resident inspectors and are documented below.

Question 1. Is there a trend in the failure to return diesel generators to service following maintenance?

The task force concluded that a trend was not readily apparent. Management's practice was to minimize diesel generator starts by combining post maintenance and

operability testing. Combining this practice with the low threshold for a corrective action document could give the appearance of a trend.

The inspector agrees and has no more questions.

Question 2. Are the diesel generator maintenance documents matched to the skills of the workers?

The task force concluded that the skill of the workers and procedures are not matched.

Apparently, the diesel generators' high reliability was the combined effect of System Engineers and maintenance scheduling. The task force determined that training by the vendor had not been conducted in a number of years. This has resulted in only a few trained workers still in the department. A number of recommendations were made to improve performance.

At the exit interview, the licensee was reminded that the skill of the craft and the technical level of the procedure must be matched. If not, the procedures required by Technical Specification 6.8 by reference to Reg Guide 1.33 are not adequate and the licensee is in violation of Technical Specification 6.8. In addition, the licensee was reminded that a declined rating in Emergency Preparedness in SALP 10 was partially due to lack of training.

Question 3. Are the testing procedures technically adequate?

The task force found that the Technical Specification surveillance tests are adequate. However, the special tests appear to be lacking some of the precautions necessary to perform them. It appears that the Technical Specification tests get a different review than the special tests do. The inspector notes that this observation applied to other special tests as evidenced by the problems discussed in Paragraph 4, "Surveillance".

The task force conclusions appear to address the inspectors concerns. Evaluation of the licensee response to these concerns will be observed as part of inspector's routine maintenance and surveillance observations.

No violations, deviations, or unresolved items were identified. One open item was identified.

6. Design Changes (37700)

From the beginning of restart testing through initial power ascension, the inspector observed plant conditions related to the replacement steam

generators and associated modification activities. These observations and testing results were discussed with Operations and System Engineering personnel. It was noted that control rod drop times were not affected by the increased reactor coolant flow, and total PCS flowrates were within expected values. The higher PCS flow resulted in increased sensitivity of the differential pressure instrumentation for detecting low PCS flow. The adjustment of the low flow pre-trip alarm setpoints for the RPS to avoid spurious alarms was discussed in Paragraph 3.e, "Operational Safety Verification." PCS leakrates were very low indicating good integrity of the primary systems. The ease of establishment of initial condenser vacuum indicated a high degree of leaktightness. Transient test results (T-305 and T-306) indicated adequate response of steam generator level controls without unanticipated transient responses.

The inspector reviewed other facility changes (FC) and observed the following weaknesses:

a. During the performance of QO-21, the inspector observed the "valving-in" of local instruments which were installed under FC-847 during the last refueling outage for collection of ISI data. When gauge FI-0737A was "valved-in", the operators and the inspector noted that the instrument went offscale low. Inspection of piping to the instrument revealed that the high side and the low side piping were reversed.

   The inspector discussed FC-847 with the licensee and reviewed construction drawings 8-JG-177, Sheet 24, Revisions 1 (7/29/89) and 2 (1/9/91). Revision 1 was released prior to installation, and Revision 2 was released after installation to incorporate field changes. The FC was in the final process of construction closeout prior to turnover to Operations. The local instruments were installed by tapping existing instrument lines from Flow Elements FE-0737 and FE-0736 to FT-0737A and FT-0736A. The inspector noted that the drawings were partial isometrics with just enough detail to allow installation of the gauges. Several configuration errors were noted on the drawings. One error was a reversed flow configuration for FE-0736 and associated instrument piping; this error was present on both Revision 1 and Revision 2 of the drawing. The other error was an incorrect valve number for instrument root valve FW-631A (indicated as FW-637A) on Revision 2 of the drawing; the valve was correctly identified on Revision 1.

   The inspector questioned whether there was a construction error associated with the installation of FI-0737A. He was informed that the constructor possibly identified the proper tapoffs through reference to the instrument root valves without regard to flow direction. If so, the installation for FI-0736A was correct in spite of the drawing error. In regard to FI-0737A, deviation report D-PAL-91-053 not only identified the installation error but also noted that the instrument root valve tags were interchanged. If the constructor had keyed off the root valve tags, this could have resulted in the erroneous installation. However, the constructor could not confirm that this was actually the case.

The review of this FC showed a lack of configuration control for the subject drawings, and weaknesses in post-work walkdowns by the licensee. The licensee had not identified the interchanged valve tags or the improper piping for gauge FI-0737A.

The inspector also learned that rework was required on two other ISI instrument installations under the same FC. These were the LPSI system, DPI-0323, P-67A Differential Pressure and DPI-0322, P-67B Differential Pressure. The responsible engineer for the FC was contacted. The engineer informed the inspector that the original design intent was to provide an isolation valve to the local instrument. This would allow local instrument isolation without rendering the control room differential pressure gauges inoperable. However, construction drawings prepared by engineering designers did not include the necessary isolation valve. The discrepancy was not realized until walkdowns were conducted during the present refueling outage. No deviation report was issued for this condition.

The inspector discussed the lack of a deviation report with plant management indicating that installation instructions were issued that did not actually reflect the intended design. A deviation report was issued.

b. On March 7, the inspector reviewed the hot shutdown testing portion of test procedure T-FC-685-001 for the anticipated transient without scram (ATWS) trip modifications performed under FC-685. The inspector informed the Project Test Supervisor that a modified test procedure did not satisfy the purpose of the test. The acceptance criteria 6.2.1, states that "The effect of the ATWS/auxiliary feedwater actuation signal (AFAS) modification on starting pump P8B has been successfully tested during hot shutdown . . . ." The Project Test Supervisor suspended the test and confirmed that activation of the ATWS solenoid valves (SVs) was required. EDC-30 was issued to revise the test procedure and the test was successfully conducted.

The purpose of the hot shutdown testing was to confirm proper operation of TDAFW control valve CV-0522B and TDAFW pump under simulated ATWS conditions. The licensee previously performed a functional test of the system on February 13. Valve opening stroke times were measured to determine if flow control valve CV-0522F was properly set. Closing stroke times determined if a check valve, located in the connecting line between the existing solenoid valve SV-0522B and SV-0522C exhaust ports and the new solenoid valves SV-0522G and SV-0522H installed for the ATWS actuation, unduly lengthened valve closure. The check valve was designed to direct air flow from the ATWS solenoid valves through separate piping from the existing system upon actuation, but allow blowdown of the air through both sets of solenoid valves during closure.

Based on the results of the cold shutdown testing, the AFW system engineer requested that the check valve between the two portions of the system be removed to minimize rundown time of the turbine driven AFW pump. EDC-27 was prepared to remove the check valve from the interconnected systems and close flow control valve CV-0522F. This

resulted in the elimination of the separate path from the output of the ATWS SVs to the input of CV-0522A. EDC-29 was also issued in the same time frame to modify the ATWS test procedure for hot shutdown. Valve opening and closure times were measured through actuation of the manual handswitch on the control board, rather than by pulling DC control power fuses. The original intention was to cause activation of the ATWS SVs by pulling the fuses. The inspector also noted an administrative weakness. Engineering and QA had signed EDC-27 on February 15. Signatures indicating approval by the SRO/PRC Member and Administrative Review and Approval were obtained by telecon on March 6, just prior to performing the modification to remove the check valve.

The inspector reviewed the control room "redline" print for control air to CV-0522B (M-205, Sheet 2, Revision 27), on March 9. It had not been corrected for the change implemented through EDC-27 on March 6, 1991. The Document Control Center drawings had also not been revised. The licensee corrected the drawings and issued deviation report D-PAL-91-060 on March 13. This addressed the missed revisions and the concern for any additional discrepancies between installed modifications and plant critical drawings.

The observations above confirm a continued weakness in the area of attention to detail on the part of the engineering design organization, consistent with the findings of the recent SALP cycle 10 report.

c. On March 15, Consumers Power Company announced the formation of a new design engineering organization and a new department responsible for the Quality Assurance audits and the off-site review function. This change was licensee initiated and intended to improve plant performance. The new department heads were Consumers Power employees. The design engineering organization will be located at the Palisades site. Both departments will report to the Vice President for Nuclear Operations. To support the formation of the new departments, a number of organization realignments and personnel changes were made. The reorganization is to be discussed during a Consumers Power and Region III Management meeting at Region III Headquarters on April 18.

No violations, deviations, unresolved or open items were identified.

7. Regional Initiatives (71707, 71710)

a. Containment Sump

In response to a request from Region III management, the inspector reviewed licensee records to confirm that the containment sump had been cleaned and inspected as required during the refueling outage. Review of Work Order 24002149 indicated that the sump was cleaned and inspected on February 20-21, 1991.

b. Containment Hydrogen Recombiners

In response to a request from Region III management, a review of the design and operation of the licensee's hydrogen recombiners was conducted.

Post-LOCA hydrogen control at the Palisades Plant is assured by two 100 percent redundant and independent electric recombiner units. Each unit contains an electric heater bank and was located inside of the containment building. The associated class IE power supply panel and control panel for each unit were located in the cable spreading room of the auxiliary building.

The electric hydrogen recombiner system is essentially a passive safeguards system with no moving parts. Following a LOCA, operation of the recombiner units is initiated from the control panel. Containment atmosphere is drawn through the units by natural convection, caused by the high temperature of the heating elements. The air temperature in the unit is raised, and the recombination of hydrogen with oxygen occurs. A more detailed description of the system is in the Final Safety Analysis Report.

The Limiting Conditions for Operations and the associated surveillance requirements are addressed by Technical Specification 3.6.4. and Table 4.2.2.

No violations, deviations, unresolved or open items were identified.

8. Management Interview

The inspectors met with licensee representatives - denoted in Paragraph 1 - on March 15 and April 16, 1991 to discuss the scope and findings of the inspection. In addition, the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection was also discussed. The licensee did not identify any such documents/processes as proprietary.

Highlights of the exit interview are discussed below:

a. Strengths noted:

(1) Conservative action to remove the unit from service when a Safety Injection Tank level float failed (Paragraph 3.b, "Operations").

(2) Willingness to secure a power increase and resolve primary coolant system low flow pre-trip actuation (Paragraph 3.e, "Operations").

(3) Overall Operations professionalism and ownership of plant equipment and evolutions (Paragraph 4.v.(1), "Surveillance").

(4) Involvement of Operations management in stressing adherence to correct operating practices (Paragraph 4.v.(1), "Surveillance").

b. Weaknesses noted:

(1) Operations procedure adherence inadequacies (Paragraphs 4.p, 4.q, "Surveillance").

(2) Inadequate incorporation of plant modifications into surveillance and special tests (Paragraphs 4.m, 4.r, "Surveillance").

(3) Inadequate development and review of test procedures and procedure revisions (Paragraphs 4.m, 4.n & 4.o "Surveillance").

(4) Weaknesses in integration of special and surveillance testing activities (Paragraphs 4.u & 4.v.(3), "Surveillance", summary).

(5) Inadequate maintenance planning to resolve deficient equipment conditions (Paragraph 5.b, "Maintenance").

(6) Procedure modification by the work order (Paragraph 5.d, "Maintenance").

(7) Inattention to detail in modification design and inadequate walkdowns of modification installations (Paragraph 6.a, "Design Changes").

(8) Lack of configuration control (Paragraphs 6.a, 6.b, "Design Changes").

(9) Inadequate modification test procedures (Paragraph 6.b, "Design Changes").

c. The 50.72 Notifications were discussed. Two of the notifications will have additional reviews when the licensee event reports are reviewed (Paragraph 3.d., "Operations").

d. The licensee was asked to evaluate removal of potentially oil soaked dirt/dust from the containment during the next outage (Paragraph 3.g.(1), "Operations").

e. The open item (Paragraph 5.c, "maintenance") was discussed. This item should be resolved when the deviation report is closed.