U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos: 50-275/90-23 and 50-323/90-23

Docket Nos: 50-275 and 50-323

License Nos: DPR-80 and DPR-82

Licensee: Pacific Gas and Electric Company
77 Beale Street, Room 1451
San Francisco, California 94106

Facility Name: Diablo Canyon Units 1 and 2

Inspection at: Diablo Canyon Site, San Luis Obispo County, California

Inspection Conducted: September 2 through October 13, 1990

Inspectors: C. M. Trammell, Acting Senior Resident Inspector

K. E. Johnston, Resident Inspector

Approved by: P. J. Morrill 9 NOV. 1990
P. J. Morrill, Chief, Reactor Projects Section 1 Date Signed

Summary:

Inspection from September 2 through October 13, 1990, (Report Nos. 50-275/90-23 and 50-323/90-23)

Areas Inspected: The inspection included routine inspections of plant operations, maintenance and surveillance activities, follow-up of onsite events, open items, and licensee event reports (LERs), as well as selected independent inspection activities. Inspection Procedures 30703, 35702, 37700, 37702, 37828 42700, 62702, 71707, 82301, 92700, 92701, 92702, 92720 and 93702 were used as guidance during this inspection.

Safety Issues Management System (SIMS) Items: None

Results:

General Conclusions on Strength and Weaknesses:

Quality Assurance concluded an extensive safety system functional inspection (SSFI) type audit of the component cooling water system. Both QA and the responding organizations, the plant staff and design engineering, committed considerable efforts and resources to the audit. QA had findings in the areas of design, implementation of design, operations and maintenance. This effort appears to be the most successful QA SSFI audit to date.

Significant Safety Matters: None.

Summary of Violations and Deviations: None.

Open Items Summary: One enforcement item was closed.

DETAILS

1. Persons Contacted

J. D. Townsend, Vice President, Diablo Canyon Operations & Plant Manager
* D. B. Miklush, Assistant Plant Manager, Operations Services
M. J. Angus, Assistant Plant Manager, Technical Services
B. W. Giffin, Assistant Plant Manager, Maintenance Services
W. G. Crockett, Assistant Plant Manager, Support Services
* W. D. Barkhuff, Quality Control Manager
T. A. Bennett, Mechanical Maintenance Manager
* D. A. Taggert, Director Quality Support
* T. L. Grebel, Regulatory Compliance Supervisor
* H. J. Phillips, Electrical Maintenance Manager
R. C. Washington, Instrumentation and Controls Manager
* J. S. Bard, Work Planning Manager
* J. A. Shoulders, Onsite Project Engineering Group Manager
M. G. Burgess, System Engineering Manager
S. R. Fridley, Operations Manager
R. Gray, Radiation Protection Manager
E. C. Connell, Assistant Project Engineer

The inspectors interviewed several other licensee employees including shift foremen (SFM), reactor and auxiliary operators, maintenance personnel, plant technicians and engineers, quality assurance personnel and general construction/startup personnel.

*Denotes those attending the exit interview.

2. Operational Status of Diablo Canyon Units 1 and 2

During the report period, both units remained at full power, except for brief periods where power was reduced to facilitate the cleaning of main condensers and intake tunnels. Additionally, Unit 1 reduced power to 30% on October 4 to repair a leaking oil reservoir on reactor coolant pump 1-4 (see section 4).

An emergency drill was staged on October 3, 1990. Although an emergency preparedness inspection was performed (Inspection Report 50-275/90-25), the NRC did not participate in the drill.

3. Operational Safety Verification (71707)

a. General

During the inspection period, the inspectors observed and examined activities to verify the operational safety of the licensee's facility. The observations and examinations of those activities were conducted on a daily, weekly or monthly basis.

On a daily basis, the inspectors observed control room activities to verify compliance with selected Limiting Conditions for Operations (LCOs) as prescribed in the facility Technical Specifications (TS). Logs, instrumentation, recorder traces, and other operational records were examined to obtain information on plant conditions and to evaluate trends. This operational information was then evaluated to determine if regulatory requirements were satisfied. Shift turnovers were observed on a sample basis to verify that all pertinent information of plant status was relayed to the oncoming crew. During each week, the inspectors toured the accessible areas of the facility to observe the following:

(a) General plant and equipment conditions.

(b) Fire hazards and fire fighting equipment.

(c) Conduct of selected activities for compliance with the licensee's administrative controls and approved procedures.

(d) Interiors of electrical and control panels.

(e) Plant housekeeping and cleanliness.

(f) Engineered safety feature equipment alignment and conditions.

(g) Storage of pressurized gas bottles.

The inspectors talked with operators in the control room and other plant personnel. The discussions centered on pertinent topics of general plant conditions, procedures, security, training, and other aspects of the work activities.

b. Radiological Protection

The inspectors periodically observed radiological protection practices to determine whether the licensee's program was being implemented in conformance with facility policies and procedures and in compliance with regulatory requirements. The inspectors verified that health physics supervisors and professionals conducted frequent plant tours to observe activities in progress and were aware of significant plant activities, particularly those related to radiological conditions and/or challenges. ALARA consideration were found to be an integral part of each RWP (Radiation Work Permit).

c. Physical Security (71707)

Security activities were observed for conformance with regulatory requirements, implementation of the site security plan, and administrative procedures including vehicle and personnel access screening, personnel badging, site security force manning, compensatory measures, and protected and vital area integrity. Exterior lighting was checked during backshift inspections.

No violations or deviations were identified.

4. Onsite Event Follow-up (93702)

a. Leaking Reactor Coolant Pump 1-4 Lower Motor Bearing Lube Oil Reservoir

On October 4, 1990, the licensee reduced Unit 1 power to repair a leak in the reactor coolant pump (RCP) 1-4 lower motor bearing lube oil reservoir. Earlier that day, an inspection revealed that a fitting, where the bearing thermocouple exits the oil reservoir, was leaking. Electrical maintenance performed a temporary repair to stop the leak.

The lube oil leak first became evident on August 18, 1990 when a control room alarm indicated a lower motor radial bearing low lube oil level. Oil was added on August 20, 1990 and the alarm cleared. Between August 20 and October 4, approximately eight gallons of oil were added to the 25 gallon reservoir. During this time period, the licensee was unable to determine the location of the leak. Until October 4, licensee personnel observed little evidence of lost oil in the RCP general area or in the oil collection sump. Prior to October 4, as compensatory measures the licensee performed the following:

- A video camera was installed to monitor the oil level sight glass, allowing operators to trend oil level.
- Lower motor radial bearing vibration and temperature measurements were trended. As oil levels dropped between fillings, bearing temperatures increased approximately 8 degrees.
- A review of the fire protection plan was conducted. The licensee determined that 10 gallons of lube oil had been assumed in the combustible loading calculation.
- Discussions with the motor vendor were held to determine the potential effects of lube oil entering the stator. It was concluded that in the quantities observed, the oil would have no effect on the stator and that aside from a motor fault, there were no ignition sources.
- A temporary standpipe was added to allow the remote filling of the oil reservoir. This was done because radiation levels were approximately 9 rem/hour near the fill point.

Trending of oil level changes and reservoir fillings indicated that the magnitude of the leak increased from approximately one-half quart per day to three quarts per day in late-September. Although the licensee had performed several prior inspections, the first clear evidence of oil in the RCP general area was observed on October 4. The licensee reduced reactor power to 30 % to perform a more thorough inspection and at that time identified the leaking thermocouple fitting.

Following the temporary leak repair, the licensee cleaned leaked oil from around the motor cubicle. Some oil was observed to have collected in the motor stator. This had been expected since the 10,000 cfm motor ventilation fan takes its suction from the area below the oil reservoir. An evaluation, performed by engineering, with input from the motor vendor, determined that continued operation was acceptable. The licensee has scheduled a permanent fix to the thermocouple fitting to be performed during the next refueling outage.

b. Design Commitment Not Implemented for the Control Room Ventilation System Chlorine Detectors

On September 26, 1990 the licensee issued a Justification for Continued Operations (JCO 90-18R0) concerning the seismic qualification of the Control Room Ventilation System (CRVS) chlorine detectors. It was determined that a design feature had never been implemented. The design feature was to have a failure of the chlorine detectors initiate a switch of the CRVS to a mode which protects against a chlorine gas release. Since the chlorine detectors were not seismically qualified, this feature provided a CRVS fail-safe if the chlorine detectors failed during a seismic event.

The JCO provided compensatory measures to allow continued operation. Although a chlorine detector failure did not initiate a CRVS mode switch, it did provide a control room alarm. The annunciator response procedures for both the earthquake and the chlorine detector failure alarms were modified to instruct the operators to initiate a CRVS mode change if a chlorine detector failure occurred coincident with an earthquake.

Design engineering initiated a non-conformance report (NCR DCO 90-EN-N022) on September 24, 1990 and was planning to submit a Licensee Event Report.

During a review of the NCR, the inspector noted that this problem had first been identified by design engineering on May 16, 1990 while they were preparing a design change for ventilation instrument setpoints. Although it was recognized as a potential Quality Evaluation (QE) issue on that date, no apparent action was taken until September. This was discussed with plant management at the exit meeting as possibly another example of a problem review not performed in a timely manner.

These types of problems were the subject of an October 10, 1990 management meeting. The licensee committed to review this particular example to understand why it had not been dispositioned in a timely manner and to discuss how recent program changes would address this example.

The inspector will follow up the licensee's actions in a review of the LER.

c. Discharge of Fire Protection Cardox System

On September 20, 1990, the control room received indication that the diesel generator carbon dioxide (cardox) fire protection system had discharged into the diesel generator (DG) 1-3 room. The licensee was in the process of testing the system, but had not expected a discharge. No one was located in the room at the time. Subsequent inspection did determine that the system had discharged.

The licensee initiated a non-conformance report (NCR DCO-90-SS-N063). At the end of the report period, the root cause had not been confirmed. However, the licensee had been able to reproduce the sequence of events which preceded the discharge and had determined that a characteristic of the cardox discharge logic had probably caused the discharge.

Basically, the licensee found that the DG room cardox test could be completed without a timing relay (which actuates an area alarm, the cardox main header valve, and local area valve) completing its full cycle. If the timing relay for any DG room has not completed its cycle following a test, the testing of a subsequent DG room may result in an indavertant discharge to the first room.

The licensee has taken three steps to address this problem.

- The testing procedure was revised to require a pretest check of the status of the timing relays.
- Indication at the timing relays was enhanced to more clearly show their status.
- A review of the design of the cardox system logic was initiated to understand its basis.

The inspector will follow the completion of the NCR process.

d. Diesel Generator 1-3 Failure During Testing

On September 21, 1990, following the successful completion of its monthly start test, DG 1-3 began to unexpectedly unload. Operators separated the generator from the bus and tripped the diesel. It was subsequently discovered that the DG fuel oil booster pump belt had broken.

The failed belt inadvertently was not retained for subsequent root cause determination. As a result, the licensee took the following steps to determine root cause:

- The mechanics were interviewed. They stated that the belt had failed because two adjacent rivets had fractured, resulting in the belt becoming unlinked.
- An inspection of the other four DGs showed no other belt problems.

- o A belt used for 18 months and a new belt were rotationally stressed to failure. In both cases the failure was in the belt material and not the rivets.

- o Plant and industry DG operating history were reviewed. No other similar failures were identified.

- o The vendor was contacted; they were not aware of belt problems.

Based on the above, the licensee concluded that this was an isolated failure. The licensee determined that this event was reportable to the NRC under Regulatory Guide 1.108 as a "non-valid" failure.

The discarding of the failed belt was also addressed in the NCR. Specifically, the maintenance manager conducted a meeting with the craft to emphasize the need to save failed parts on important equipment.

The inspector will followup the licensee's actions with regard to the submittal of the special report.

No violations or deviations were identified.

5. Maintenance (62703)

The inspectors observed portions of, and reviewed records on, the following maintenance activities to assure compliance with approved procedures, technical specifications, and appropriate industry codes and standards.

- o Reactor Coolant Pump (RCP) 1-4 motor lower radial bearing lube oil reservoir leak.

- o Centrifugal Charging Pump (CCP) 2-1 lube oil system problems.

Additionally, during the week of September 17, 1990, a regional inspector reviewed several maintenance activities. These are discussed in Inspection Report 50-275/90-24.

No violations or deviations were identified.

6. Surveillance (61726)

By direct observation and record review of selected surveillance testing, the inspectors assured compliance with TS requirements and plant procedures. The inspectors verified that test equipment was calibrated, and acceptance criteria were met or appropriately dispositioned.

a. RHR System Water Hammer Testing

On October 2, the inspector observed the performance of a test to establish the cause of recurring excessive pressure spikes (hereafter referred to as a "water hammer") in the Residual Heat Removal (RHR) system.

Approximately two years ago, the licensee established a task force to review the cause of a recurring water hammer in the Unit 1 RHR system (Inspection Report 50-275/88-31). The water hammer event, which design engineering later established to be occurring in both units, normally occurred within seconds of starting an RHR pump. At that time, design engineering determined through system instrumentation and inspection, that the force of the water hammer was not damaging to the system.

Prior to the Unit 1 refueling outage, design engineering suspected a leaking isolation valve was the cause. When the valve was disassembled during the outage, there was evidence of past minor leakage. However, following the outage and the refurbishing of the valve, the RHR system continued to hammer following a pump start. It was postulated that the valve could still be leaking, perhaps due to its configuration.

To resolve the issue, the engineering proposed to freeze seal the line downstream of the valve to establish a leak-tight condition. Prior to the freeze seal, the RHR system was instrumented for vibration and pressures. A pump start was also performed and a water hammer was observed and video recorded. Mechanical maintenance then established a freeze seal on the downstream line.

The inspector noted that the licensee had performed an engineering analysis of the stress of a freeze seal in conjunction with the magnitude of the pressure surges previously measured. The inspector also noted that the licensee's freeze seal procedure MP M-54.3 was consistent with the guidance in the NRC Inspection Manual Part 9900 Technical Guide on freeze seals.

After a freeze seal was established, the same RHR pump was restarted. A water hammer was again observed and was approximately the same magnitude as the previous event.

The inspector will continue to follow the licensee's investigation of these RHR water hammer events.

No violations or deviations were identified.

7. <u>Design Changes and Design Change Installation and Testing (37700 and 37828)</u>

In the past year the resident and regional inspection staff has focused attention on the design change process including the installation and testing of temporary and permanent design changes. Inspection reports containing design change related findings are listed below.

89-31 -Containment recirculation design discrepancies.

89-34 -Non-seismically qualified scaffolding erected above vital batteries.
-Bolting of 4KV bus cubicles.

90-05 -Intake security modifications.
-Rescheduling of the Unit 2 Boron Injection Tank removal.
-Uncovering Auxiliary Saltwater piping outside the protected area.

90-08 -Fuel handling building bridge crane problems.

90-13 -Auxiliary Feedwater turbine driven pump overspeed trip.
-Reactor trip on turbine trip (P-9) setpoint questions.
-Instrument air compressor overcurrent trips.

90-15 -DG droop relay design package.

90-19 -Outage design package review.

90-24 -Auxiliary Feedwater check valve leak repair problems.

The following issues were discussed in these inspection reports:

- The adequacy of communication between design engineering and the plant staff regarding information on normal plant operating configuration.
- The adequacy of instructions provided to craft implementing design changes.
- The turnover of system information to operations and maintenance following the implementation of a design change.
- Design engineering lacking a sufficiently self critical attitude towards identified problems.

The inspectors noted progress in the some areas such as the system design criteria documents, the QA system audits, and the increased communication between design and system engineering. However, the inspectors will continue to emphasize the role of engineering and the design change process in future inspections.

8. Quality Assurance Component Cooling Water Safety System Function Audit Review (40500)

On October 4, 1990, the inspector attended the Quality Assurance (QA) component cooling water (CCW) Safety System Functional Audit Review (SSFAR) exit with plant and engineering management.

The QA SSFAR involved the efforts of 14 auditors for 9 weeks performing a "vertical slice" audit of the CCW system. Auditors were drafted from plant and design engineering, operations, and maintenance as well as QA in-house auditors and contracted personnel.

QA concluded that while they found the CCW system to be "operable", there were a number of issues which needed to be addressed. Two NCRs and fifteen Quality Evaluations were initiated as a result of the audit. Findings were made in all areas; the adequacy of portions of the design

basis, implementation by operations of the design basis, maintenance of equipment, and even the availability of parts.

The audit also concluded that while the design criteria memorandum (DCM; design basis document) program produced a good product, it found examples where the CCW DCM lacked specificity. Additionally, the audit identified that verification of the implementation of the DCM into plant operating practices and procedures was weak.

The inspector observed that both QA and the responding organizations, (plant staff and design engineering), committed considerable effort and resources to the audit and that the resulting product was good. However, the inspector noted at the NRC exit meeting that benefits of the efforts could not be fully realized unless the identified weaknesses were resolved in a timely manner.

9. Open Item Follow-up (92703, 92702)

Scaffolding Erected Over Vital Batteries Without a Review of Seismic Qualification (Enforcement Item 50-323/89-34-01, CLOSED)

The inspector reviewed the licensee's response to the Notice of Violation and found it acceptable. In summary, the licensee has formalized the seismic review of scaffolding erected around vital equipment. Additionally, the licensee has provided training to those involved in implementing the program.

During walkdowns subsequent to the Notice of Violation, the inspector has observed that the licensee has implemented its seismic review program for scaffolding. This item is closed.

10. Exit (30703)

On October 22, 1990 an exit meeting was conducted with the licensee's representatives identified in paragraph 1. The inspectors summarized the scope and findings of the inspection as described in this report.