U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/92028(DRS)

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, MI

Inspection Conducted: December 7 through 18, 1992

Inspectors: _____ 1-21-93
A. Dunlop Date

_____ 1-21-93
M. Huber Date

Approved By: _____ 1-21-93
J. M. Jacobson, Chief Date
Materials & Processes Section

Inspection Summary

Inspection conducted December 7 through 18, 1992 (Report No. 50-255/92028(DRS))
Areas Inspected: Announced safety issues inspection of the licensee's incorporation of Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Test Programs," into the Inservice Testing (IST) Program (TI 2515/114), the licensee's program on check valves (TI 2515/110), and licensee's self-assessment in these areas.
Results: The inspection disclosed one violation (Paragraph 3.d.(1)) concerning inadequate testing of check valves and two unresolved items (Paragraphs 2.b.(3) and 4.) concerning testing of the auxiliary feedwater (AFW) pumps at low flow rates and use of the firewater system as an alternate water supply for the AFW system. Based on this inspection, TI 2515/114 and TI 2515/110 are considered closed.

The licensee demonstrated a strength in the following areas:

- The use of basis documents for defining the bases for inservice testing procedures.
- Scope of the check valve program was considered excellent
- Participation in the Nuclear Industry Check Valves Committee demonstrated a proactive attitude.

The licensee demonstrated a weakness in the following areas:

- The administrative procedures controlling the check valve program were not comprehensive.
- Inconsistencies between the requirements defined in the IST program and how they were incorporated into the implementing surveillance procedures.

TABLE OF CONTENTS

DETAILS

1. Persons Contacted

Consumers Power Company

*K. Osborne, System Engineering Manager
*P. Donnelly, Plant Safety and Licensing Director
*B. VanWagner, Predictive Testing Supervisor-System Engineering
*B. Low, Performance Engineering Supervisor-System Engineering
C. Grady, Mechanical Maintenance Superintendent-Planning
*T. Rexius, Operations Analyst
*T. Watson, Senior Nuclear Operations Analyst
E. Tiffany, Senior Engineer
*G. Schrader, Senior Engineer
W. Roberts, Licensing Engineer
R. Brzezinski, Performance Specialist
*D. Sternberger, System Engineering
D. Bixel, Senior Engineer
*J. Johns, System Engineering
J. Thielmann, Maintenance Engineering
*C. Hillman, Licensing
*W. Nummerdor, Senior Nuclear Performance Assessor

U. S. Nuclear Regulatory Commission (NRC)

J. Heller, Senior Resident Inspector
*D. Passehl, Resident Inspector

*Denotes those personnel attending the exit meeting on December 18, 1992.

2. Inservice Testing (IST) of Pumps and Valves

The inspectors reviewed IST procedures and completed IST surveillances. Generally, the methods used for the testing of pumps and valves were adequate. The test frequencies and acceptance criteria were specified and provisions were made for prompt operability determinations. Areas reviewed are discussed below.

a. Scope

The scope of the licensee's IST Program appeared adequate. Selected plant systems were reviewed to ensure that the program scope was adequate. Technical Specifications (TS) and Emergency Operating Procedures (EOPs) were also reviewed to evaluate the program scope.

The licensee maintained surveillance test procedure basis documents to detail the bases for the procedures used to perform IST. The procedures included bases for the testing methodology, details of measured parameters, acceptance criteria, and calculations to support the acceptance criteria. The use of basis documents provide a controlled reference for the procedure development and was considered a strength.

b. Pump Testing

Generally, testing of pumps in the licensee's IST program was performed in accordance with ASME Code requirements and the recommendations of Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs." Problems and issues noted during the inspection are discussed below.

(1) Inservice Testing Procedures

The surveillance procedures used to perform IST on the auxiliary feedwater (AFW) pumps P-8A and P-8B did not incorporate a positive means for ensuring that the reference flow rate was established prior to collecting pump performance data. The pumps were tested when running on recirculation flow, which was a fixed orifice system. The system configuration was such that the reference flow rate was assumed to be constant from test to test, however, the reference flow rate should be verified and recorded. Verification of the reference flow rate is necessary to ensure that IST was performed correctly and that system or component degradations can be more accurately evaluated and trended.

The licensee was incorporating controls to verify the reference flow rate into pump testing procedures at the time of the inspection.

(2) Duration of Tests

While observing testing of the component cooling water pumps, it was noted that the interpretation of the surveillance procedure by the operators did not ensure that the Code required test duration was accomplished. After the step in the procedure where the reference flow was established, a 15 minute run time was specified before continuing with the test. However, the operators interpreted the time to begin at the start of the pump instead of when the flow was established. If the pump was

operating for more than 10 minutes prior to establishing the required flow rate, the interpretation of the test procedure by the operators would not be consistent with IWP-3500 of the ASME Code. IWP-3500, "Duration of Tests", requires that each pump shall be run at least 5 minutes under conditions as stable as the system permits prior to measuring test parameters, which in this case, would be the point at which the reference flow was established.

The licensee implemented changes to the pump testing procedures to more clearly define the requirement for a 5 minute holding time.

(3) Low Flow Testing

The AFW pumps were tested in accordance with ASME Code, Section XI to verify operability. The required testing was performed in accordance with TS surveillance procedure MO-38, "AFW system IST Procedure," which tests pumps P-8A and P-8B at minimum flow through the recirculation line. Testing of pumps at low flow conditions, however, may not ensure the capability of a pump to perform adequately under design basis conditions. The low flow testing methodology could result in the failure to detect a degraded pump.

The licensee could incorporate full flow testing of pumps that are currently tested under low flow conditions to resolve this issue. Currently, pumps that are tested under low flow conditions for TS surveillance purposes are full flow tested every 10 years or when major maintenance was performed. However, the 10 year testing frequency would not provide adequate assurance that pumps can still meet their design basis requirements.

On May 14, 1990, the licensee performed Special Test T-187 Revision 3, "AFW Turbine K-8 and Pump P-8B Performance," following the replacement of the pump rotating element. The full flow test data showed reduced pump performance when compared to the original pump curve. The T-187 test was again performed on March 5, 1991, following the replacement of the turbine. The test data confirmed the results of the previous test.

Since the testing of a pump under low flow conditions may not demonstrate the capability of a pump to perform under design basis conditions, any

further degradation in addition to the already reduced margin resulting from the replacement of the rotating element may not be detected over the 10 year period between full flow tests. Further review is required by the NRC to determine if testing under low flow conditions is adequate to ensure operational readiness of pumps. Therefore, this item will be considered an unresolved item pending NRR review (50-255/92028-01(DRS)).

c. Valve Testing

In most cases the guidance of GL 89-04 was incorporated into the IST program for valves. Concerns regarding the testing of check valves is documented in paragraph 3.d of this report. An issue was also noted regarding position indicator verification testing.

Remote position indicators were verified by the licensee at least once every 2 years to ensure that valve operation was accurately indicated, with the exception of certain valves that have two sets of indicators. For these valves, stroke time testing was alternated between the two locations on a quarterly basis, but the procedure did not verify that the indicators at both locations were checked on a 2 year interval. Section XI of the ASME Code requires that valves with remote position indicators be observed at least once every 2 years to verify that valve operation was accurately indicated. The interpretation of the requirement by ASME was that only the indications that were used for stroke timing needed to be verified. NRC's position was that remote position indicators be observed to verify that valve operation was accurately indicated wherever a valve could be operated during an accident. The licensee initiated a deviation report (DR) D-PAL-92-276 to review testing of valves with position indicating lights.

3. Check Valve Program

a. Scope

The scope of the check valve program was considered to be excellent. It included valves identified in INPO SOER 86-03, "Check Valve Failures or Degradation," all additional safety-related check valves, and balance of plant check valves based on maintenance experience. A total of 257 check valves were included in the program with a 100% overlap with the IST program.

Administrative procedures lacked much of the detail needed to control the check valve program. However, the inspectors did not find any concerns with the implementation of the program. The licensee had previously recognized this issue and has initiated plans to upgrade many aspects of the program.

Participation on the Nuclear Industry Check Valve Committee (NIC) by licensee personnel was a positive commitment and should allow the check valve program to evolve based on expanding industry experience and knowledge.

b. Design Application Review

The design evaluation guidelines were developed by Combustion Engineering from information in INPO SOER 86-03 and EPRI report NP-5479, "Application Guidelines for Check Valves in Nuclear Power Plants." Guidelines included items such as valve sizing, type, location/orientation, flow stability, seat leakage, erosion/corrosion, and maintenance history. The evaluation was thorough and consistent with the SOER.

c. Disassembly and Inspection (D/I)

All valves in the check valve program were scheduled to receive D/I for preventive maintenance to obtain baseline data. The valves were scheduled to be completed in a 6 year period (4 refueling outages). Based on results of these inspections, the scope of valves requiring D/I for subsequent outages would be determined.

The inspection sheets were reviewed and appeared to be effective. Revisions to the inspection sheets were in progress to make them more user friendly. Information recorded include full-stroke tests, as-found condition of valve internals, internal valve measurements, and disposition of recorded conditions. The inspection sheets did not identify acceptable internal valve component measurements for comparison due to a lack of available vendor data. The check valve coordinator received copies of the inspection sheets for review, trending, and historical documentation. No specific maintenance procedures were used for disassembly; however, "Periodic and Predetermined Activity Control" sheets (PPACs), developed for repeatable tasks, did contain information such as match marking components prior to disassembly. Inspections were conducted by the maintenance workers and reviewed by the maintenance supervisor prior to valve reassembly.

The check valve D/I results for previous refueling outages were reviewed. A total of 120 valves have received D/I. In most cases the documentation of the inspection results was good. Many small valves were replaced after D/I rather than repaired, based on engineering evaluations.

The post-maintenance testing (PMT) requirements were identified on the work request and included applicable IST requirements. An exception to this was for valve CK-FW729 where the IST requirements were not identified in the PPAC. A review of tests performed prior to returning the valve to service concluded that the applicable testing had been accomplished. The licensee had previously commenced a program to upgrade PPACs to ensure these type of issues were identified and corrected.

d. Inservice Testing

Check valve testing, in most cases, was in accordance with GL 89-04. Exceptions were identified and noted below. Testing to verify that a valve would go to its full open position was accomplished by establishing the full flow required by the respective system or by D/I. Verifying that a check valve would close was accomplished by seat leak testing, pressurizing downstream piping and verifying no pressure increase on the upstream piping, D/I, or for pump discharge check valves, verifying no reverse pump rotation.

(1) Procedure QO-8B, "ESS Check Valve Operability Test," was written to verify that the primary coolant system (PCS) and low pressure safety injection (LPSI) check valves opened when full flow was applied through the valves. The test acceptance criteria required 1200-1800 gpm as the full flow rate for both sets of valves. However, EGAD-EP-01 listed the required flow rates for the PCS check valves and the LPSI check valves as 8000 gpm and 1500 gpm, respectively. Based on these rates, the testing to verify that the valves fully opened, was inadequate. This was considered to be a violation of ASME Section XI (50-255/92028-02(DRS)).

During the inspection the licensee identified that the required flow for the LPSI valves should be 1600 gpm based on accident analysis data. A review of previous test data indicated that for three of the four LPSI check valves a flow of 1600 gpm had been obtained on at least one occasion.

Deviation Report D-PAL-92-280 was initiated to address this issue. Operability of the valves did not appear to be a concern based on the continued partial stroking of the valves and the valves being included in the check valve D/I program.

(2) EGAD-EP-01 stated that CK-ES3331 would be back flow tested in Procedure QO-19, "HPSI Pumps and ESS Check Valve Operability Test". This valve however, was not identified on the procedure cover sheet or within the procedure as being tested. The test did establish flow downstream of CK-ES3331, which should seat the valve, however, check valves upstream of CK-ES3331 prevent positive verification of valve closure based on a flow test alone. The identical valve for the opposite train received D/I to verify its closure test. Several other test procedures reviewed performed adequate backflow testing but did not contain acceptance criteria or documentation that a backflow test was performed. In most cases the test procedure basis document did identify that credit was being taken for backflow testing.

(3) EGAD-EP-01 stated CK-ES3183 and CK-ES3168 would be full flow tested in QO-19. The test procedure only took credit for a partial stroke test. However, the valves did undergo full flow testing in another section of the test, although no credit was taken. The licensee agreed to review the procedures to correct the discrepancies.

(4) Disassembly/inspection of several checks valves was also being used in lieu of testing required by the Code as allowed by GL 89-04. Scheduling of these inspections was per the check valve program requirements of once every 6 years. GL 89-04, however, required valves to receive D/I every refueling outage unless similar valves were grouped and D/I was performed on a sampling basis not to exceed once every 6 years. This issue was identified by the licensee's self-assessment program and AIR A-AP-92-012 was initiated to address the issue.

The lack of documentation for backflow testing and inconsistencies between the IST program and the implementing test procedures appeared to indicate a weakness in the implementation of the program.

e. Non-Intrusive Testing

Non-intrusive testing (NIT) of valves was not part of the check valve program. The licensee had researched use of this technology and determined the first phase of the Palisades check valve program would utilize D/I to develop base-line data. The licensee was continuing to stay up-to-date with advances in this technology through participation in NIC and intended to pursue use of NIT if vendors could demonstrate successful use of the equipment at Palisades. The NRC encouraged the use of NIT in lieu of D/I based on NIC's published results of Phase 1 water testing. In addition, NIT would show valve response under dynamic conditions.

f. Trending

No formal trending program had been established. However, the check valve coordinator was responsible for reviewing D/I results and component measurements. The data that would be used in a formal trending program was being recorded and analyzed for incorporation back into the program.

4. Auxiliary Feedwater Alternate Water Supply

The design basis for the use of the fire water system as an alternate water supply and its inclusion in the TS was under evaluation by the licensee. The TS at Palisades require the fire water and service water systems to be operable and capable of providing water to the suction for the auxiliary feedwater pumps. The EOPs at Palisades call for the use of the fire water and service water systems for providing water to the steam generators when no other sources are available. However, the licensee indicated that no credit was taken in the design basis for use of the alternate supplies to mitigate the consequences of an accident.

More significantly, no analysis or testing exists to verify the capability of the fire water system to provide water to the AFW system. The licensee has initiated action to analyze the fire water system supply to the AFW system to ensure that it could be used, however, the actual design basis needed to be evaluated by the licensee. The evaluation of the design basis and inclusion of the fire water system in the Palisades TS as a backup water supply to the AFW system was considered an unresolved item (50-255/92028-03(DRS)). A response to this item within 60 days of the receipt of this report was requested by the NRC inspectors.

5. Licensee Self-Assessment

The licensee performed self-assessments in the areas of inservice testing and check valve programs. Several issues identified by the inspectors had previously been identified through these self-assessments.

6. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance, or deviations. Unresolved items disclosed during this inspection are discussed in Paragraphs 2.b.(3) and 4. of this report.

7. Exit Meeting

The inspectors met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on December 18, 1992. The inspectors summarized the purpose, scope and findings of the inspection and discussed the likely informational content of the inspection report. The licensee identified none of the documents or processes reviewed by the inspectors during the inspection to be proprietary.