UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report No.: 50-261/90-16

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket No.: 50-261 License No.: DPR-23

Facility Name: H. B. Robinson

Inspection Conducted: July 16-20, 1990

Inspector: S. Sparks 8/2/90
S. Sparks Date Signed

Approved by: [illegible] 8/6/90
G. A. Belisle, Section Chief Date Signed
Test Programs Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, unannounced inspection was conducted in the areas of inservice testing and followup on previous inspection findings.

Results:

Weaknesses were identified for valves in the Component Cooling Water (CCW) System which were not included in the Inservice Testing (IST) Program, and in the area of relief valve testing, paragraph 2.

In the areas inspected, violations or deviations were not identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*C. Baucom, Regulatory Compliance Engineer
*D. Crook, Regulatory Compliance Engineer
*R. Dayton, Technical Support Manager
*E. Harris, Onsite Nuclear Safety
*J. Kloosterman, Regulatory Compliance Director
*R. Morgan, Plant General Manager
C. Moon, Auxiliary Feedwater System Engineer
*S. Pruitt, Senior ISI Specialist
L. Wiegand, Reactor Operator

Other licensee employees contacted during this inspection included craftsmen, engineers, operators, and administrative personnel.

Other Organizations

J. Lane, Sygna Energy Services
J. Victory, Gilbert Commonwealth

NRC Resident Inspectors

*L. Garner, Senior Resident Inspector
*K. Jury, Resident Inspector

2. Inservice Testing (73756)

10 CFR 50.55a(g) and Technical Specification (TS) surveillance requirement 4.0.1.a require that Code Class 1, 2, and 3 pumps and valves be inservice tested in accordance with Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, which specifies testing requirements to assess operational readiness. The licensee's IST Program, TMM-004, Inservice Inspection Testing, dated January 12, 1990, is based on Subsections IWP and IWV of the 1977 Code through Summer 1978 Addenda, except for specific reliefs requested in accordance with 10 CFR 50.55a(g)(5)(iii).

The inspector's review of the IST Program consisted of a comparison of current and planned testing practices to the guidelines contained in Generic Letter (GL) 89-04, Guidance on Developing Acceptable Inservice Testing Programs, dated April 3, 1989. GL 89-04 noted that the licensee is a Table 1 plant, and thus will receive a Safety Evaluation Report (SER) in the near future. The schedule for incorporating the NRC staff positions contained in GL 89-04 for Table 1 plants is keyed to the SER because the licensee needs an opportunity to review the SER before

having to commit to an implementation schedule. The inspector discussed planned revisions to the IST Program for pump and valve testing of components in the CCW system, and general testing methodology, and concluded the licensee has a proper understanding of the general guidance provided in GL 89-04. However, additional inspection would be required to verify testing procedures have been properly revised and implemented.

The inspector reviewed the licensee's implementation of their current IST Program through a review of procedures, plant drawings, and test results that accomplish IST for pumps and valves that are located in the CCW system. The following specific areas were reviewed:

a. Pump Testing

The inspector reviewed IST of the CCW pumps to determine if testing was performed in accordance with Section XI, Subsection IWP requirements. The licensee's CCW system consists of three horizontal centrifugal pumps, and Section XI testing is performed using procedure OST-908, Component Cooling System Component Test (Quarterly), Rev. 17, dated March 31, 1989. Acceptance criteria in procedure OST-908 for flow rate, differential pressure, vibration, and bearing temperature, were verified to be in accordance with Section XI, Table IWV-3100-2. The inspector noted through discussions with IST personnel and review of the testing procedure that if test data falls within the required action range, the pump is immediately declared inoperable. Subsequently, gages may be recalibrated and the test performed again, or an analysis performed that demonstrates that the condition does not impair pump operability and that the pump will still fulfill its function. The licensee's position on pump inoperability is consistent with position 8 of GL 89-04, which states that instrument recalibration is an alternative to replacement or repair, and not an additional action that can be taken before declaring the pump inoperable. The inspector also witnessed the performance of OST-202, Steam Driven Auxiliary Feedwater Pump Test. Test personnel appeared knowledgeable of procedural requirements and all acceptance criteria were satisfied.

The inspector compared recent test results with the vendor head curves for the CCW pumps. Although this comparison is not an ASME Section XI testing requirement, it may provide another source of information on whether the pump has experienced any significant degradation, or whether it can provide sufficient accident flow rate. The licensee stated that this comparison is usually performed after any major pump maintenance which could affect the hydraulic characteristics. The inspector noted that the pumps are operating approximately on the vendor's head curves.

The inspector also discussed possible testing enhancements for pump vibration monitoring. Section XI, Subsection IWP requires vibration monitoring in peak-to-peak displacement, which the licensee accomplishes per IST. However, pump vibration velocity measurements

are considered to provide a better overall indicator of pump vibration problems. This is due, in part, because the overall vibration severity of a component is a function of displacement and frequency, which can also be attained through the measurement of peak velocity. The NRC is currently considering rulemaking to reference ASME Standard OM-6, Inservice Testing of Pumps in Light-Water Reactor Power Plants. This standard would require pump vibration velocity measurements as part of IST. The licensee stated that peak vibration velocity measurements are taken as part of the predictive maintenance program, and notable results are provided to IST personnel. In addition, the licensee stated that a relief request will be submitted with the revised IST Program to perform IST vibration monitoring using the vibration velocity acceptance criteria contained in OM-6.

b. Power Operated Valves

The inspector reviewed the IST Program document, TMM-004, and other testing procedures for valves contained in the CCW system, which included the following:

CC-716A	CC-716B	CC-730	CC-735	CC-739
CC-737A	CC-749A	CC-749B	FCV-626	

The review confirmed that the criteria of Section XI, IWV are specified and implemented in the program and procedures, including:

- Position indication (IWV-3300).
- Valve exercising and stroke timing (IWV-3411).
- Stroke time at quarterly intervals (IWV-3412).
- Stroke time at cold shutdown or refueling outages where relief requests are established. Relief requests stating justification for alternate positions are included in the program document and are based on the positions of GL 89-04, (IWV-3412).
- Fail Safe actuation (IWV-3415).
- Valve failure criteria (IWV-3417).
- Return of components to service (IWV-3416).

The inspector reviewed testing results from 1988 through 1990 and concluded that testing was performed at the required frequency. These records also indicated that subsequent to maintenance or modification, valves were tested prior to return to service.

c. Check Valve Testing

Requirements for full stroke and reverse flow exercising check valves are contained in Section XI, Subsection IWV-3520 of the Code. In addition, specific guidance is contained in positions 2 and 3 of GL 89-04, which discuss forward flow and reverse flow testing. The following check valves in the CCW system were reviewed:

CC-702A CC-702B CC-702C CC-744 CC-721A
CC-721B CC-721C

The inspector noted that check valves CC-721A, B, and C, as well as CC-744, were not in the current IST Program. The purpose of check valves CC-721A, B, and C, is to contain high pressure reactor coolant that could enter the CCW system through leaks in the reactor coolant pump thermal barrier heat exchangers. Failure to prevent reverse flow could expose the low pressure CCW system piping to pressures higher than designed. In addition, check valve CC-744 must open to provide overflow capacity of the CCW surge tank. The inspector concluded that the above check valves should be included in the IST Program. This weakness was also identified in GL 89-04 under position 11, which requests licensee's to review their current IST Program to ensure adequate scope. The licensee agreed to review the above valves as part of their IST Program revision in response to GL 89-04.

The inspector also questioned the reverse flow testing of check valves CC-702A, B, and C, which are located at the CCW pump discharge. The current IST Program identifies these check valves to be reverse flow tested. Review of the current testing procedure OST-908, Component Cooling System Component Test (Quarterly), Rev. 17, dated March 31, 1989, indicated that no pressure instruments were specified, nor was any quantitative values specified for differential pressure across the check valve to verify the reverse flow function. However, as part of the IST Program review for GL 89-04, the licensee had previously identified this procedure to be inadequate, and provided the inspector a draft copy of the revised testing procedure (OST-908). The proposed changes included the identification of pressure instruments, and specified quantitative values for differential pressure.

d. Relief Valve Testing

The requirements for relief valve testing are contained in Subsection IWV-3512 of the Code, which states that setpoint testing shall be in accordance with ASME Performance Test Code (PTC) 25.3-1976. The inspector reviewed IST for the following relief valves located in the CCW system:

CC-707 CC-718 CC-722A CC-722B CC-722C
CC-791B CC-791D CC-791K CC-791J CC-791L

The inspector noted that relief valve CC-707 was not in the current IST Program. The purpose of this relief valve, as described in the safety evaluation of the Final Safety Analysis Report, Section 9.2.2.3, is to provide additional overflow relief for the component cooling surge tank. Valve RCV-609 is blocked open, providing the normal relief path should the surge tank overflow in the event of a large tube side to shell side leak in a residual heat removal

exchanger. If the leak is not isolated from the component cooling loop before the inflow completely fills the surge tank, the overflow could exceed the flow capacity of RCV-609, thereby requiring CC-707 to lift. As such, the inspector concluded relief valve CC-707 performs a safety function in minimizing leakage of contaminated water, and should be included in the IST Program. This is an additional example where the licensee had not reviewed their current IST Program to ensure adequate scope.

The inspector also noted that the licensee did not consider the effects of temperature on relief valve lift setpoint. Section 0.01 of PTC 25.3-1976 states the following:

> It should be noted that if the temperature of the medium used to test the valve differs substantially from the temperature to which the valve is subjected while in service, the opening and closing pressures as well as the blowdown will be different from the test pressures. In this case, it is necessary to develop appropriate corrections for the valve under test to account for these differences which is outside the scope of this Code.

The effect of temperature on lift setpoint has been previously documented in NRC Information Notice No. 89-90: Pressurizer Safety Valve Lift Setpoint Shift. The Notice stated that Westinghouse had observed a shift of 4 to 8 percent on Crosby pressurizer safety valves (PSVs) when setpoints were initially established using a loop seal with 300 °F water, and checking the lift setpoint with steam (approximately 600 °F). The licensee bench tests all relief valves at ambient conditions (approximately 80 °F) using air, nitrogen, or water. The inspector noted the following relief valves which may be affected by temperature:

Valve	Description	Actual Operating Temperature
RC-551A,B,C	PSV	350 °F to 600 °F
RHR-706	Residual Heat relief valve	< 350 °F
CC-722A,B,C	Thermal Barrier Heat Exch. relief	< 200 °F

Due to the issue of PSV setpoint drift, the licensee intends to test the PSVs at actual operating temperature to determine the effect of temperature on the lift setpoint. These PSVs will then be installed during the upcoming refueling outage in September 1990. In the interim, the licensee and Westinghouse have evaluated the effect of possible PSV setpoint drift for Robinson, and determined that the current testing method would result in a slight setpoint drift in the downward direction. The evaluation concluded that no safety concern existed, assuming the PSV drift did not result in PSV lifting prior

to a power operated relief valve (PORV) actuation. The licensee verified this assumption by increasing the reactor coolant pressure to 2335 psig (PORV setpoint) during leakage inspection, and noted the PSVs did not lift.

The licensee stated that their current relief valve testing does not consider the effects of temperature on lift setpoint. In addition, temperature compensation is not identified as a requirement in Section 4.091(c) of PTC 25.3, which pertains to bench testing of relief valves. As such, the licensee took the position that although temperature compensation is considered to be a good engineering practice, it is not a testing requirement. The licensee also stated that the provisions for temperature compensation contained in ASME Section XI, OM-1, Relief Valve Testing, would be effective in March 1991.

The inspector disagreed with the licensee's interpretation of PTC 25.3-1976, and considered temperature compensation for relief valve testing to be a requirement. The issue of temperature compensation is an industry wide concern, and the licensee's actions with regard to the PSV setpoint testing were appropriate. The setpoint drift for the thermal barrier heat exchanger relief valves and the residual heat removal relief valve would probably not be sufficient to prevent their ability to perform the intended safety function. In addition, similar questions have been identified at other facilities, and the NRC is currently evaluating the proper testing media for relief valve testing. Based on the licensee's actions with the PSVs and their intention to comply with OM-1 after March 1991, the licensee's actions were considered satisfactory. As such, a violation for failure to comply with PTC 25.3-1976 will not be issued. However, the inspector concluded that this area was a weakness in that the licensee has not exercised good engineering practice to evaluate the effects of temperature on relief valve lift pressure, and incorporate these effects, if any, into the current IST Program.

Within the areas inspected, no violations or deviations were identified.

3. Action on Previous Inspection Findings (92701)

a. (Closed) Inspector Followup Item (IFI) (50-261/89-01-01): 85-BU-03 Post Maintenance Testing, Provisions to Monitor Valve Performance and D/P Testing of Replacement Actuators

As a result of Generic Letter 89-10, Safety Related Motor Operated Valve Testing and Surveillance, dated June 28, 1989, the licensee was currently revising post maintenance testing procedures to specify the correct post maintenance tests to be performed after valve maintenance. In addition, the licensee was also developing provisions to monitor valve performance throughout the life of the plant. The licensee's GL 89-10 program was currently underway, and as such these programs had not been completed at the time of the

inspection.. However, the inspector confirmed that after major valve maintenance such as actuator replacement, the licensee intends to perform diagnostic testing and/or differential pressure testing to ensure proper valve operation. GL 89-10 post maintenance testing requirements will be reviewed during subsequent NRC inspections.

b. (Closed) IFI (50-261/89-01-02): Revise Procedure CM-106 to Provide for Adjustment of and Documentation of Ring Settings

The purpose of this item was to ensure that the licensee had revised procedure CM-106, Main Steam Safety Valve Maintenance, to document the correct "as-found" and "as-left" ring settings for main steam safety valves (MSSVs). Through discussions with the vendor (Crosby) and internal evaluations, the licensee determined conservative ring settings such that full lift and rated steam flow capacity was achieved. However, a higher MSSV blowdown value would be exhibited during MSSV performance with the recently recommended vendor settings, which required further evaluation. The licensee's additional evaluation concluded that the previously analyzed accident analysis criteria were still bounded with their existing safety analysis.

The inspector verified that procedure CM-106 was revised to ensure that the MSSVs are procedurally maintained in accordance with the discharge capacity capabilities required for all plant evolutions. The correct ring settings identified by the licensee's procedure were a nozzle ring setting of (-20), and a guide ring of level. In addition, the inspector reviewed the previous MSSV maintenance records, and verified the proper settings.

c. (Closed) IFI (50-261/89-01-03): Review of Stroke Time Results by System Engineers and Basis for Valve Full Stroke Limiting Value

The licensee's IST Program, TMM-004, Inservice Inspection Testing, dated January 12, 1990, had been revised to specify that evaluations of possible component degradation (valve abnormal stroke time, maximum stroke time exceeded, pumps that are in the alert or required action range) will be performed by the appropriate engineering personnel, typically the assigned system engineer. In addition, the licensee's evaluation of limiting stroke time values was in progress, and will be completed as part of the GL 89-04 Program revisions.

d. (Closed) Violation 50-261/89-01-04, Failure to Increase to Monthly Surveillances or Take Corrective Actions Following Increases in Stroke Times for Cold Shutdown Valves

The inspector reviewed the licensee's corrective actions in response to the violation, which consisted of a revision of plant procedures to require documentation of evaluation of valve stroke time results

for valves required to be tested in the cold shutdown condition. The violation in particular identified safety relief valve PCV-1716, in which increased surveillance or corrective actions had not been taken. The licensee monitored the stroke time for PCV-1716 during a subsequent test, and did not note any increasing trend. The licensee's actions in response to the violation were considered satisfactory.

e. (Closed) Unresolved Item (URI) (50-261/88-12-01): Adequacy of Forward Flow Testing of Check Valves

This item was identified as a result of testing check valves SI-875A, SI-876A, SI-875C, and SI-876C, in which the licensee did not demonstrate the valves can pass the full accident flow. This issue is addressed in GL 89-04, position 1, in which the NRC staff considers that an acceptable check valve full stroke to the open position may be verified by passing the maximum required accident condition flow through the valve. The inspector discussed testing methodology with the licensee, and in particular check valve testing using accident flow rates to verify full stroking. The licensee concurred with the GL 89-04 position, and was revising IST procedures to satisfy the check valve full stroke GL 89-04 position. The licensee had not received an SER for their IST Program, and as such revised testing procedures had not been completed as of this inspection. Based on discussions with the licensee, the inspector concluded that the planned procedural revisions should properly address check valve full stroking as delineated in GL 89-04. However, subsequent NRC inspection effort would be required to verify the implementing procedures incorporate the provisions of check valve full stroke testing.

f. (Closed) URI (50-261/89-09-04): Resolve What Degree of Maintenance Activity on Check Valves Warrants a Partial Flow Test After Reassembly per GL 89-04

This item concerned post maintenance testing requirements after the licensee disassembled containment spray pump discharge check valve SI-890B. As stated in NRC Inspection Report No. 50-261/89-09, the licensee took the position that a partial flow test would not be required for a limited work scope such as removal and replacement of a bonnet with an attached flapper assembly. However, for check valve SI-890B, the licensee performed additional partial stroke testing prior to returning it to service.

The licensee's position appears contrary to that stated in position 2 of GL 89-04, in which it is specifically stated that partial flow testing quarterly or during cold shutdowns, or after reassembly must be performed, if possible. In addition to the GL 89-04 guidelines, Section XI, IWV-3200 of the ASME Code specifically identifies removal of the bonnet as maintenance, and states that the check valve shall be tested to demonstrate that performance parameters which could be

affected are within acceptable limits. As such, the inspector considered it a Code requirement that partial flow testing must be performed if specified in the licensee's IST Program as the testing methodology to satisfy Code requirements. If the licensee does not intend to perform partial flow testing after valve disassembly, then specific written relief from the testing requirements must be obtained. The inspector discussed these requirements with the licensee.

Within the areas inspected, no violations or deviations were identified.

4. Exit Interview

The inspection scope and results were summarized on July 20, 1990, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results listed above. Proprietary information is not contained in this report. Dissenting comments were received from the licensee in the area of relief testing. Licensee management took the position that the provision for relief valve temperature compensation as identified in PTC 25.3-1976, Section 0.01 is intended as guidance and should be considered good engineering practice, and was a Code requirement.

Licensee management was informed that the following items were closed:

IFI 50-261/89-01-01, paragraph 3.
IFI 50-261/89-01-02, paragraph 3.
IFI 50-261/89-01-03, paragraph 3.
VIO 50-261/89-01-04, paragraph 3.
URI 50-261/88-12-01, paragraph 3.
URI 50-261/89-09-04, paragraph 3.