APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-285/90-37 Operating License: DPR-40

Docket: 50-285

Licensee: Omaha Public Power District
444 South 16th Street Mall
Mail Stop 8E/EP4
Omaha, Nebraska 68102-2247

Facility Name: Fort Calhoun Station (FCS)

Inspection At: FCS, Fort Calhoun, Nebraska

Inspection Conducted: September 17-20, 1990

Inspector: T F Stetka for 10/3/90
M. F. Runyan, Reactor Inspector, Plant Systems Section, Division of Reactor Safety — Date

Approved: T F Stetka 10/3/90
T. F. Stetka, Chief, Plant Systems Section Division of Reactor Safety — Date

Inspection Summary

Inspection Conducted September 17-20, 1990 (Report 50-285/90-37)

Areas Inspected: Routine, unannounced inspection of the licensee's response to TMI Action Item III.D.3.4.3, "Control Room Habitability," and onsite followup of written reports of nonroutine events.

Results: During this inspection, TMI Action Item III.D.3.4.3, Control Room Habitability, was closed. As a result of maintenance repairs and modifications to the control room ventilation system, the control room operators should be protected in the event of any design basis accident to the 30 day radiation doses prescribed by General Design Criterion 19 and Standard Review Plan 6.4.

A weakness was identified in licensee event report (LER) 89-12. The assessment of safety significance and mitigating factors did not meet the intent of 10 CFR 50.73(b)(3).

An inspector followup item regarding stroke testing of the pressurizer power operated relief valves (PORVs) was left open. The issue of whether the PORVs should be tested at normal operating temperature and pressure to demonstrate operability in the once-through cooling mode of decay heat removal will be evaluated further.

DETAILS

1. PERSONS CONTACTED

OPPD

*R. Andrews, Division Manager, Nuclear Services
S. Clayton, System Engineer
*K. Dunham, System Engineer
*S. Gambhir, Division Manager, Production Engineering
*J. Gasper, Manager, Training
*D. Gerence, Lead Secondary Systems Engineer
*L. Kusek, Manager, Nuclear Safety Review Group
S. Lindquist, Station Licensing Engineer
*D. Matthews, Supervisor, Station Licensing
*T. Matthews, Station Licensing Engineer
*W. Orr, Manager, Quality Assurance/Quality Control (QA/QC)
*T. Patterson, Manager, Fort Calhoun Station
*W. Pence, System Engineer, Heating, Ventilation, and Air Conditioning (HVAC)
S. Resch, Special Services Engineer
R. Schwartzbeck, Motor Operated Valve (MOV) Program Engineer
*C. Simmons, Station Licensing Engineer
*T. Therkildsen, Supervisor, Nuclear Licensing

NRC

R. Mullikin, Senior Resident Inspector, Fort Calhoun
T. Reis, Resident Inspector, Fort Calhoun

The inspector also contacted and interviewed other OPPD operations and engineering personnel during the course of the inspection.

*Denotes attendance at the exit meeting conducted on September 20, 1990.

2. LICENSEE ACTION ON PREVIOUS INSPECTION FINDINGS (92701)

(Open) Inspector Followup Item (285/8940-06) PORV Testing

An NRC probabilistic risk assessment (PRA) inspection conducted in November 1989, identified that the two pressurizer power-operated relief valves (PORVs) had not been tested under conditions anticipated during emergency operation in the once-through cooling mode. Once-through cooling (OTC) is the decay heat removal mode of last resort to mitigate the consequences of a total and unrecoverable loss of feedwater (TLOFW) event. In response to a TLOFW event, the operator must cycle the PORVs (before plant pressure causes them to open automatically) to establish the bleed portion of the OTC feed and bleed process.

In response to this finding, the licensee committed to perform PORV stroke tests during the 1990 refueling outage. Although the tests were performed,

they were conducted under cold plant conditions (approximately 130°F, 200 psia). Testing under these conditions did not appear to answer the question raised by the PRA team finding, in that the valves were not tested under conditions approximating the TLOFW accident scenario.

When questioned, the licensee stated that their testing met ASME Section XI requirements for PORV testing with respect to low temperature overpressure protection (LTOP) and noted that testing of these valves at normal operating temperature and pressure (NOT, NOP) was not required. The licensee also expressed concern that the PORVs could be damaged if tested at high temperature and pressure. The licensee was therefore unwilling to commit to PORV testing at NOT and NOP but indicated that testing under these or similar conditions may be initiated as a result of their response to Generic Letter 90-06, "Resolution of Generic Issue 70, Power-Operated Relief Valve and Block Valve Reliability, and Generic Issue 94, Additional Low-Temperature Overpressure Protection for Light-Water Reactors." The licensee's response is scheduled for December 1990. This item will remain open pending resolution of the appropriate testing conditions.

3. TMI ACTION PLAN REQUIREMENT FOLLOWUP (TI 2515/065)

(CLOSED) TMI ACTION ITEM III.D.3.4.3, CONTROL ROOM HABITABILITY MODIFICATION

This Three Mile Island (TMI) Action Item required each licensee to design and construct a control room emergency ventilation system that would limit the radiation dose incurred by control room operators during post-accident conditions to the limits prescribed in General Design Criterion 19 and the guidelines of Standard Review Plan (SRP) 6.4. In October 1986 an NRC Control Room Habitability Review Team (CRHRT) inspected the Fort Calhoun control room ventilation system to assess OPPD's 1981 control room habitability analysis submitted in response to this action item.

The CRHRT observed inconsistences between the analysis and system performance. Specifically, the OPPD control room habitability analysis assumed zero unfiltered inleakage in the filtered air makeup (emergency ventilation) mode; however, the CRHRT detected a measurable flow of unfiltered inleakage under those conditions. The major source of inleakage appeared to have been through dampers communicating with the outside atmosphere, duct joints, and housing joints. The licensee acknowledged that the presence of unfiltered inleakage placed the plant outside the assumptions of the 1981 analysis. Consequently, the licensee issued licensee event report (LER) 87-13 to document this condition and to provide for corrective actions.

The licensee concluded that the air leakage problems of the control room ventilation system resulted from a combination of design, construction, and maintenance deficiencies. Evidently, the system components, including dampers, ductwork, and housings, were not designed to be leak-tight. In addition to unfiltered inleakage in the supply ducting system, testing revealed that air outleakage from the control room through door and wall penetrations was of such magnitude that the control room could not be maintained at a positive pressure

while in the filtered air makeup mode. A positive pressure is needed in the control room area to prevent inleakage from surrounding rooms and the outside atmospnere.

The three major elements of the licensee's corrective action program were: (1) to seal leaks in the control room area as necessary to ensure a consistent positive pressure in the filtered air makeup mode, (2) to relocate the air conditioning units to the control room area to eliminate unfiltered inleakage through the unit housings (Modification MR-FC 81-51), and (3) to replace the existing outside filter unit and fan with redundant filter units and fans, install bubble-tight dampers to isolate the unfiltered outside air duct, install redundant dampers in each flow path between the control room and the outside, and weld outside and recirculation ductwork joints to ensure that the ductwork was leak-tight (Modification MR-FC 87-20). After completing these corrective actions, the licensee submitted a report to the NRC (LIC-90-0449, July 20, 1990) describing the control room ventilation system as modified and tested and the results of a revised radiological analysis showing that control room operators were protected for all design basis accidents.

The inspector verified that the licensee had established compensatory measures to ensure protection of control room operators while corrective actions were in progress. A justification for continued operation (JCO) in letter FC-947-87 (August 10, 1987) stated that control room operators were trained to employ respiratory equipment and consume iodine tablets as necessary to reduce exposure from airborne radiation sources.

The inspector reviewed maintenance orders (MO) 864097, 864129, 864144, 864463, 870012, 871943, 871627, and 875063, each of which involved an effort to seal the control room area to enable the establishment of a positive pressure while in the filtered air makeup mode. These MOs included the installation of door sweeps and weather stripping, the sealing of conduit penetrations, and the sealing of HVAC ducts and housings. The inspector examined the work in the control room area and reviewed test procedure MR-FC-87-20-M3. This test demonstrated that the control room remained at a positive pressure of at least 1/8 inch W.G. in relation to all adjacent rooms and the outdoors while in the filtered air makeup mode of operation.

The inspector reviewed documentation regarding modification MR-FC-87-20, in which new filter units, fans, dampers, and welded ductwork were installed. The updated safety analysis report (USAR), Technical Specifications (TS), plant procedures, and drawings appeared to have been properly revised to account for these modifications. The licensee also considered the electrical load impact and the effect of interfaces with other systems. Training was conducted for plant operators including local operation of the new components. The inspector walked down the system using updated plant drawings and verified that all in-line components and tag numbers were as shown on the drawings. The design and quality of construction of the system appeared to be excellent. Post-modification testing, as documented in test procedure MR-FC-87-20-M3, revealed system performance consistent with the established acceptance criteria.

The inspector reviewed the licensee's most recent report to the NRC addressing control room habitability requirements (LIC-90-0449, July 20, 1990). This report provided a detailed description of the control room ventilation system and results of the revised radiological habitability analysis. The radiological analysis again contained the assumption that no unfiltered inleakage will occur in the filtered air makeup mode of operation. After reviewing plant drawings and taking into account system design and operating pressures, it appeared to the inspector that this is a reasonable assumption. The radiological analysis concluded that 30 day doses to control room operators following the most limiting design basis accident (loss of coolant accident) would be 1.97 rem gamma, 7.6 rem thyroid, and 8.9 rem beta (skin) as compared to the limits of General Design Criterion 19 and Standard Review Plan (SRP) 6.4 of 5 rem, 30 rem, and 30 rem, respectively. The inspector concluded that the licensee had taken adequate measures to ensure the radiological protection of control room operators for all design basis accidents. Consequently, this TMI action item is closed.

4. ONSITE FOLLOWUP OF WRITTEN REPORTS OF NONROUTINE EVENTS AT POWER REACTOR FACILITIES (92700)

(Closed) Licensee Event Report (LER) 89-12, HCV-1386 Setpoint Incorrect

This LER documented the licensee's determination, dated May 2, 1989, that main feedwater isolation valve (FWIV) HCV-1386 to the "A" steam generator was inoperable because of an improperly set torque switch on the valve's motor operator. The valve would not have completely closed before being tripped by the torque switch during a design basis main steamline break (MSLB). This condition is outside the design basis of the plant as presented in the USAR, Chapter 14, which assumes that both safety-related FWIVs close in 35.6 seconds following a design basis MSLB. The operability of these valves is not addressed in Fort Calhoun's Technical Specifications.

The licensee discovered this problem while conducting a routine plant startup. During this evolution, two nonsafety-related FWIVs (HCV-1103, 1104) could not be closed from the control room. When the torque switches on these two valves were determined to be set too low for reliable operation, the settings on the two safety-related FWIVs (HCV-1385, 1386) were also checked since these valves are identical to HCV-1103 and HCV-1104. The torque switch for HCV-1385 was set at a numerical setting of 2.5. The licensee determined that this setting was high enough to permit the valve operator to generate the 47,700 pounds of stem thrust needed to close the valve at a differential pressure of 1500 psid anticipated during a design basis MSLB. The switch setting for HCV-1386 was set at 1.75, which under best-case conditions e.g., well-lubricated shaft, would have tripped the valve operator when stem thrust reached 41,000 pounds. Thus, HCV-1386 would not have completely closed under the conditions of a design basis MSLB. The rapid closure of the FWIVs is needed to prevent a reactor plant overcooling transient following an MSLB.

The licensee reset the torque switches of the three affected valves (HVC-1103, 1104, and 1386) to ensure the availability of adequate stem thrust. The

licensee also verified that all other safety-related valves utilizing motor operators had the torque switch set correctly.

This event resulted from the fact that the stem thrust on the FWIVs could not be measured using available test equipment. The FWIVs are the only valves in the plant to employ Limitorque SMB 4T operators, which do not have upper thrust bearings. Until recently, test equipment designed to measure stem thrust required the presence of an upper thrust bearing. Lately, testing equipment became available which measures stem thrust using a strain gage attached to the stem. This equipment was used to reset the torque switches in response to this event. Since stem thrust on the FWIVs could not be measured in the past, the torque switches could not be reliably set as part of routine valve maintenance. This implies that the FWIVs could have been intermittently outside the design basis of the plant since the time of initial reactor operation. With respect to this implication, the inspector noted a weakness in the LER to fully address the safety significance of the event fully. In addition, 10 CFR 50.73(b)(3) states that the licensee event report shall contain "an assessment of the safety consequences and implications of the event. This assessment must include the availability of other systems or components that could have performed the same function as the components and systems that failed during the event." The LER states that the plant was outside the design basis and that the FWIVs are needed to prevent excessive cooldown of the reactor coolant system (RCS). However, no quantitative or qualitative assessment was made of the potential impact to the RCS nor was any mention made of other components or operator actions which could have mitigated the severity of an unanalyzed MSLB. The inspector noted that this deficiency was apparently an isolated case and would not be expected to recur. The inspector considered the overall corrective actions for the event to be excellent.

The long-term corrective action for this issue is incorporated in the licensee's response to Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance." In response to this letter, the licensee developed and implemented an extensive motor-operated valve (MOV) maintenance plan. This plan includes the following elements: design and document control, procedures, training and operating experience review, testing, preventive maintenance, predictive maintenance, and procurement. The inspector reviewed the MOV maintenance plan and verified that the program will address the adequacy and maintenance of torque and limit switch settings for all MOVs in the plant.

The inspector determined that short and long-term corrective actions for this event were acceptable and that proper implementation of the MOV maintenance plan should preclude recurrence. Consequently, this licensee event report is closed.

(Closed) Licensee Event Report 87-13, "Control Room Habitability"

This LER identified a deficiency in the licensee's response to TMI Action Item III.D.3.4.3, "Control Room Habitability." The description of this LER and an assessment of the licensee's corrective actions are presented in paragraph 3

of this report. Based on inspection activity documented therein, this LER is closed.

5. EXIT INTERVIEW (30703)

The inspector met with Mr. T. L. Patterson and other members of the OPPD staff identified in paragraph 1 at the conclusion of the inspection. At this meeting, the inspector summarized the scope and findings of the inspection. The licensee did not identify as proprietary any of the material provided to, or reviewed by, the inspector during this inspection.