U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-461/94009(DRP)

Docket No. 50-461 License No. NPF-62

Licensee: Illinois Power Company
500 South 27th Street
Decatur, IL 62525

Facility Name: Clinton Power Station

Inspection At: Clinton Site, Clinton, Illinois

Inspection Conducted: April 15 - May 16, 1994

Inspectors: P. G. Brochman
F. L. Brush
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Approved By: Brent Clayton 6/1/94
Brent Clayton, Chief Date
Reactor Projects Branch 1

Inspection Summary

Inspection from April 15 through May 16, 1994, (Report No. 50-461/94009(DRP))
Areas Inspected: Special safety inspection by resident and regional inspectors of licensee actions in plant operations, maintenance, and engineering following the overpower event of April 15, 1994.

Results: One violation was identified (The reactor exceeded the Operating License Maximum Power Level - paragraph 8.0).

Executive Summary

Operations

- The reactor was operated at approximately 109.8% power. This was a violation of the Clinton Operating License (461/94009-01(DRP)).

- Operator immediate response to the event was weak. There were communication and coordination problems within the crew. However, further recovery actions were very good.

Maintenance

- Maintenance personnel were complacent during work on the hydraulic power unit temperature control valve prior to the event.

Engineering

- Engineering performance was very good in determining the root cause of the event.

DETAILS

1.0 Persons Contacted

Illinois Power Company (IP)

*J. Cook, Vice President - Clinton Power Station (CPS)
*R. Morgenstern, Manager - Clinton Power Station
*J. Miller, Manager - Nuclear Station Engineering Department (NSED)
*R. Wyatt, Manager - Quality Assurance
*D. Thompson, Manager - Training
*J. Palchak, Manager - Nuclear Planning and Support
*F. Spangenberg, III, Nuclear Strategic Change leader
*R. Phares, Director - Licensing
L. Everman, Director - Radiation Protection
*P. Yocum, Director - Plant Operations
*W. Clark, Director - Plant Maintenance
*K. Moore, Director - Plant Technical
*W. Bousquet, Director - Plant Support Services
*C. Elsasser, Director - Planning & Scheduling
*R. Kerestes, Director - Nuclear Safety and Analysis
*D. Korneman, Director - Systems and Reliability, NSED
*J. Langley, Director - Design and Analysis, NSED
*J. Sipek, Supervisor - Regulatory Interface

The inspectors also contacted and interviewed other licensee and contractor personnel during the course of this inspection.

* Denotes those present during the exit interview on May 16, 1994.

2.0 Purpose of the Inspection

Review the circumstances surrounding the overpower event of April 15, 1994.

3.0 Event Description

On April 15, 1994, a reactivity excursion occurred due to equipment failure. Reactor power peaked at approximately 109.8%. Power was initially at 100%. No increase in radiation levels or reactor coolant activity were detected.

At 11:15 a.m., the "A" reactor recirculation (RR) flow control valve (FCV) failed fully open. Reactor power rose from 100% to a maximum of 109.8% as indicated by the "A" average power range monitor (APRM). Mean core power was approximately 106%. The FCV moved when the reactor operators (RO) restarted the RR FCV hydraulic power unit (HPU) A2 subloop following a high temperature trip. There are two 100 % redundant subloops for each RR FCV HPU skid. The "B" RO then stopped the A2 subloop and started the A1 subloop. The FCV ramped closed automatically to 47% before the operators stopped its movement. The transient lasted 75 seconds.

The operators returned the FCV to its original position of 57% open and stabilized the plant at 100% power. Operations, maintenance, and engineering performance is discussed in the following paragraphs.

4.0 Event Root Cause

The root cause of the event was the failure of a solenoid valve in the RR FCV HPU A2 subloop. The licensee determined that resin from the HPU hydraulic fluid had accumulated on the solenoid's operating mechanism. This caused the valve to stick in the operate condition. When the HPU was restarted, following the high temperature trip, the stuck solenoid valve caused the FCV to open even though there was a motion inhibit signal present.

Following a similar event in 1989, at another facility, operation of the HPU subloops were rotated on a monthly basis. However, the heat of the solenoid coils caused the resin in the hydraulic fluid to plate out on the mechanism. The licensee's corrective actions to prevent recurrence are noted in paragraph 7.0.

5.0 Operations

Following the HPU overtemperature trip, and after discussions with the other control room personnel, the "B" RO went to the control room back panels to start the A2 subloop. However, he did not inform the "A" RO when he restarted it. Because the "A" RO was reviewing the procedure to reset the FCV motion inhibit signal, he did not see the valve ramp open. This was an example of poor communications and coordination by the operating crew. However, after the initial problems, the operators performance was very good in addressing the problem. The total duration of the event was limited to approximately 75 seconds.

During the inspector's discussions with the operating crew, they stated that they had focused their attention on the "A" RR FCV problem rather than the overall plant conditions. In hindsight, they stated they should have reduced power using either the "B" RR FCV or by manually scramming the plant.

6.0 Maintenance

At the time of the event, a C&I technician was adjusting the temperature setpoint of the "A" RR FCV HPU A2 subloop temperature control valve (TCV). The technician had received permission from the control room for this activity. After turning the TCV adjusting screw 1/2 turn, the technician watched the local temperature indication for approximately 10 minutes. After noting no change, he left for another job. The vendor's manual recommended that the temperature be monitored for an hour. The overtemperature trip followed approximately five minutes later.

Maintenance technicians had been working on the HPU TCV for over a week. The technicians had made a number of adjustments to the valve with no corresponding change in temperature. This, and the lack of a questioning attitude, resulted in complacency by maintenance personnel.

7.0 Engineering

The licensee exhibited good teamwork in troubleshooting the problem concerning the FCV drift. There were relatively few delays and little retracing of steps to confirm results. The inspectors noted that other engineers stepped in when the system engineer's attention was directed at work associated with the replacement of the RR pump seal. This allowed troubleshooting work to continue around the clock. Management was also involved with the troubleshooting effort. The inspector observed good engineering interface with the operating staff and maintenance. The staff engineers involved in the troubleshooting had a good understanding of the FCV system operation.

In retrospect, the corrective actions and root cause analysis on a previous similar problem in 1989, at another facility, did not provide enough information for the licensee to understand and correct the mechanism creating the problem. However, during this investigation, the root cause determination was excellent.

The inspectors concluded that Engineering performance was generally very good.

8.0 Corrective Actions

The licensee's corrective actions include the following:

- The "B" RO was removed from shift work for one week for remediation.
- Training was conducted for operations personnel which included a review of the event, discussions on procedural guidance for operator actions in response to a reactivity excursion caused by a malfunctioning FCV, and operator communications.
- This event will be included in simulator training.
- The A2 subloop solenoid valve will be replaced and subsequently examined after approximately three months of operation to determine if there is any indication of resin buildup.
- HPU Preventative Maintenance tasks were revised to shift subloops on a weekly basis.

The inspectors reviewed the licensee's corrective actions and have no further concerns.

9.0 Conclusion

Clinton Operating Licensee NPF-62, section 2.C.(1), Maximum Power Level", states, in part, "IP is authorized to operate the facility at reactor core power levels not in excess of 2894 megawatts thermal (100 percent rated power)...."

The operation of the plant at approximately 106% mean power level (109.8% maximum APRM power level) was a violation of the Clinton Operating License, section 2.C(1). Based on the licensee's corrective actions, the inspectors have no further concerns. This violation is considered closed.

10.0 Exit Interview

The inspectors met with the licensee representatives denoted in paragraph 1 at the conclusion of the inspection on May 16, 1994. The inspectors summarized the purpose and scope of the inspection and the findings. The inspectors also discussed the likely informational content of the inspection report, with regard to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents or processes as proprietary.