U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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License No:	NPF-62
Report No:	50-461/96005(DRP)
Licensee:	Illinois Power Company
Facility:	Clinton Power Station
Location:	Route 54 West Clinton, IL 61727
Dates:	May 7 - June 17, 1996
Inspectors:	M. J. Miller, Senior Resident Inspector K. K. Stoedter, Resident Inspector
Approved by:	H. B. Clayton, Chief Reactor Projects Branch 5

EXECUTIVE SUMMARY

Clinton Power Station
NRC Inspection Report 50-461/96005(DRP)

This integrated inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers a 6-week period of resident inspection from May 7 - June 17, 1996.

Operations

- Operator actions following a manual reactor scram on June 13 were focused and well coordinated. Additional support by engineering and maintenance aided in determining the root cause of the event (Section O1.1).

- Operations promptly responded to the effects of a step change initiated by the feedwater control system. In addition, plant engineering personnel were effective in identifying that the problem originated in the output of the "B" controller (Section O1.2).

- Miscommunication and a procedural inadequacy resulted in a feedwater oscillation on June 10. Engineering response both prior to and following the oscillation was good (Section O1.3).

- Material condition of the portions of the reactor water cleanup (RT) system inspected was acceptable. Housekeeping was also appropriate considering the radiation levels inside the rooms that were toured (Section O2.1).

Maintenance

- The effect of removing floor access plugs from the "B" RT heat exchanger room was not recognized by maintenance or engineering personnel prior to performing maintenance on the system. As a result, four temperature instruments were inoperable for a time longer than allowed by technical specifications (TS) (Section M1.1).

- The decision to perform scheduled maintenance on the "B" train of control room ventilation prior to repairing a known deficiency on the "A" train resulted in an unplanned entry into TS 3.0.3 and was considered a weakness (Section M1.2).

Plant Support

- A radiation technician acted appropriately and professionally when approaching an engineer who was chewing gum within the radiological controlled area (Section R1.1).

- Thorough pre-job briefings by radiation protection personnel contributed to the efficient performance demonstrated during the recent RT outage (Section R1.1).

Report Details

Summary of Plant Status

The unit operated at 100 percent power for most of the inspection period. On June 13, both reactor recirculation pumps shifted to slow speed and the reactor was manually scrammed due to entering the restricted area of the power-to-flow map. On May 29, the licensee entered technical specification (TS) 3.0.3 and began preparations to shut down the reactor because both trains of control room ventilation (VC) were inoperable. The TS was exited approximately one hour later when the "B" VC train was restored to service (see Section II). Feedwater transients occurred on June 3 and 10; however, there was no adverse impact on plant operations.

I. Operations

01 Conduct of Operations

01.1 Entry into Restricted Area Due to Downshift of Reactor Recirculation Pumps

a. Inspection Scope (93702)

At 17:20 on June 13, control room operators received alarms which indicated that both reactor recirculation (RR) pumps had downshifted to slow speed. The inspector responded to the control room and observed the response by operations, maintenance and engineering personnel.

b. Observations and Findings

Following the downshift of the RR pumps, flow dropped to 28 x 10^6 lbm/hour and reactor power was approximately 42 percent. The control room operators immediately evaluated the situation and initiated a manual scram when it was determined that the reactor was operating within the restricted area of the power-to-flow map.

Immediate actions taken in response to this event were prompt and in accordance with the licensee's procedures. Once the reactor was placed in a stable condition, the operators paid close attention to the cooldown rate and other control room indications. Command and control following the scram was good. The shift supervisor and the other senior reactor operators on shift monitored the status of the recovery actions performed and aided in planning the actions that were yet to be completed.

Maintenance and engineering personnel provided good support to the control room crew following the event. Engineering helped to analyze data recorded during the event and provided additional expertise related to the operation of the feedwater system. Insights provided by maintenance personnel helped identify the root cause of the RR pump downshift.

The licensee determined that the RR pumps downshifted due to sensing a false level 3 signal on two RR low level trip units (1C34K626A&B) which are located within back panels of the control room. During the performance of preventive maintenance task PCIFWM135, a controls and instrumentation (C&I) technician was attempting to test the feedwater low flow trip unit (1C34K618B). As the C&I technician tried to connect his test lead to terminal #9 on K618, he observed a spark on the terminal board. It was believed that the spark resulted from an interruption of continuity due to a loose lead at terminal #9. Because feedwater low flow trip unit 1C34K618B was electrically interconnected with two RR low level trip units, the loss of continuity created a momentary loss of power to the low level trip units which resulted in the false level 3 signal.

c. Conclusions

Operators responded appropriately to the downshift of the RR pumps and the subsequent reactor scram. In addition, follow-up actions by operations, maintenance, and engineering were effective in determining the cause of the event. The inspectors planned to perform additional follow-up actions via their review of the licensee's event report.

O1.2 Response to Feedwater Transient

a. Inspection Scope (71707/37551)

On June 3, 1996, a reactor water level transient occurred due to a step change in an output signal from the "B" turbine driven feed pump (TDFP) controller. The inspectors interviewed operators, reviewed computer data, and reviewed the initial trouble shooting process by engineering.

b. Observations and Findings

The reactor operators received the reactor vessel level low annunciator, observed level at 29 inches, and checked both TDFP controllers. By the time the operator looked up from the controllers, level had dropped to 24 inches and was starting to recover. The "A" TDFP appeared to respond to the transient first followed by the "B" TDFP. As the transient progressed, the reactor operator decreased the master level controller setpoint to stabilize reactor vessel water level. The entire transient lasted less than one minute.

Engineering personnel reviewed the computer data recorded during the event and identified that the transient originated within the output of the "B" controller. After 20 seconds, the output of the "B" controller corrected itself and the system responded appropriately. The "A" controller immediately responded to compensate for the lowering water level.

Initially some licensee personnel believed that the transient may have occurred due to a portable radio transmission in the vicinity of the control system. This theory was disproved since a majority of the

feedwater control system (FWCS) was located in the main control room and portable radios were not allowed in this area. The effect of radio transmissions on the inputs to the FWCS was also ruled out as a contributor since the transient was not observed at the input to the controller.

Two problems with the "B" controller causing feedwater transients were previously observed in February 1995 and again in April 1996. Engineering personnel believe that the problem observed in February 1995 was caused by dirty edge connectors on controller circuit card 1C34-R601B-1. The cause of the controller problem identified in April was traced to a relay which failed due to high resistance on a normally closed contact.

The licensee has proceeded cautiously with troubleshooting while the plant is online since the "A" and "B" controllers share a common signal path. Troubleshooting performed following the June 13 scram did not find any dirty or loose edge connectors. The licensee planned to perform additional troubleshooting efforts at a later date.

c. Conclusions

Operators responded promptly and appropriately to the transient. Engineering's initial review of the transient was effective in narrowing the problem to the output of the "B" controller. The decision not to pursue troubleshooting efforts that may compromise the plant was also appropriate.

O1.2 Problems Encountered with Resin Transfer and Backwash Evolutions

a. Inspection Scope (71707/37551)

The inspectors reviewed actions taken by operations and engineering following a feedwater oscillation on June 10. The evaluation included discussions with personnel involved in the event and a review of the computer data recorded during the oscillation.

b. Observations and Findings

At the beginning of the day shift, operations personnel were tasked with transferring resin from the "C" condensate polisher. In addition, the "C" condensate filter was to be backwashed and tagged out for maintenance. Prior to starting work, engineering personnel briefed the equipment operator (EO) and the control room operator assigned to complete the evolution.

Once the briefing was completed, the EO began transferring resin to the ultrasonic resin cleaning tank. During this evolution, the EO was relieved by another EO who completed the resin transfer without incident.

Tagging out the "C" condensate filter was completed by a third EO. Due to a note on the tagout, the third EO began the condensate filter backwash process in accordance with CPS 3104.01, Section 8.1.2.7. This part of the procedure assumed that a filter would not be backwashed without first having the respective condensate polisher in service. However, the polisher was not in service since the resin was removed prior to beginning the backwash. As the EO opened the filter outlet valves (1CP002C and 1CPMV2A), water was diverted from the condensate system to fill the partially empty condensate polisher.

Following the opening of the filter outlet valves, the control room received an annunciator which indicated that the FWCS was controlling outside of its normal band. The diversion of water discussed above caused condensate header pressure to decrease which created a corresponding decrease in condensate flow to the suction of the feedwater pumps. This resulted in a decrease in feedwater flow and a subsequent lowering of reactor vessel level to approximately 31.5 inches (normal level is 35 inches). The FWCS responded appropriately to this event and system parameters returned to normal in approximately 3 minutes.

c. Conclusions

Discussions with operations personnel indicated that both the second and third EOs were briefed prior to taking control of the condensate polisher (CP) system. However, the effectiveness of the turnover was questionable since the actions performed resulted in oscillations within the feedwater system.

The licensee identified that inadequacies within CPS 3104.01 also contributed to this event since the section which governs backwashing a condensate filter assumed that the respective polisher was in service. A revision to the procedure was planned to ensure that operations personnel verify that a condensate polisher is filled and vented prior to backwashing a filter.

Engineering support both prior to and following the event was good. The CP system engineer provided a briefing to ensure that the first EO and the control room operator were aware of all the activities associated with the tasks they were assigned to perform. In addition, the CP and feedwater system engineers provided input into the troubleshooting session which followed the transient.

02 Operational Status of Facilities and Equipment

02.1 Observations of Reactor Water Cleanup System Condition

a. Inspection Scope (71707)

On June 4, 1996, the licensee began a reactor water cleanup (RT) system outage. Since this equipment is typically inaccessible, the inspectors

used this opportunity to assess portions of the RT system for material condition and housekeeping.

b. Observations and Findings

The material condition of the RT "B" heat exchanger (HX) room was observed following the replacement of leaking drain valves on the HXs. The inspector noted that valves, piping, insulation, and supports appeared properly maintained. Since the room was a high radiation area and personnel entry into the room was seldom, less effort had been placed on housekeeping. Lighting was poor, and the general cleanliness was reduced. However, workers were provided temporary lighting and debris generated by the repair efforts was removed by the workers.

The inspector did question the use of a ladder based on industry safety concerns. The ladder was too short for the application and workers had to use the top step which was at least 3 feet below the mezzanine level they were climbing to. Management had been stressing industrial safety and expressed concern over this observation. A subsequent review by management determined that the workers were cognizant that the method chosen to reach the mezzanine may not have met management's current industrial safety expectations. However, workers were unable to devise another method for reaching the mezzanine which would not be hampered by the space limitations within the HX room. Both management and the workers were reviewing the work area to identify possible future improvements.

Conditions within the "B" RT pump room were similar to those observed in the HX room. The inspector was concerned about a large puddle of water on the floor which appeared to be coming from the room cooler. Engineering personnel planned to observe the operation of the cooler during the next entry into the pump room.

c. Conclusions

Considering the radiation levels of the HX room and the pump room, the equipment was maintained appropriately. Although the housekeeping was not up to the standards of normally accessible equipment, it was acceptable. It appeared that management's industrial safety expectations were not met concerning the ladder and that the issue was not brought to management's attention prior to beginning work in the HX room.

08 Miscellaneous Operations Issues

08.1 Review of Site Specific INPO Evaluation

The inspectors reviewed the June 1996, Institute of Nuclear Power Operations (INPO) evaluation. No safety significant issues were identified and the results were consistent with similar evaluations conducted by the NRC. No additional regional follow-up is planned.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Temperature Indicators Inoperable Due to Removal of Floor Plugs

a. Inspection Scope (62703)

The inspectors reviewed the licensee's finding that four temperature instruments associated with the RT system were rendered inoperable following removal of the floor access plugs in the RT HX "B" room. The inspection included interviews with cognizant personnel and reviews of condition report 1-96-05-068 and critique OP-96-0002.

b. Observations and Findings

On May 29, at 12:00, the floor access plugs for the "B" RT HX room were removed in preparation for a system outage. Under normal conditions, this room was configured as a fully enclosed area. Temperature conditions within the HX room were monitored by four temperature instruments (2 ambient and 2 differential) to provide early indication of a steam leak or possible line break inside the room. Approximately seven hours after the floor access plugs were removed, operations personnel questioned the operability of the temperature instruments since the configuration of the room was changed significantly once the floor access plugs were removed. At 21:28, the HX was isolated until a determination could be made regarding the operability of the temperature instruments.

At 00:20 on May 30, engineering personnel determined both the ambient and differential temperature instruments (1E31-N626A & B and 1E31-N618A & B) should have been declared inoperable in accordance with technical specification (TS) 3.3.6.1, "Primary Containment and Drywell Isolation Instrumentation," once the design configuration of the HX room was changed (i.e., it was no longer an enclosed area). Although actions were taken to comply with TSs when the condition was discovered, the actions were not completed within the allotted time allowed by TSs from the time the floor access plugs were removed.

The licensee documented this occurrence via a condition report and a critique was held to determine possible follow-up actions. A Licensee Event Report (LER) was also being developed at the conclusion of the inspection. This item is considered an unresolved item URI(50-461/96005-01(DRP)) pending the inspector's review of the LER and an evaluation of the licensee's follow-up actions. Possible enforcement actions will be determined following the review of the actions associated with the unresolved item.

M1.2 Both Control Room Ventilation Trains Inoperable

a. Inspection Scope (62703)

On May 31, the inspectors learned that both trains of control room ventilation (VC) were declared inoperable. The inspectors reviewed the licensee's actions associated with this event and discussed this review with management personnel from the maintenance, operations, and engineering departments.

b. Observations and Findings

In November 1995, the vibration velocity of the VC "A" supply fan exhibited a step change to .41 inches/second. From November 1995 through May 1996, the vibration readings for the supply fan fluctuated between .40 to .41 inches/second. Troubleshooting efforts determined that the vibration isolators within the chiller unit were fully compressed. The vibration isolators were replaced in April 1996; however, the vibration velocity remained at approximately .41 inches/second.

Although personnel within maintenance, operations and engineering were aware that the vibration velocity on the "A" supply fan had been within .06 inches/second of a vendor recommended shutdown for approximately six months, they proceeded with the scheduled outage on the "B" train on May 29. The longest run time on the "A" VC train prior to the scheduled 3.5 day VC "B" outage was approximately 24 hours. Before beginning work on the "B" train, the "A" train was started and engineering personnel performed additional vibration monitoring on the supply fan. Results of the monitoring determined a vibration velocity of .41 inches/second. Based on these results, the "B" train was taken out-of-service in preparation for maintenance.

Prior to the actual start of the maintenance activities, a second vibration analysis was performed on the "A" VC train. At this time, the "A" train had been running for approximately five hours. Again, the vibration velocity was approximately .41 inches/second. Approximately 10 hours later, a third vibration analysis was performed which showed that the vibration velocity had increased to .80 inches/second. VC "A" was declared inoperable due to the abrupt step change in vibration velocity and due to the possibility of damaging the system if operation was continued. At this time, the "B" VC train was also inoperable since it was tagged out and the chiller refrigerant was pumped down in preparation for the scheduled outage. Because of the degraded condition of both trains, the licensee entered TS 3.0.3 which requires that preparations for shutting down the reactor be initiated within 1 hour. Approximately one hour later, the "B" VC train was restored and TS 3.0.3 was exited.

The inspectors reviewed the work histories of both VC trains. After determining that the replacement of the vibration isolators did not correct the problems on VC "A," the licensee received assistance from

the vendor on May 4, 1996. The vendor representative suspected that the vibration problem was caused by a faulty outboard motor bearing (due to the design, the fan did not contain bearings). Licensee personnel received replacements for both the inboard and outboard bearings onsite on May 24. However, instead of repairing the degraded "A" VC train prior to taking VC "B" out of service, the licensee scheduled the repairs for VC "A" for June 10.

c. Conclusions on Conduct of Maintenance

Following a reactor scram on April 9, 1996, the licensee determined that the sensitivity to evaluating the impact of online maintenance on plant operations was lacking. The inspectors considered the items discussed above to be two additional examples where the evaluation did not fully consider possible effects on the plant. The failure by engineering and maintenance planning personnel to recognize the results of removing the floor access plugs on the remainder of the RT system demonstrated a lack of questioning attitude. In addition, the decision to perform a system outage which contained corrective maintenance of minor significance instead of repairing a known equipment deficiency on the remaining train demonstrated a lack of safety perspective.

The inspectors were concerned with these events because they continued to identify weaknesses in your ability to plan, execute and control plant configuration while performing maintenance activities online. Although in each case, the licensee was able to establish or reestablish the required plant configuration to support the maintenance activity, the apparent lack of rigor and questioning attitude in planning these events should be reviewed carefully.

At the conclusion of the inspection, the licensee was in the process of documenting the causes and corrective actions for this event in a LER. This item is considered an unresolved item URI(50-461/96005-02(DRP)) pending a review of the licensee's corrective actions. Any enforcement recommendations will be pursued following the inspector's review.

M8 Miscellaneous Maintenance Issues (92700/92903)

M8.1 (Closed) LER 50-461/96003: Failure of procedure to account for a main steam line radiation monitor detector housing as a secondary containment leakage path. On March 5, 1996, control and instrumentation (C&I) technicians identified that during main steam line radiation monitor channel calibration the monitor's detector housing tube penetrates secondary containment. As a result, when the housing tube was opened a breach of secondary containment occurred. Once control room personnel were notified, they conservatively entered TS 3.6.4.1, "Secondary Containment," until the results of an engineering evaluation could be determined.

The engineering evaluation determined that the secondary containment was not operable when the detector housing penetrated the secondary containment barrier. Corrective actions consisted of revising the

respective procedure to identify the impact that the removal of the detector and the housing tube cover has on secondary containment. In addition a sign was installed near the detector housing tube penetration to warn technicians about the impact on secondary containment integrity.

The licensee's review of previously completed work determined that on November 18, 1995, C&I technicians removed a detector housing tube cover for a period longer than allowed by TSs. The failure to maintain secondary containment in accordance with TS was a violation of NRC requirements. However, this licensee-identified and corrected violation is being treated as a Non-Cited Violation consistent with Section VII.B.1 of the NRC Enforcement Policy NCV(50-461/96005-03(DRP)).

III. Engineering

Engineering issues for this inspection period were covered in other sections of this report.

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Observation of Radiation Protection Workers

a. Inspection Scope (71750)

The inspectors observed radiation worker practices during tours and during the reactor water clean up (RT) outage.

b. Observations and Findings

The inspectors observed a radiation protection (RP) technician challenge an employee who had entered the radiological controlled area (RCA) while chewing gum. The technician acted in an appropriate and professional manner and the individual readily acknowledged his error and complied with the technician's directions. The employee was then allowed to continue with his normal work. The RP technician informed his management of the occurrence and management concurred with the actions taken.

The inspectors observed the RP pre-job briefing related to the RT outage. The workers were knowledgeable of the work scope, the location of equipment with respect to high and low dose areas, and the requirements concerning protective clothing. The RP technicians questioned the workers concerning specific aspects of the work to verify that the workers were ready to perform the work efficiently. Following review of the expected doses and the time required to accomplish specific tasks, the workers and the RP technician worked together to establish appropriate stay times and dose limits.

c. Conclusions

The approach used by the RP technician concerning the employee chewing gum in the RCA was effective in promoting radiological safety and in fostering good relations between departments. The interaction during RP briefs for the RI outage were thorough and efficient. The combination of workers being prepared to perform radiological work and the RP technician's ability to assess that preparedness in a succinct manner contributed to that efficiency.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on June 17, 1996. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PERSONS CONTACTED

Licensee

W. Connell, Vice President
R. Morgenstern, Manager - Clinton Power Station
D. Thompson, Manager - Nuclear Station Engineering Department
R. Phares, Manager - Nuclear Assessment
J. Palchak, Manager - Nuclear Training and Support
M. Lyon, Director - Licensing
D. Morris, Director - Radiation Protection
A. Mueller, Director - Plant Maintenance
K. Moore, Director - Plant Operations
D. Antonelli, Acting Director - Plant Support Services
C. Elsasser, Director - Planning & Scheduling
M. Stickney, Supervisor - Regulatory Interface

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 40500:	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 62703:	Maintenance Observation
IP 71707:	Plant Operations
IP 71750:	Plant Support Activities
IP 92700:	Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities
IP 92903:	Followup - Maintenance
IP 93702:	Prompt Onsite Response to Events at Operating Power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-461/96005-01	URI	RT temperature instruments inoperable due to removal of floor access plugs
50-461/96005-02	URI	Both trains of VC inoperable
50-461/96005-03	NCV	Failure of procedure to recognize inoperable secondary containment

Closed

50-461/96003	LER	Failure of procedure to recognize main steam line radiation monitor detector housing as secondary containment leakage path

LIST OF ACRONYMS

C&I	Controls and Instrumentation
CP	Condensate Polisher
DRP	Division of Reactor Projects
EO	Equipment Operator
FWCS	Feedwater Control System
HX	Heat Exchanger
IFI	Inspection Follow-up Item
INPO	Institute of Nuclear Power Operations
LCO	Limiting Condition for Operation
LER	Licensee Event Report
NCV	Non-cited Violation
NRC	Nuclear Regulatory Commission
PDR	Public Document Room
RCA	Radiologically Controlled Area
RP	Radiation Protection
RP&C	Radiological Protection and Chemistry
RR	Reactor Recirculation
RT	Reactor Water Cleanup System
TDFP	Turbine Driven Feed Pump
TS	Technical Specification
URI	Unresolved Item
VC	Control Room Ventilation