U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-461/92020(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: October 27 - December 7, 1992

Inspectors: P. G. Brochman
F. L. Brush
M. J. Miller

Approved By: Richard L. Hague, Chief
Reactor Projects Section 1C

12/9/92
Date

Inspection Summary

Inspection from October 27 through December 7, 1992, (Report No. 50-461/92020(DRP))
Areas Inspected: Routine, unannounced safety inspection by the resident and region based inspectors of licensee actions on previous inspection findings, plant operations, radiological controls, maintenance and surveillance, security, engineering and technical support, safety assessment and quality verification, and management meetings.

Results: Of the seven areas inspected, no violations or deviations were identified in six areas: one violation was identified in the remaining area: (entry into an operational condition with required equipment inoperable - paragraph 3.c). One unresolved item was identified concerning the analysis of potential fires in the offgas charcoal absorber beds (paragraph 2.b).

The following is a summary of the licensee's performance during this inspection period:

Plant Operations

- The reactor operators response on entry into the power-to-flow instability region was excellent. A manual scram was promptly made and no power oscillations were observed.

- The plant entered Operational Condition 2 with the drywell and containment H_2/O_2 analyzer inoperable.

Maintenance and Surveillance

- Additional failures of the reactor feedwater pump throttle linkages occurred. The licensee replaced the bronze bushings with tapered roller bearings.

- An excellent effort by the maintenance and engineering personnel identified a manufacturing defect in the number one service air compressor's fourth stage seal air hole. This problem had caused excessive oil leakage, vibration, and also affected motor bearings.

- Contributing to the operations problem with the H_2/O_2 analyzer was a failure to utilize written procedures and not recognizing that reprogramming a microprocessor was performing maintenance.

Security

- A review of the fitness for duty program did not identify any deficiencies.

Engineering and Technical Support

- An excellent analysis was performed by the engineering staff of overheating of electrical relays utilizing a ganged configuration. The scope of the analysis was expanded beyond the specific concern identified in an NRC information notice and was very thorough.

- A review of the accident analysis section of the Clinton Updated Safety Analysis Report (USAR) indicated that an offgas charcoal adsorber fire had not been adequately analyzed for the potential release of fission products to the environment; and that non-conservative assumptions appeared to have been utilized.

Safety Assessment and Quality Verification

- The quality of a third-party audit of the quality assurance (QA) organization was excellent. Several improvement items and one weakness were identified.

DETAILS

1. Persons Contacted

Illinois Power Company (IP)

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

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 December 7, 1992.

2. Action on Previous Inspection Findings (92702)

a. (Closed) Unresolved Item (461/91018-01(DRP)): Blown fuse in standby gas treatment system (SBGT) affects other components. On August 28, 1992, a fuse failed in a load driver for the SBGT relays. This condition was alarmed and the licensee replaced the blown fuse within 3 hours. A subsequent evaluation indicated that multiple components in Division I would have failed to actuate on valid high radiation or loss of coolant accident signals. The inspectors had requested the licensee evaluate the reportability of this event, the system's conformance to General Design Criterion (GDC) 23, and the information contained in the annunciator response procedures.

The licensee's analysis concluded that this event was not reportable since no technical specification action statements were exceeded, redundant isolation valves existed, or equipment received start signals from other process parameters. The licensee concluded that while selected valves would not fail to their safety position, on a loss of power, that the safety function was designed against a single failure. Therefore, the

failure of one division would not prevent the operation of the other and the plant's design was in conformance with GDC 23.

The licensee did revise its annunciator response procedures and operator training to recognize that the failure of this fuse would affect more components than the SBGT system. Based on the licensee's corrective actions and evaluations, the inspectors have no further concerns. This item is considered closed.

b. (Closed) Open Item (461/92010-03(DRP)): Questions on the design of the offgas charcoal adsorber system. The inspectors had asked three questions on design information for the offgas system, which was contained in the Clinton Updated Safety Analysis Report (USAR). The licensee had responded to the first question and was still evaluating questions two and three. Question one related to the fact that USAR Table 11.3-5 did not consider the possibility of a charcoal fire in the "equipment malfunction analysis".

The licensee stated that a charcoal adsorber fire was an event rather than an equipment malfunction. And that this event was analyzed in USAR Chapter 15. The inspector reviewed the analysis in Section 15.7.1.1 and identified that the assumptions used appeared to be non-conservative and did not reflect the possibility that a high temperature charcoal fire might result in the release of fission products to the environment.

In USAR Section 15.7.1.1.5.2, "Design Basis Analysis," a seismic event was considered as the only conceivable event which would cause significant system damage; and therefore release of radioactive material to the environment. A fire was not considered a reasonable possibility. However, a high temperature fire had already occurred at Clinton and the inspector considered the question moot as to whether a fire was possible.

Given that a charcoal fire is a credible event, the following assumptions need to be considered. First, any radioactivity which had been adsorbed by the charcoal would be released as the carbon matrix was consumed; rather than being retained, as the USAR assumptions stated. Second, the source term used for the analysis might not include the proper quantity of long term fission products retained by the charcoal at the end of plant life. Third, and more importantly, to extinguish the fire, nitrogen gas (N_2) would be used to purge the charcoal beds. However, to purge the N_2 into the beds an outlet path must be available. Consequently, any radioactivity which was released would have an exhaust path to the environment.

The inspector questioned if the USAR analysis accurately addressed this accident and whether releasing the maximum possible, end of life, quantity of fission products stored in the charcoal adsorber beds would result in offsite doses outside of the limits of 10 CFR Part 100, "Reactor Site Criteria." This issue will be followed as Unresolved Item (461/92020-01(DRP)). The issues raised by the

open item all remain open; however, they will be tracked under this unresolved item; consequently, this open item is considered closed.

No violations or deviations were identified.

3. Plant Operations

The unit operated at power until 3:12 a.m. on November 22, 1992, when the unit was manually tripped due to entry into the power-to-flow instability region. The reactor was taken critical on November 24. The reactor operated at power for the remainder of the report period.

a. Onsite Event Follow-up (93702)

The inspectors performed onsite follow-up activities for an event which occurred during November 1992. Details of the event and the licensee's corrective actions developed through the inspectors follow-up are provided below:

Manual Reactor Trip Upon Entry Into the Power-to-Flow Instability Region

At 3:12 a.m. on November 22, 1992, with reactor power at 75 percent, the "B" reactor feed pump (RFP) minimum flow valve failed open, diverting feedwater flow from the reactor. The "A" RFP was out of service to inspect its throttle linkage bearings. The diverted feedwater caused reactor level to drop from the normal level of 36 inches [91.4 cm] to approximately 28 inches [71.1 cm]. The reactor recirculation flow control valves (FCV) then ran back to their minimum position when reactor water level reached the Level 4 setpoint — 30.8 inches [78.2 cm] — coincident with one RFP in operation. The FCV runback decreased reactor power into the power-to-flow instability region. The reactor operator immediately tripped the reactor per procedure. No power oscillations were observed. All systems responded as designed and the unit was stabilized in hot standby.

The minimum flow valve failed open due to a loss of instrument air (IA). The copper IA supply line failed immediately upstream of the fitting connecting it to the valve's operator. The licensee believed this was due to vibration induced stress hardening. The IA lines to both the "A" and "B" RFP minimum flow valves were replaced using stainless steel flexible hoses. The licensee had developed a generic modification, FECN 24523 — in 1989 — to replace copper IA lines after they fail. The licensee intends to inspect other copper IA lines before the end of the next refueling outage and replace susceptible IA lines before a failure occurs. The licensee was also evaluating the operation of the flow control runback to determine if it could be set to a higher value or if it could be disabled if the plant is already operating on one RFP.

The response of the reactor operators was excellent in assessing the situation and promptly scramming the unit before any oscillations began. Operations personnel had recommended before the downpower that control rods be inserted below the 80% rod line on the power-to-flow map; however, management had chosen not to do this. If this had been done the reactor would not have entered the power-to-flow instability region when the FCV ran back; removing the need for the scram. During the subsequent repairs to the B RFP, control rods were left inserted below the 80% rod line.

The inspectors will perform further reviews of this event after the LER is issued.

b. Operational Safety (71707)

The inspectors observed control room operation, reviewed applicable logs, and conducted discussions with control room operators. During these discussions and observations, the operators were alert, cognizant of plant conditions, attentive to changes in those conditions, and took prompt action when appropriate. The inspectors verified the operability of selected emergency systems, reviewed tagout records, and verified the proper return to service of affected components.

Tours of the circulating water screen house and auxiliary, containment, control, diesel, fuel handling, rad-waste, and turbine buildings were conducted to observe plant equipment conditions, including potential fire hazards, fluid leaks, excessive vibrations, and to verify that maintenance requests had been initiated for equipment in need of maintenance.

The inspectors observed plant housekeeping and cleanliness conditions and verified implementation of radiation protection controls and physical security plan.

c. Operational Condition Change With a Hydrogen/Oxygen Analyzer Inoperable

At 8:56 p.m. on November 23, 1992, the reactor entered Operational Condition (OC) 2, "Startup". At 9:20 a.m. on November 24, 1992, operations personnel discovered that the Division II drywell and containment H_2/O_2 analyzer was inoperable. On November 22, 1992, operations personnel had requested that maintenance personnel run the Division II H_2/O_2 analyzer through its calibration cycle to verify it was working properly. To accomplish this task, maintenance personnel had to reprogram the microprocessor - which controlled the analyzer - to execute a calibration cycle at that time, rather than the usual time of 8:10 a.m. each day. This task was successfully completed and at 10:30 a.m. maintenance personnel then reentered the commands to return the monitor to its normal routine. However, the maintenance technician who performed this task made a personal error and transposed two numbers in the commands he entered. This rendered the analyzer inoperable. This

condition was not recognized until November 24, 1992, after the unit was started up.

There were several causes to this event:

1. The controller for the H_2/O_2 analyzer was not designed to support the performance of a calibration check on demand, but required that the controller's software be reprogrammed.

2. Neither operations nor maintenance personnel recognized that reprogramming the controller was performing maintenance on the analyzer. Consequently, administrative procedures, which would require that the monitor be declared inoperable and post-maintenance testing be performed, were not implemented.

3. The maintenance personnel performing this task did not utilize any written instructions or procedures.

4. There was no independent verification to assure the quality of the software commands was maintained.

5. Operations personnel did not observe the printout on November 23, 1992, which would have indicated that the monitor was inoperable. Technical specifications did not require that a channel check be performed daily, but only monthly on the H_2/O_2 analyzers.

Technical specification (TS) 3.0.4 required that entry into an operational condition shall not be made unless the condition for the limiting condition for operations are met. Technical specifications 3.3.7.5, Table 3.3.7.5-1, Instrument 7, required that both the Division I and II containment and drywell H_2/O_2 analyzers be operable in OC 1, 2, and 3. The failure to have both H_2/O_2 analyzers operable during entry into OC 2 was a violation of technical specification 3.0.4 (416/92020-02(DRP)).

From a listing of the causes of this event it was apparent that the licensee's "software QA" program had failed to prevent this problem. The licensee had recently revised its software QA program and had just issued it before this event occurred; however, the new program had not been implemented. In its response to the violation, the NRC requested the licensee address whether its newly issued software QA program adequately controls activities on this type of safety-related computer.

As corrective action the licensee has developed procedures to change the programming on the controller and briefed maintenance and operations personnel on this event. The inspectors will review this event further after the LER is issued.

No deviations were identified. One violation was identified.

4. Radiological Controls (71707)

External Surveys

As part of routine monitoring, the inspectors performed a radiological survey to verify accuracy of the licensee's survey maps. The results of the monitoring were found to be in close agreement with the licensee's surveys.

No violations or deviations were identified.

5. Maintenance and Surveillance (61726 & 62703)

a. Observations Of Work Activities

Station maintenance and surveillance activities of both safety-related and nonsafety-related systems and components listed below were observed or reviewed to ascertain that they were conducted in accordance with approved procedures, regulatory guides, industry codes or standards, and in conformance with technical specifications.

Document	Activity
D23534	Votes Testing of Valve 1SX097A
D25008	Div I DG Output Breaker Inspection
D26498	Clean/Inspect Valve 1E51-F068
D30476	Rebuild Horizontal Fire Pump
D31903	Repair Controller for valve 1WS0181B
D32476	Replace bearing on 1SA01C Air Compressor
D33015	Replace valve 1E51-F324A
D36798	Votes Testing of Valve 1E12-F049
7911.35	Calibrate Alnor Dosimeters
9080.01	Diesel Generator Operability Test
9404.02	Valve Stroke Timing 1E51-F068, F077, F078
9433.16	RCIC storage tank level channel 1E51-N035A calibration

b. Reactor Feedwater Pump (RFP) Maintenance

The B RFP had been taken out of service to inspect the condition of the bronze bushings in the throttle linkage. This was done as part of the licensee's extensive efforts to resolve the problem with the throttle linkage binding. The licensee had previously done extensive machining to repair the bushings and had committed to inspect the condition of the bushings after 150 hours of operation (see Inspection Report 461/92012, Paragraph 4.c). When the throttle linkage was initially inspected, maintenance personnel noted that the linkage was difficult to move by hand. Examination of the bushings showed accelerated wear and pitting of

both the bushings and the steel journals. The licensee replaced the bushings with new ones for both the A and B RFPs.

The unit was subsequently restarted on November 24, and with less than 20 hours of service the B RFP throttle linkage again locked up. The pump was isolated without inducing a transient. Examination of the bushings indicated severe galling and damage to bushings and damage to the journals. Based on the lack of success in resolving the problems with the bushings, the licensee replaced the bronze bushings with double tapered roller bearings. This was also done for the A RFP.

The licensee initiated a failure analysis of the bronze bushings, which was still in progress at the end of the inspection period. After replacing the bushings in the A RFP the licensee experienced problems with the hydraulic control actuator for the throttle linkage. The problem had not been corrected by the end of the report period and the inspectors will perform further evaluation in a subsequent report on this problem and the results of failure analysis.

c. Service Air Compressor Activities

The licensee rebuilt the 1SA01C service air compressor (SAC) and subsequently observed that the oil seal on the fourth stage failed prematurely. The licensee investigated this problem and discovered that the manufacturer had improperly drilled a seal air port hole in the fourth stage and that the hole was slightly misaligned. Maintenance personnel filled in the hole and drilled a new one.

The licensee also inspected the bearings on the air compressor's motor. In the past, the licensee would repair the SAC after problems were observed, return the SAC to service, and subsequently notice that the motor bearings were damaged. This time the licensee inspected the motor bearings before the SAC was returned to service and discovered the outboard bearing was damaged. The SAC was successfully returned to service.

The inspectors noted excellent efforts of the maintenance and engineering personnel in identifying the misdrilled seal air port hole and the interrelationship between problems in the compressor and the motor bearings.

No violations or deviations were identified.

6. Security

Fitness for Duty Program

The inspector reviewed the licensee's fitness for duty (FFD) records for positive tests in the first half of 1992. The records were complete and provided information on the substance involved and actions taken by the

licensee on the individual's access to Clinton station. There was an absence of documented information on whether impaired individuals, who had access to the plant, had been involved with any safety-related activities; and if so, was there any impact on those activities. However, the FFD program manager had met with plant management in each case and discussed the impact. In all of the cases, there was no impact on safety related systems, structures, or components. Following discussion with the inspector, the licensee decided to document these discussions and consolidate them with the other positive test information.

No violations or deviations were identified.

7. Engineering and Technical Support

The inspectors reviewed the licensee's evaluation of the applicability of NRC Information Notice (IN) 92-27, "Thermally Induced Accelerated Aging and Failure of ITE/Gould A.C. Relays used in Safety-Related Applications." The IN addressed using class J10 relays mounted in a horizontal "ganged" arrangement. The licensee reviewed the installation for all class J relays and determined that Clinton had two instances of normally energized class J13 relays, in a ganged configuration. However, this arrangement had been tested by another utility and no problems were identified. The inspectors concluded that the licensee had expanded the scope of its analysis beyond the requirements of the IN and performed a thorough evaluation. The inspectors have no concerns on this issue.

No violations or deviations were identified.

8. Safety Assessment and Quality Verification

a. Self Assessment Capability (40500)

The inspector reviewed a third-party audit of the quality assurance (QA) organization. The audit appeared to be very thorough and identified strengths and weaknesses. Findings from the audit were as follows: Several weaknesses were noted in the quality engineering's inspection planning. Strengths were noted in the level of training of quality engineers and the morning turnover meeting. Quality verification personnel were knowledgeable of inspection program requirements.

The audit recommended that the matrixes for the audit schedule, Appendix B, and technical specifications be consolidated to assure proper coverage. The licensee's response stated that its present structure was adequate. The certification of auditors was found to be current and audit checklists were thorough and supported audit findings. Problems and concerns were properly identified on condition reports or recommendations. The overall conclusion was that the audit and surveillance program was effective in assessing QA program implementation.

However, problems were identified in procurement QA. Procurement document reviews were marginally adequate. The QA reviews did not include drawings or specifications. The QA acceptance of items was unsatisfactory. The primary problem was a lack of objective evidence in support of testing/inspections required to demonstrate the acceptability of items. Contributing to this was a lack of attention to detail. This problem was most apparent in commercial grade dedications. The licensee's response noted that this problem had been identified earlier. The licensee concluded that the previous corrective action had failed to resolve the problem and was developing new corrective actions.

The inspectors will review this issue in a subsequent report after the licensee's corrective actions are implemented and a followup audit is performed.

b. Licensee Event Report Follow-up (90712 & 92700)

Through direct observation, discussions with licensee personnel, and review of records, the following licensee event reports (LER) were reviewed to determine that the reportability requirements were fulfilled, immediate corrective action was accomplished, and corrective action to prevent recurrence had been accomplished in accordance with technical specifications.

LER	Title
461/92001	Main Transformer "B" phase fault resulted in a Turbine Trip and Reactor Scram.
461/92002	Reactor Feed Pump Control Lockup resulted in a Low Reactor Water Level Trip.

No violations or deviations were identified.

9. Management Meeting

Mr. J. S. Kerry, Senior Vice President and members of his staff met with Mr. A. B. Davis, Regional Administrator, and members of his staff on November 10, 1992, at the Clinton Power Station. Topics included efforts to improve the corrective action and Generic Letter 89-10 programs, maintenance program performance, and the nuclear program strategic plan.

10. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. One unresolved item disclosed during the inspection is discussed in paragraph 2.b.

11. Exit Interview

The inspectors met with the licensee representatives denoted in paragraph 1 at the conclusion of the inspection on December 7, 1992. 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.