U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-461/92005(DRS)

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 Power Station, Clinton, IL 61727

Inspection Conducted: March 16 through June 10, 1992

Inspectors: R. M. Lerch — Date: 6-23-92

I. T. Yin — Date: 6/23/92

G. M. Nejfelt — Date: 6/23/92

Approved By: B. L. Burgess, Chief, Operational Programs Section — Date: 6/23/92

Inspection Summary

Inspection on March 16 through June 10, 1992 (Report No. 50-461/92005(DRS))
Areas Inspected: Routine, unannounced safety inspection of licensee engineering and technical support program including modifications and design changes (IP 37700).
Results: One violation was identified regarding the correction of seismic restraint deficiencies on the Division III emergency diesel generator. An unresolved item was identified regarding system operation (Paragraph 9).

Strengths

- Management involvement in improving the performance of the engineering department including staffing increases, reductions in engineering work backlogs and enhancements in progress for management of the workload (Paragraphs 3 and 4).

- The fostering of initiative and accountability among the engineers (Paragraph 5).
- QA audits and surveillances of engineering including the root cause analysis performed for previous violations (Paragraph 12).

Weaknesses

- The temporary modification (TM) program had 53 TMs installed with a number of examples of weak program elements including designs, documentation, and extended service (Paragraph 7).
- The corrective action program was not effective in identifying long term problems with the Division III emergency diesel generator air start system (Paragraph 9) and correcting EDG tubing restraint deficiencies (Paragraph 10).

REPORT DETAILS

1. Persons Contacted

Illinois Power

J. S. Perry, Vice President, Illinois Power Company
J. G. Cook, Plant Manager
J. A. Miller, Manager, Nuclear Station Engineering Department
R. E. Wyatt, Manager, Quality Assurance
F. A. Spangenberg, Manager, Licensing and Safety
D. E. Korneman, Director, Systems and Reliability Engineering
R. T. Kerestes, Director, Engineering Projects
R. F. Phares, Director, Licensing
J. R. Langley, Director, Design and Analysis Engineering
J. A. Puzauskas, Assistant Director, Design and Analysis Engineer

U. S. Nuclear Regulatory Commission

G. C. Wright, Chief, Operations Branch, Division of Reactor Safety
P. G. Brochman, Senior Resident Inspector
F. L. Brush, Resident Inspector

These individuals and others of the licensee's staff attended the exit meeting. The inspectors also met with others of the licensee's staff including engineers and quality assurance representatives during this inspection.

2. Followup on Previously Identified Items

(Closed) Violation (461/90027-01): Inadequate design control for plant modifications. The inspector reviewed the licensee's corrective actions for the specific concerns discussed in the violation, and considered the item to be closed. The closure of the item was also based on the review of the licensee Audit Report Q38-92-01, conducted in January 1992, which concluded that Nuclear Station Engineering Department design control program had shown improvements.

3. Initiatives

The licensee described numerous initiatives involving the Nuclear Station Engineering Department (NSED) which were in various stages of progress. Initiatives included taking steps to increase the engineering design capabilities of NSED to 75% of design needs. Administrative enhancements to accomplish this have been implemented and NSED engineers trained in them. Concurrent with this have been actions to

update design documents and drawings and to establish means for maintaining them up-to-date. The licensee was also developing an engineering "work management system" to provide additional capabilities for tracking work. This system was already being used to produce the monthly NSED Performance Monitoring Report tracking routine work as well as a new "Top Ten Material Concerns" list.

The NSED Performance Monitoring Report tracked approximately 35 initiatives and routine activities, a significant challenge for engineering management and a burden on resources. The progress observed and a review of trends indicated that performance was improving. Maintaining improved performance and completing all of the above initiatives will require continued management attention.

4. Workload

A weekly worklist was in use that provided the status of engineering commitments regarding overdue and approaching due items. The licensee provided trending charts covering the past year which showed that work backlogs were reduced. Although some backlogs remained in engineering, goals for overdue items were established and tracked. With the "work management system" initiatives, it appeared that the licensee is making significant improvements in the control of work.

The inspectors reviewed the figures for engineering overtime worked as a percentage of hours worked. Overtime did not appear excessive with a peak of 2.7 % during non-outage months and 13.2% during outages. During discussions with management and plant staff, it was apparent that overtime was well controlled with NRC overtime guidelines met.

5. Corrective Actions

The corrective actions taken for several Condition Reports (CRs), two NRC violations, and a licensee event report were reviewed. The effectiveness of the corrective action taken by the system engineer ranged from effective (e.g., determination of a scram discharge volume (SDV) valve failure, LER 92-001) to poor (e.g., not recognizing inoperability of fission product monitor, NRC Violation 50-461/91023-04). The adequacy of corrective actions were dependent on the thoroughness of the root cause evaluation.

The inspectors found that system engineers with training in root cause analysis, tended to do a better job of determining causal factors for problems. For example, the engineer responsible for ASCO valve performance was knowledgeable of industry experience with ASCO valve failure

modes. In the last five years of Clinton operations only one failure of an ASCO solenoid valve occurred. The ASCO failure was detected during closure of 1 of 145 ASCO scram solenoid valves during the last refueling outage. The system engineer, trained in root cause analysis, determined that the ASCO solenoid valve opening time was also a measure of valve performance, and incorporated the recording of the valve opening time in CPS No. 9813.01, "CONTROL ROD SCRAM TIMING." On the other hand, a system engineer responsible for the drywell fission product monitor had no root cause analysis training. Subsequently, the inoperability of the fission production monitor was cited as a violation, for lack of adequate corrective action.

Approximately 50% of the system engineers received root cause investigative technique training (Lesson Plan No. XY10603-00 and XZ10608-00) required for CR evaluation.

6. Modifications

The licensee recently revamped the modification program, revising the procedure and training the engineering staff on its use. A limited number of modifications and temporary modifications had been done under the revised program. The inspector reviewed two recent modifications, MS-035 and DG-062, with no problems noted.

7. Temporary Modifications

A sample of temporary modifications (TMs) were reviewed. A variety of problems were noted as described below.

a. TM 90-050: This TM installed three relief valves on the steam jet air ejector system. As identified during a previous inspection, the relief valve lifting thrust was not calculated. During this inspection, the inspector reviewed the new calculation performed by Sargent and Lundy (S&L) and found a number of deficiencies including: (1) lack of a stress isometric drawing to identify force locations and directions, (2) no justification for the formula used and the safety factor applied, (3) lack of calculations for pressure induced thrust reaction, and (4) lack of applications of dynamic load factors. Furthermore, the S&L calculation was not reviewed by a responsible licensee project or system engineer. During re-evaluation, the licensee found the relief valves did

not provide sufficient overpressure relief capacity for the protection of system instrumentation. A Condition Report (CR), 1-92-03-072, was issued on March 28, 1992, to address this problem.

b. TM 91-028: This TM installed three gauges on the three circulating water pump discharge lines to monitor condenser thermal performance. The inspector reviewed the 10 CFR 50.59 screening evaluation, and had no adverse comments. During a system walkdown, the inspector observed that two of the three gauges were not adequately supported. Instead of supports, the gauges were hung by the 1/8 inch diameter tygon tubes. The licensee subsequently determined that the supports were removed by workman during the painting of the circulating water pumps and associated piping. These supports were re-installed during the inspection. This was considered a weakness in the monitoring of an installed TM.

c. TM 90-032: This TM replaced two actuators on two motor-operated valves (MOVs) in the reactor water cleanup (RWCU) system for better control of system flow rate. The inspector reviewed the 10 CFR 50.59 safety evaluation and backup engineering studies, and had no adverse comments. The TM was initiated in July 1990, and had not been restored to original configuration, or changed into a permanent modification. Furthermore, documentation used to extend the TMs indicated only one actuator had been replaced. The inaccurate documentation was revised during the inspection.

d. TM 90-51: This TM replaced single hole orifices with multiple hole orifices in the three, cycled condensate water pump discharge lines to reduce line vibration. This TM was an addition to permanent Field Alteration Request CY-F003, which replaced the Larc valves on the three, cycled transfer pump discharge lines with a piping tee, a check valve (CV), and a single hole orifice to prevent recurring weld cracking due to line vibration. The S&L design put the CV right after the tee which created flow turbulence at the tee and caused continuous CV chattering. The licensee's overview of the S&L design appeared to be questionable based on the above.

e. TM-90-37: This TM revised system operation to increase precoat fill time setting in the RWCU system. This TM was issued in August 1990, and replaced by TM 91-13 in

May 1991, which expanded the TM scope to increase venting and flushing time and to turn off the agitator after precoating. However, the basic function of the TM issued in 1990 did not change.

f. TM 88-44: This TM installed a chlorination system to prevent biofouling of circulating water and plant service water heat exchanger tubes. This TM was issued in April 1988, and replaced by TM 91-31 in August, 1991, which installed a more compact sodium hypochlorite tank, and modified some system arrangements. These changes were minor in nature and did not change the function of the system. Issuance of a TM in 1991 appeared to only extend the TM issued in 1988.

g. TM 92-023: This TM installed a tool decon facility outside of the power block for which a thorough review of safety implications was performed. Licensee management expectations regarding safety implications review included a review of vendor calculations and evaluations for acceptability. A programmatic weakness was identified in that licensee procedures did not require engineers to document the review of vendor calculations and evaluations, therefore, potentially valuable information could be lost. With respect to TM 90-050, a S&L calculation was not reviewed (paragraph 7a); for TM 92-023, the review was performed but not documented.

The inspection found that temporary modifications had examples of: (1) inadequate design, (2) inadequate review of S&L calculations, (3) inadequate review of S&L designs, (4) lack of monitoring of installed TMs, (5) inaccuracy in the documentation of modification scope, and (6) use of a new TM to extend the life of an old TM. The licensee responded in stating that Attachment 6 to procedure D.55, "Modification and Configuration Change Control," Revision 5, dated January 31, 1992, provided for better TM design review. Regarding the other TM examples, the licensee staff stated that they realized the TM program had weaknesses, and formalized a preliminary corrective action program during the inspection. This corrective action program did not address all of the specifics of the deficiencies identified above.

8. Condition Reports (CRs)

The inspector reviewed the following CRs:

a. CR-1-92-02-021: This CR documented the failure of service air compressor (SAC) No. 2. The inspector

concluded that the CR did not describe the adverse condition in accordance with the definitions prescribed in procedure No. 1016.01, "CPS Condition Reports," dated July 18, 1991. The licensee's corrective action was considered to be adequate; however, the personnel error which resulted in equipment damage was not documented in the cause of the problem section.

The SAC failed four times from June 1991 to February 1992. The first failure was due to inadequate preventive maintenance (no seal replacement for seven years), which resulted in lube oil seal leakage. The second and third failures were due to replacement seals damaged on installation caused by inadequate training. The fourth failure was caused by human error during machine testing and adjustment. On February 7, 1992, the Assistant Supervisor requested that the unit be run unloaded for tuning and calibration. The unit was run for five hours in the unloaded condition without attendance which resulted in severe internal damage.

At the time of the inspection, the SACs were still suffering internal dirt buildup and lube oil leak problems. The licensee had recently initiated monitoring and trending program for these SACs. During review of the damaged compressor, the inspector was informed that Maintenance Work Requests (MWRs) documented all damaged conditions in the replacement parts lists. The inspector reviewed the replacements parts lists within the subject MWRs, and found both corrective and preventive maintenance items were listed; therefore, no specific identification was provided for the damaged or worn out parts and components. This practice made trending of component failures difficult.

b. CR 1-91-06-020: This June 26, 1991 CR documented a cracked after- cooler U-tube on the diesel driven air compressor (DDAC) for the Division III emergency diesel generator (EDG). Although there was no requirement for root cause evaluation, an informal interoffice note indicated that it was caused by "a check valve problem." The note also stated that, ". . . two cases of U-tube failure have occurred . . . reason for the second is not specifically known . . ." A followup discussion with the license revealed that the second failure occurred in July 1991. After further review of the documents and personnel interviews, the inspector concluded the following:

(1) The program threshold for requiring root cause evaluation of a deficient condition, especially for the nonsafety-related systems and components, was very high. The informal staff evaluation performed by the IP staff contained insufficient and inaccurate information.

(2) The program for identifying deficient conditions was generally done through the use of either the CR or the MWR system. The CR issued did not include the repeated problem of aftercooler tube cracking and the MWR did not identify specific component problems (CR 1-90-02-021).

(3) In review of Field Engineering Change Notice 27140, dated July 12, 1991, for repair of the first aftercooler U-tube crack, the inspector found questionable design control under its "justification" section. For removal of a segment of cooling fins, the evaluation stated that, "Removal of approximately 2 inches times two represents 1.73% of the total finned areas. Based on engineering judgement, performance of the cooling coil will not be adversely affected by the repair." The inspector stated that physical change may not equal performance change; e.g., Licensee management concurred with the inspector and committed to provide their engineering staff additional training on the matter.

(4) The safety-related CV installed on the motor driven air compressor (alternate) train was tested acoustically and found to be leak tight.

(5) In response to an NRC request, the licensee determined the cause of the second aftercooler tube rupture was the same as the first aftercooler rupture; a stuck shut check valve. This is an example of a weak corrective action program in terms of identification and correction of long term equipment problems.

Previous examples of not correcting long term equipment problems were cited in IR 461/91020 and 461/91023 and the licensee has initiated corrective action to prevent recurrence. These corrective actions are discussed in paragraph 9.d.1. This issue is very similar to the violations discussed above, and the licensee's

corrective actions for these violations has not yet been fully implemented. Due to the similarity of the violations, and the short time frame since implementing corrective actions, a separate violation will not be issued.

Licensee audit number Q-38-91-09, conducted in February 1992, identified program deficiencies in identifying repeat problems, and initiating root cause analyses. The Reliability Engineering Department staff also indicated that they had found deficiencies of documentation and cause of failure assessment in the MWR system.

9. Division III Emergency Diesel Generator Air Start Operation

The Clinton Power Station (CPS) Updated Safety Analysis Report (USAR) Paragraph 9.5.6.2 described the operation of the emergency diesel generator (EDG) air start system. The present Division III EDG air start operation differed from two of the USAR descriptions when the diesel driven air compressor (DDAC) diesel was tagged out in August 1991, and when the associated CV was found frozen shut in June 1991. The USAR states:

- "the two air receivers for each unit are charged by an individual compressor associated with that particular air receiver."

- "Both compressors on the Division III air start skid operate in response to system pressure switches and start automatically when the system pressure drops to 225 psig, and shut off when the air pressure reaches 240 psig."

In order to maintain the air receiver for the DDAC operable while the DDAC and its associated check valve were not functional, the air receiver was filled using the electric driven air compressor through the pressure equalization valve which connects the two sub-trains. In lieu of automatic filling as described in the USAR, equipment operators checked air receiver pressures each shift and manually filled the DDAC air receiver by opening the pressure equalization valve, then closing it when the pressure was within tolerances.

These differences from the USAR description were present since August 1991, due to diesel driven air compressor inoperability and the check valve being frozen shut on the corresponding air supply train. The licensee provided to the inspectors a 10 CFR 50.59 safety evaluation, dated February 1990 to allow the diesel driven air receiver to be filled from the motor driven air compressor subsystem. The inspector reviewed the evaluation, and concluded that it did not address the system operational and configuration changes as described above. This is considered an unresolved item pending further discussions with the licensee (461/92005-01).

In addition to the above problems with system operation, the following additional conditions were noted:

a. The Petter diesel for the DDAC was tagged out five times in 1990, three times in 1991, and from June 12, 1991, to the present.

b. The motor driven air compressor (MDAC) is a larger motor was installed to drive the compressor to meet the air supply load demand. This unit was tagged out three times in 1990.

c. There has not been any preventive maintenance program for the two safety-related check valves (CVs) in the two air start trains. The CV on DDAC train was found leaking every time the licensee opened it in 1985, 1987, and 1991-1992. The CV on the motor driven air compressor (MDAC) train was also found leaking every time the licensee opened it (3 times: 1985, 1987, and 1990). The records showed the CV leakage was due to dirt and rust buildup indicating poor air quality in the system. These adverse conditions continued during the inspection period. The poor maintenance record for these CVs will also be discussed with the licensee in conjunction with the unresolved item above.

d. Although there had been discussion regarding replacing both of the DDAC, MDAC and the safety-related CVs since 1987 among the licensee departments, an MWR was not initiated until July 1991. Specific licensee actions taken since July were documented in the following documents:

(1) A Modification Control Form was issued to replace the CVs on April 2, 1992, during the inspection. The scheduled work completion date is July 7, 1992.

(2) A licensee one-page document "DG-60 Conceptual Design" was issued during the inspection. The document stated "Division III diesel generator starting air compressors are unreliable and undersized for the application. For approximately the past year, only one of the two compressors has been operable." The document also stated "Replace both compressors and drivers with units of appropriate reliability and size. Model IST compressors and 20HP motors similar to Division I and II diesel generators will be used for Division III."

10. Division III EDG Deficiencies

During Division III EDG system walkdown, the inspector observed deficiencies in two areas:

a. The air start system pressure was set at 200 psig. EDG manufacturer's recommendation was stated to be 140 to 200 psig. The gauge readings for the two air trains upstream of the air motors were 204 psig and 208 psig. Followup inspection revealed that the licensee did not have a program to monitor and regulate air pressure. To correct this deficiency, IP maintenance task was developed and implemented during the inspection.

b. The EDG tubing restraint system to meet the site component seismic qualification requirement was deficient in that: (1) there was extensive use of plastic tie wraps for tubing supports and bundle-ups, (2) a tubing restraint was installed on an oil cooler expansion joint, and (3) loose and touching tubes were found in a number of places such as the S-23 low service water pressure transmitter and the S-55 low circulating oil pump pressure transmitter. The licensee issued CR 1-92-02-058 on March 20, 1992 to document these deficiencies. Subsequent licensee investigation found that these deficiencies had been identified in a GE Field Deviation Disposition Request (FDDR), dated September 1985, and a second FDDR dated November 1987. The second FDDR was closed in November 1987 stating that all deficiencies were corrected. The problem was compounded, in that an NRC Information Notice (IN) 89-07 was sent to all licensees informing them of the EDG tubing installation and restraint problems and licensee's followup action for

IN 89-07 did not uncover any of the stated problems. Failure to correct the problems identified since 1985 is a violation of 10 CFR 50, Appendix B, Criterion XVI (461/92005-02).

Subsequent to the inspection, the licensee determined the EDG tubing to comply with IE Bulletin 79-14 criteria and observed no similar problems with Divisions 1 and 2 EDGs. Modification No. DG-063 was developed to relocate and to add restraints to the EDG small bore tubing.

11. Staffing

Through interviews of staff engineers, no weaknesses in training or qualifications were noted. The licensee reported that all affected engineers had been trained on the revised modification procedure. This training appeared to have been adequate. However, the long term equipment problems with the Division III EDG air start system discussed in paragraph 8.b. were attributed, in part, to personnel changes and inexperience with the system engineers involved.

The inspectors observed that system engineers were allowed to take corrective and preventative actions for assigned systems. During interviews, system engineers provided specific examples; one engineer ordered specialized paint without additional approval to preclude delay of a modification, while another engineer expanded the scope of a CR investigation to consider additional fire doors.

An administrative system to provide each system engineer with a summary of the responsible engineer's tasks (e.g., MWRs, CRs, Corrective Commitment Tracking (CCTs), etc.) was planned to be implemented by the end of 1992.

The system engineers interviewed were:

- knowledgeable of their assign system trending and potential problems (e.g., monitoring plant instrument air particulate less than 3 microns; and temporary shielding control);
- appeared to be proactive, such as, actively involved with industry forums and discussing topics with other licensees and
- knowledgeable of methods to get information into the trending system.

It was concluded that management had fostered the sense of

12. Self Assessment

Quality Assurance audits and surveillances of the engineering department for 1991 and 1992 were reviewed by the inspectors. In all, 5 audits and 29 surveillances were reviewed for technical insight and engineering responsiveness to findings. With one exception all were found to provide insights into the engineering program. Surveillance Report Q-15079 evaluated LER 90-009 concerning failure of the drywell air particulate sample panel as inadequate to prevent recurrence. Repeated failure of this equipment was subsequently the subject of NRC violation 3-04. The licensee conducted a thorough evaluation of the violation utilizing formal causal factor determination methods. Review of the audits also noted a program improvement by the licensee to require a Condition Report to be issued for each finding and to also require a root cause evaluation.

13. Communication

The engineering staff was observed participating in plant status and work planning meetings. Managers conducted to plan engineering work and to keep the staff informed of current activities.

During review of Condition Report 3-91-11-025 which involved a ventilation system lineup, it was noted that the CR was assigned to the operations department and resolved without any involvement by the system engineer or NSED. The licensee did not formally route CRs to engineers and did not maintain reference copies readily available in the engineering area. This contrasts sharply with the handling of maintenance requests which are routed to the cognizant system engineers both when initiated and when closed. Initial CRs were reportedly routed to engineers by managers participating in the Corrective Action Review Boards. To resolve the above CR, a procedure change was issued without NSED concurrence, revising the system lineup. The lineup reflected how the system was being operated and would be significant information to a system engineer.

14. Trending

The principal information sources used for problem trending by the licensee were maintenance work requests and condition reports. The trending process was sampled by the inspector for consistency and accuracy of information through reviews of CRs and NRC violations and interviews with system engineers.

MWR trending was performed by reliability engineers and quality assurance staff. In the review of "Corrective Action Trend Analysis Report" for July [1991], the inspector noted that QA condition report trending effectively used the categorization of the root cause on a routine basis.

A licensee evaluation of the causes for the recurring problems identified with the diesel fire pump and fission product monitor found that repair work was performed via MWR, CRs or preventive maintenance activities. It was further noted that using these multiple systems interfered with the trending of problems. The recurring problems the inspector found with the air start system also demonstrated this program weakness. The licensee committed in the response to violations 461/91020-01 and 461/91023-04 to evaluate this.

15. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations or deviations. An unresolved item disclosed during this inspection is discussed in Paragraph 9.

16. Exit Meeting

The inspectors met with the licensee representatives (denoted in Paragraph 1) on April 3, 1992, and via telecon on June 10, 1992. The inspectors summarized the scope and findings of the inspection. The licensee acknowledged the statements made by the inspectors. 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 and the licensee did not identify any such documents/processes as proprietary.