

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/82-05(DPRP)

Docket No. 50-331

License No. DPR-49

Licensee: Iowa Electric Light and Power Company
IE Towers, Post Office Box 351
Cedar Rapids, IA 52406

Facility Name: Duane Arnold Energy Center

Inspection At: Palo, IA

Inspection Conducted: March 15 through May 12, 1982

Inspectors: *John A. Reyes for*
N. Chrissotinos

8/10/82

L. Clardy
L. Clardy

8-10-82

Approved By: *J. F. Streeter*
J. F. Streeter, Chief
Projects Branch 2

8/10/82

Inspection Summary

Inspection on March 15 through May 12, 1982 (Report No. 50-331/82-05(DPRP))

Areas Inspected: Special announced inspection of the sequence of events from February 19 to March 15, 1982, concerning the inoperability of an emergency diesel generator and other safety-related systems. The inspection involved a total of 36 inspector-hours onsite by two NRC inspectors including 0 inspector-hours onsite during off-shifts.

Results: Five violations were identified (Failure to take the required action when a LCO was exceeded - Paragraph 2, failure to follow procedures in two instances - Paragraphs 3.a and 3.b, failure to have adequate procedures - Paragraph 3.c, and failure to have a procedure 3.d).

DETAILS

1. Persons Contacted

- +L. Root, Assistant Vice President - Nuclear Generation
- +R. McGaughy, Director - Nuclear Generation
- +*D. Mineck, Chief Engineer
 - R. York, Assistant Chief Engineer - Operations
- *D. Wilson, Assistant Chief Engineer - Radiation Protection and Security
- *D. Teply, Operations Supervisor
- *E. Matthews, Manager - Quality Assurance
- *C. Mick, Assistant Operations Supervisor
- *R. McCracker, Quality Control Supervisor
- *D. Gipson, Shift Supervising Engineer
- *M. Teply, Shift Technical Advisor
 - R. Rockhill, Mechanical Maintenance Supervisor
 - J. VanSickel, Technical Engineer

+Denotes those present at the enforcement conference on March 23, 1982.

*Denotes those present at the exit interview on March 19, 1982.

In addition, the inspectors interviewed several other licensee personnel including shift supervising engineers, control room operators, auxiliary operators, and maintenance personnel.

2. Diesel Generator Inoperability Event

On February 19, 1982, at approximately 10:50 a.m., the licensee discovered a broken snubber and hanger on the "A" loop of the Residual Heat Removal (RHR) System. The "A" loop of RHR was declared inoperable and the licensee entered a seven day limiting condition for operation (LCO).

On February 25, 1982, at 3:23 a.m., while conducting the RHR service water system surveillance, motor operated valve MOV-1947 failed to close. This caused "B" RHR service water system to be declared inoperable.

The combination of "B" RHR service water system inoperable and the "A" RHR system inoperable caused the licensee to enter into a 24-hour LCO (Technical Specification 3.5.B.2), and a power reduction was begun as required.

Also on the morning of February 25, 1982, a high differential pressure on the fuel oil filters of diesel generator 1G-21 was discovered, and Maintenance Action Request No. 031626 was issued for replacement of the filters. At 7:39 a.m., the maintenance action request was authorized and the filters were replaced at approximately 11:00 a.m. Upon completion of the work, the maintenance action request was placed in the deferred test file with the assumption that "B" diesel generator operability would be conducted later that evening based on the expected return of operability of the "B" MOV-1947 valve of the RHR service water system.

On the evening of February 25, 1982, repairs to the RHR "A" loop were completed. Following operability tests of the Low Pressure Coolant Injection (LPCI) mode, the LPCI system was declared operable and thus the 24-hour LCO did not exist. However, the seven day LCO was still in effect due to MOV-1947. This valve was declared operable at 3:38 p.m. on February 26, 1982. With both systems operable, testing of diesel generator 1G-21 was deferred until the regularly scheduled monthly surveillance.

On March 15, 1982, at 4:10 a.m., the monthly operability test of diesel generator 1G-21 was performed and the diesel failed to start. The failure is attributed to fuel starvation due to the fuel oil filter casings not being properly filled and vented during maintenance on February 25, 1982.

During the period that the diesel was inoperable several safety systems were also inoperable. These systems would not have been able to perform their intended functions.

- a. During the period from February 25 to March 15, 1982, the 1G-21 diesel generator was inoperable. This event exceeded the limiting condition for operation for 18 days (Technical Specification 3.5.G.1).
- b. RHR loop "A" was inoperable from February 19, 1982, at 11:00 a.m. to February 25, 1982, at 10:58 p.m. Concurrently diesel generator 1G-21 was inoperable from February 25, 1982, at 11:00 a.m. to March 15, 1982, at 11:10 a.m. Diesel generator 1G-21 supplies emergency power for "B" RHR loop pumps. Thus from 11:00 a.m. to 10:58 p.m. on February 25, 1982, both loops of the LPCI system were inoperable, which is contrary to Technical Specification 3.5.A.3.
- c. The "A" train of the Standby Gas Treatment System was inoperable from 1:49 p.m. on March 2, 1982 to 4:00 p.m. on March 8, 1982. Concurrently the 1G-21 diesel generator, which supplies power to the "B" Standby Gas Treatment System was inoperable. Thus from March 2 to March 8, 1982, the Standby Gas Treatment System was inoperable. This exceeded the limiting condition for operation for 6 days (Technical Specification 3.7.B.1).
- d. The High Pressure Coolant Injection System was inoperable from 1:49 p.m. on March 5, 1982 to 10:04 p.m. on March 6, 1982. Concurrently the 1G-21 diesel generator was inoperable which renders "B" Core Spray and "B" LPCI loop inoperable. This exceeded the limiting condition of operation for 8 hours and 15 minutes (Technical Specification 3.3.D.2).

This is considered an item of noncompliance (331/82-05-01).

The consequences, during the period from March 5, 1982, at 1:49 p.m. to March 6, 1982, at 10:04 p.m. (8 hours 15 minutes), if a loss of offsite power occurred would have caused the HPCI System; Standby Gas Treatment System (both trains); "B" Core Spray Subsystem; and "B" loop LPCI System from performing their intended functions.

Maintenance Action Request (031626) contained adequate information to alert the licensee that a surveillance test was required following maintenance. The inadequate processing of that request combined with the absence of satisfactory shift turnover and daily overall operations review were the major contributing factors causing the Technical Specification violations.

Operation in a degraded mode which violated a limiting condition of operation is significant in itself; however, of more importance is that during the period February 19 to March 15, 1982, four safety systems at various times were inoperable. The various concurrent inoperability of these systems measurably degraded the safety of the plant.

3. Contributing Causes

- a. The inspection revealed that a combination of items contributed to 1G-21 diesel generator being made inoperable and remaining that way for 18 days.

The inspectors ascertained that the licensee exercised inadequate judgement in performing maintenance on a safety-related piece of equipment (diesel generator 1G-21), which supplies power to the "B" loop of RHR, while the "A" side of RHR was inoperable. This item was discussed both specifically as applied to the incident and generically to the plant with the licensee on March 19, 1982.

The inspectors reviewed Maintenance Action Request (MAR) No. 031626 for the procedural compliance. The review revealed that no reason was given on the associated Safety Related Inspection and Test Report (82-118) for deferring testing on the 1G-21 diesel generator as required by Section 6.20.5.1. of ACP 1401.4, "Control of Plant Work." This maintenance action request was filed in the deferred testing file until March 15, 1982, when operability testing was performed.

Technical Specification 6.8.1, states in part that, "Detailed written procedures involving nuclear safety shall be prepared... and adhered to."

This is considered an item of noncompliance (331/82-05-02).

- b. The inspectors reviewed the Shift Supervising Engineers' and Control Room Operators' logs for the time period between February 19 and March 15, 1982, to establish the chain of events and ascertain whether logbook entries were made in accordance with procedures.

The review of the Shift Supervising Engineers' logs revealed that no entries were made on February 25, 1982, concerning maintenance on the 1G-21 diesel generator or its status. This is required by ACP 1404.4, "Operating Logs," Item 6.3.4.2. Consequently this contributed to the fact that the diesel remained inoperable for 18 days without knowledge of it.

DAEC Technical Specification 6.8.1, states in part that, "Detailed written procedures involving nuclear safety shall be prepared...and adhered to."

This is considered an item of noncompliance (331/82-05-03).

- c. The inspectors also evaluated how the maintenance and subsequent inoperability of the 1G-21 diesel generator could remain undetected for 18 days.

Based on a review of procedures which govern shift turnover, the inspector determined that the procedures are inadequate. Section 6.7 of ACP 1404.1 "Shift Organization Operation and Turnover," states in part, "Shift change shall be accomplished by having each incoming shift operator relieve each outgoing shift operator...."; however, there are no guidelines or procedures which clearly specify what shall be reviewed during shift turnover.

A review of the Shift Technical Advisors (STA) responsibilities and authorities indicate that procedures which govern them are inadequate also. ACP Section 4.3 of ACP 1404.1, states only that "routine duties should include matters involving engineering evaluation of day to day plant operations from a safety point of view." There are no mandatory or specific guidelines on what is to be reviewed or accomplished. An interview with the lead STA indicates that each STA reviews items differently and that these reviews encompass different items depending on the shift. The STA's are also not fully cognizant of all indications of plant status available to them. One STA questioned did not know that the deferred testing file existed. In addition, ACP 1201.6, "Shift Technical Advisors," does not address specifically what the STA shall review or accomplish on a shift turnover.

10 CFR 50, Appendix B, Criterion V states in part, "Activities affecting quality shall be prescribed by documented instructions, procedures of a type appropriate to the circumstances...." The inadequacies of ACP 1404.1 in the areas of shift turnover and STA responsibilities and authorities demonstrate that the procedure is not appropriate to the circumstances. This is an item of noncompliance (331/82-05-04).

- d. The inspectors also reviewed the maintenance procedures, and interviewed mechanical maintenance personnel and auxiliary operators.

The inspectors determined that fuel oil filter changeout is normally only accomplished during the annual diesel generator inspection. There is a vendor technical representative present at this inspection to oversee the activities. During this inspection the filters are filled, vented and primed. However there is no procedure in the vendor technical manual to address this, nor is

there a licensee procedure to address it. In addition, the maintenance personnel interviewed indicated they had not seen the vendor representative or the operators refill, vent or prime the filters on the annual inspection. This could be expected since the change out is usually accomplished where the diesel is torn down and the maintenance personnel are not present for the initial start.

As evidenced by interviews conducted with maintenance personnel and operators, this is inadequate. Maintenance relies on operators to refill, vent and prime the filters. However the auxiliary operator on shift had never seen or performed this evolution. In addition the only reason he was aware of the fuel oil filter replacement was that he was in the diesel room cleaning. This lack of a procedure as required by Section 5.0 of ACP 1406.2, "Maintenance Procedures," and Technical Specification 6.8.1 is an item of noncompliance (331/82-05-05).

The consequences of these violations when viewed separately would not be of significant safety concern. However, the combination of the contributing causes escalates the possible consequences of this or similar incidents.

4. Evaluation of Safety Significance

a. Licensee Testing

As a result of the March 23, 1982, enforcement conference, the licensee performed special testing on April 4, 1982, which simulated an automatic start of the 1G-21 diesel generator. Prior to the test the fuel oil filters were replaced to simulate the conditions as they existed on February 25, 1982. The diesel was started twice and reached rated speed and voltage in 30.2 and 30.3 seconds respectively rather than the 10 seconds specified in the FSAR. The diesel failed to start in the manual mode as designed when the seven second timer tripped when the diesel failed to reach 600 rpm.

b. Licensee/NSSS Evaluation of the Event

On behalf of the licensee, the Nuclear Steam System Supplier (NSSS) (General Electric) performed an analysis and evaluation on the DAEC design basis accident (DBA) coincident with a loss of offsite power, the worst single failure (LPCI injection valve failure), and a sixty second delay in the start of diesel generator 1G-21. The evaluation concluded that the peak clad temperature (PCT) resulting from the above accident would be well below the 2200°F 10 CFR 50, Appendix K, licensing limit. The delayed start time for diesel generator 1G-21 would not have unacceptably affected the plant response to such an accident at the power level which the plant was operating at during the period of the incident.

c. NRC Review of the Licensee/NSSS Evaluation

NRR reviewed the General Electric analysis and concluded that the analysis was acceptable in demonstrating that no threat to the health and safety of the public existed as a result of the events described in Paragraph 2.

5. Exit Interview

The inspector met with the plant staff on March 19, 1982, at the conclusion of the onsite inspection to discuss the inspection findings. The Region III Regional Administrator and staff met with Iowa Electric management (denoted in Paragraph 1) on March 23, 1982, for an enforcement conference. The inspector met with D. Mineck on May 12, 1982, and discussed the NRR review of the General Electric analysis.