U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-341
License No:	NPF-43
Report No:	50-341/99015(DRP)
Licensee:	Detroit Edison Company
Facility:	Enrico Fermi, Unit 2
Location:	6400 N. Dixie Hwy. Newport, MI 48166
Dates:	October 21 through December 3, 1999
Inspectors:	S. Campbell, Senior Resident Inspector J. Larizza, Resident Inspector
Approved by:	A. Vegel, Chief Reactor Projects Branch 6

EXECUTIVE SUMMARY

Enrico Fermi, Unit 2
NRC Inspection Report 50-341/99015(DRP)

This inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers a 6-week period of resident inspection.

Operations

- A licensed operator inserted a control rod two notches instead of withdrawing it two notches during a control rod check procedure. The reactivity change was negligible and no change in reactor power, temperature, or pressure were noted. The cause was inattention to detail (Section O1.1).

- Plant power changes to replace worn brushes on the motor-generator sets for the reactor recirculation pumps were performed in a controlled manner (Section M1.2).

Maintenance

- Maintenance workers did not effectively implement human performance training during work to replace a residual heat removal pump motor. During the evolution, maintenance personnel struck and bent a drain pipe on the thermal recombiner system with a fork lift. The operators appropriately declared the thermal recombiner system inoperable until testing confirmed the system was not damaged (Sections O6.1 and M1.1).

- Distractions to the control room from the field during one pre-job brief to change worn brushes on the recirculation pump motor-generator sets made it difficult to effectively communicate essential elements of the task. Human performance training conducted to reduce these distractions and eliminate work environment error precursors was not entirely effective. Further, the expectation to use a drop light for changing the brushes was not effectively communicated or understood (Sections O6.1 and M1.2).

- The method used by personnel to verify the nitrogen supply valve alignment for the Mechanical Draft Cooling Tower "C" fan brake system was inadequate. As a result, a high pressure nitrogen cylinder was isolated for 14 days, causing a reservoir of the ultimate heat sink to exceed the allowed outage time in violation of Technical Specification 3.7.2. This Severity Level IV violation is being tracked as a non-cited violation, and is in the licensee's corrective action program as CARD 99-18349 (Section M1.3).

- On November 12, 1999, the licensee experienced a reportable failure of the Emergency Response Information System due to age-related component failures. The licensee made the necessary NRC notifications. The licensee initiated action to replace the system in 1993 but has not made much progress, due in part to lack of available resources. The licensee currently plans to replace the system in April 2000 (Section M1.4).

Engineering

- The licensee lacked rigor and thoroughness in their evaluation of a vendor calculation that was used as the basis for retracting a 4-hour notification regarding the inoperability of the high pressure coolant injection system. The site engineering organization did not formally review the vendor's analysis, and a test for the configuration in question had never been performed. The licensee initiated a condition assessment resolution document to re-evaluate the issue (Section E1.1).

- A voltage regulator for 480 Volt Bus 72E failed due to a seized motor bearing on the voltage regulator. The licensee sufficiently determined the operability limits to justify continued operation with the inoperable regulator. The licensee implemented appropriate compensatory actions, including periodic monitoring of bus voltage (Section E1.2).

Plant Support

- The licensee identified a Technical Specification violation when an engineer entered a locked high radiation area without stay time tracking. Procedural controls for tagging keys for locked high radiation areas did not exist. Inattention to detail and lack of a thorough review of the survey sheets by the radiological protection supervisor and the engineer involved contributed to the event. The licensee's root cause investigation was thorough and corrective actions appeared comprehensive. This Severity Level IV violation is being tracked as a non-cited violation and is in the licensee's corrective action system as CARD 99-15113 (Section R1.1).

Report Details

Summary of Plant Status

Unit 2 began this inspection period at 97 percent power. On October 21, 1999, power was reduced to 82 percent to replace worn exciter brushes on the motor-generator set for Recirculation Pumps A and B. Power was returned to 97 percent the same day after completing the activity. On November 14, 1999, power was reduced to 82 percent to replace worn exciter brushes on the motor-generator set for Recirculation Pump B. Power was returned to 97 percent the same day after completing the activity.

I. Operations

O1 Conduct of Operations

O1.1 Control Rod (CR) Mispositioning During Control Rod Drive (CRD) Operability Check

a. Inspection Scope (71707)

On October 23, 1999, a control room operator mispositioned CR 10-35 when the operator inadvertently moved the CR from position notch 46 to position notch 44. The inspectors discussed the event with operations department management and reviewed the following procedures:

- Procedure 23.623, "Rod Mispositioning Event;"
- Procedure 24.106.01, "CRD Operable CR Check;"
- Operations Department Instructions, ODI-22, "Reactivity Management,"
- Control Room Logs;
- Condition Assessment Resolution Document (CARD) 99-18033;
- Written statements made by control room personnel related to the event; and
- General Administration Conduct Manual, MGA03, "Procedure Use and Adherence."

b. Observations and Findings

On October 23, 1999, the control room operator performed the CR operability check per Procedure 24.106.01, "CRD Operable CR Check." During performance of the surveillance, the operator used proper three way communication and peer checking. The operator moved Control Rod 10-35 from its full out position, notch 48, to notch position 46. The next step was to move the CR back to its original position. The operator placed his hand on the switch and instead of twisting the switch clockwise (out), twisted the switch counterclockwise (in). The operator immediately realized the error and stopped the CR manipulation. The reactivity change was negligible and no change in reactor power, temperature or pressure were noted.

In accordance with Procedure 23.623, "Rod Mispositioning Event," CR 10-35 was properly repositioned to notch 48, and the licensee initiated CARD 99-18033 to document the event.

Improved Technical Specification (ITS) 5.4.1.a. states that written procedures shall be established, implemented, and maintained for procedures recommended in Appendix A, of Regulatory Guide 1.33, Revision 2, February 1978. Appendix A of Regulatory Guide 1.33, Revision 2, February 1978, specifies procedure adherence as an example of an administrative procedure. General Administration Conduct Manual, MGA03, "Procedures Use and Adherence," Revision 8, Step 4.1.1.2, requires that continuous use procedure steps shall be performed as written in the sequence given.

The failure to follow procedure steps in proper sequence constitutes a violation of minor significance and is not subject to formal enforcement action. This minor violation is in the licensee's corrective action program as CARD 99-18033.

c. Conclusions

A licensed operator inserted a control rod two notches instead of withdrawing it two notches during a control rod check procedure. The reactivity change was negligible and no change in reactor power, temperature, or pressure were noted. The cause was inattention to detail.

O6.1 Human Performance Training

a. Inspection Scope (71707)

The inspectors reviewed the licensee's progress in training personnel for human performance. The licensee experienced several human performance errors while performing safety-related activities. The inspectors reviewed training plans, planning memos, and interviewed personnel responsible for the training.

b. Observations and Findings

Fermi management established 1 week of human performance training as an organizational urgent issue. Site training was tentatively scheduled to be completed by September 1999. Consequently, efforts were made to recruit seven trainers, but departments within the Fermi organization were unable to provide the resources for personnel to become trainers and satisfy meeting the organizational urgent issue. The operations department was the only department that has completed human performance training. Further, only 435 of 1000 site individuals, including contractors, have completed the training.

The training required a consideration of the following errors:

- Task demands (time pressure, repetitive tasks);
- Individual capabilities (unfamiliarity with the task, lack of proficiency);
- Work environment (distractions, interruptions, hidden system responses); and
- Human nature (stress, habits, complacency).

These errors were required to be discussed, typically during the pre-job brief, using a three question technique. This technique included questioning the critical phases of the activity, how mistakes could be made, and the adverse consequences.

Through independent observation and reviews of CARDs, the inspectors determined that the licensee has been less than fully effective at implementing the fundamentals of human performance training. Examples are listed in this report that include an operator mispositioning a control rod (Section O1.1), a bent drain pipe on the thermal recombiner test line (Section M1.1), and the pre-job brief for downpower to replace motor-generator (MG) set brushes (Section M1.2). Further, the inspectors questioned individuals in the operations crew and found that some operators were unfamiliar with the three question technique.

The licensee stated that the human performance staff will be increased and independent observations will be performed to verify that the training techniques (three question technique) are implemented during pre-job briefs.

c. Conclusions

Through independent observation and reviews of condition assessment resolution documents, the inspectors determined that the licensee has been less than fully effective at implementing the fundamentals of human performance training. The inspectors have identified instances when individuals received the training and were ineffective in implementing the training.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Bent Drain Pipe on Thermal Recombiner Test Line

a. Inspection Scope (62707)

The inspectors reviewed procedures and interviewed maintenance personnel to follow up on damage to a drain pipe on the thermal recombiner test line. The pipe was damaged during replacement of the Residual Heat Removal (RHR) Pump "C" motor.

b. Observations and Findings

On November 9, 1999, the licensee began to replace the RHR Pump "C" motor with the aid of a forklift. Before the activity started, the licensee measured the clearance between the forklift mast and the drain pipe on a thermal recombiner return line, which was above the lift path. The licensee determined the clearance to be small, between ¼ and½ inches. The mechanics discussed the lift path and the small clearance during the pre-job brief and decided to use four spotters.

After three successful passes to move the old and new motors underneath the drain

valve, the forklift mast struck and bent the drain pipe during the fourth pass. The maintenance foreman informed the shift supervisor, who arrived in the area shortly after the incident occurred. The activity was stopped and the event was debriefed with operations personnel and the involved maintenance personnel. The operators appropriately declared the thermal recombiner system inoperable. The licensee documented the incident on CARD 99-18239.

Since the drain line was welded between the thermal recombiner pipe inboard and outboard containment isolation valves, the integrity of the piping was questioned. The licensee used liquid penetrant to test the pipe welds and did not identify damage. After confirming the integrity of the drain pipe, operators declared the system operable. The inspectors determined that the licensee did not effectively implement human performance training (see Section O6.1).

c. Conclusions

Maintenance workers did not effectively implement human performance training during work to replace a residual heat removal pump motor. Maintenance personnel struck and bent a drain pipe on the thermal recombiner system with a fork lift. The operators appropriately declared the thermal recombiner system inoperable until testing confirmed the system was not damaged.

M1.2 Exciter Brush Replacements on the Reactor Recirculation MG Set

a. Inspection Scope (62707)

The inspectors observed two separate plant power reductions (October 21 and November 14, 1999) to replace worn brushes for the reactor recirculation pump MG set. The inspectors interviewed personnel and reviewed associated documents and observed the performance of the activity.

b. Observations and Findings

October 21, 1999 Brush Replacement

On October 21, the inspectors attended the control room pre-job brief for replacing the worn brushes on MG sets for Reactor Recirculation Pumps A and B. Most of the individuals who were involved in the activity attended the meeting. Non-licensed operators did not attend the brief. Consequently, calls from non-licensed operators in the field interrupted the brief several times. The interruptions caused difficulty in effectively communicating the critical elements needed to complete the task. Although there were no personnel errors during the brush replacement activities, the operators were trained that distractions and interruptions were work environment error precursors in human performance.

Also, the electrical supervisor expressed concern regarding the short lead time for replacing the brushes. This challenged the scheduling of qualified maintenance personnel. As a result, the licensee began pursuing efforts to better estimate brush wear rates and using more durable brushes.

The inspectors noted consistency among the workers regarding industrial safety practices. This was an improvement from the previous maintenance activity conducted on August 4, 1999 (see NRC Inspection Report 50-341/99011). In addition, the inspectors noted that inadequate lighting was a contributing factor in the short circuit of an MG set on May 18, 1999, (see NRC Inspection Report 50-341/99009). Consequently, an operator used a flashlight to provide lighting for the workers who were replacing the brushes. (The licensee decided to use a drop light with a lanyard for future brush replacement activities.) The inspectors identified no concerns.

The operators returned plant power to 97 percent the same day.

November 14, 1999 Brush Replacement

The electricians noted that sparking was still evident after replacing the brushes. The personnel who were present discussed the condition with operations department personnel, who determined that periodic monitoring was acceptable for continued plant operation.

The inspectors and the licensee noted that the electrician, who was holding the drop light during the brush replacement, did not use the lanyard on the light (see previous brush replacement paragraph). The inspectors determined that the expectation to use a drop light for brush replacement activities was not effectively communicated to or understood by the electrician.

After completing the brush replacement, the operators increased plant power in a controlled manner. During this evolution, the operators had trouble withdrawing CR 30-39 and entered Procedure 23.106, "CRD Hydraulics System," to increase drive water differential pressure to continue withdrawing the rod. The inspectors verified that the CRs were withdrawn to the proper positions and power stabilized at 97 percent.

c. Conclusions

Operators performed plant power manipulations to change worn brushes on the recirculation pump motor-generator sets in a controlled manner. Although no errors occurred, distractions to the control room from the field during one pre-job brief made it difficult to effectively communicate the essential elements of the task. The inspectors determined that training conducted to reduce these distractions and eliminate work environment error precursors was not entirely effective. Further, the expectation to use a drop light for brush replacement activities was not effectively communicated or understood during one brush replacement activity.

M1.3 Mechanical Draft Cooling Tower (MDCT) "C" Fan Brake Nitrogen Cylinder Manual Isolation Valve Mispositioning

a. Inspection Scope (62707)

On November 11, 1999, the licensee discovered a mispositioned manual valve on the mechanical draft cooling tower nitrogen fan brake system. The inspectors reviewed the circumstances surrounding the mispositioning of the valve and potential consequences. The inspectors also interviewed operations and system engineering personnel. The inspectors reviewed the following documents:

- Abnormal Operating Procedure 20,000.01, "Acts of Nature;"
- Detroit Edison letter to the NRC dated December 28, 1989 (Discusses how Detroit Edison determines inoperability of the RHR Service Water system MDCT fan brake);
- Updated Final Safety Analysis Report (UFSAR) Section 9.2.5, "Design of RHR Service Water system and the RHR Complex to Withstand the Effects of Tornadoes and Missiles;"
- CARD 99-18332, "Revise 27.000.05 Attachment 3, Outside Round Sheets, for MDCT Fan ITS;"
- Work Request (WR) 000Z993899, "Replace N_2 Cylinder for MDCT Fan Brake;" and
- WR 000Z982208, "MDCT Fan Overspeed Brake Setpoint Change."

b. Observations and Findings

On October 28, 1999, maintenance personnel replaced the 2000 psig N_2 cylinder and regulator on Mechanical Draft Cooling Tower C. Operations personnel then verified the system lineup by reading the pressure gauges. On November 11, 1999, instrumentation and control personnel performing N_2 regulator setpoint changes noted that the manual valve from the 2000 psig N_2 cylinder pressure regulator was shut. Operations personnel were notified and verified that the remaining N_2 valves were open. The licensee initiated Condition Assessment Resolution Document 99-18349 to document the event.

The inspectors reviewed the associated WR and found there were no procedure steps to align the nitrogen system after cylinder replacement. The inspectors determined that confirming system lineup by reading the pressure gauges was not sufficient to ensure proper lineup of the system.

The fan brake system is provided to prevent potentially damaging overspeed during a design basis tornado. Each mechanical draft cooling tower cell fan is provided with an overspeed protection system designed to prevent over speeding from a postulated design basis tornado. The shaft speed is monitored and when the speed exceeds 2100 rpm, solenoid valves are actuated to apply N_2 to an air disk brake. (The N_2 supply to the fan brake consists of three N_2 stages arranged in series through pressure reducing valves. The first N_2 source is a 2000 psig cylinder and is reduced downstream to 100 psig. The second source is a 100 psig cylinder and is reduced downstream to 45 psig. The third source, closest to the brake is a 45 psig cylinder.)

The fans are required for operability of the ultimate heat sink. The ultimate heat sink reservoir is divided into two one-half capacity reservoirs. A two cell induced draft cooling tower is located above each half capacity reservoir. Each cell is equipped with one mechanical draft cooling tower fan.

Technical Specification (TS) 3.7.2, "Emergency Equipment Cooling Water/Emergency Equipment Service Water and Ultimate Heat Sink," requires that each of the two ultimate heat sink reservoirs have two operable mechanical draft cooling tower fans during plant operation. With one inoperable ultimate heat sink, TS 3.7.2 permits plant operation to continue for 72 hours before plant shutdown is required. The inspectors determined that having only 3 of 4 operable fans from October 28, 1999, to November 11, 1999, resulted in the licensee exceeding the allowed outage time. The inspectors considered this a violation of TS 3.7.2. This Severity Level IV violation is being tracked as a Non-Cited Violation (NCV), (NCV 50-341/99015-01(DRP)), consistent with the NRC Enforcement Policy. This violation is in the licensee's corrective action program as CARD 99-18349.

c. Conclusions

The method used by personnel to verify the nitrogen supply valve alignment for the Mechanical Draft Cooling Tower "C" fan brake system was inadequate. As a result, a high pressure nitrogen cylinder was isolated for 14 days, causing a reservoir of the ultimate heat sink to exceed the allowed outage time in violation of TS 3.7.2. This Severity Level IV violation is being tracked as a Non-Cited Violation, and is in the licensee's corrective action program as CARD 99-18349.

M1.4 Loss of Emergency Response Capability

a. Inspection Scope (62707)

The inspectors interviewed computer support personnel and reviewed associated documents for following up on the circumstances surrounding a loss of emergency response capability when the Emergency Response Information System (ERIS) failed during maintenance.

b. Observations and Findings

On November 12, 1999, at 8:50 a.m., the licensee removed Central Processing Unit (CPU) 2 from service to replace a failed power supply and a cooling fan on the ERIS, per WR 000Z994069. The ERIS provides critical parameter information to the control room operators, personnel in the technical support center, and personnel in the emergency operating facility during a transient or accident condition. When the licensee removed CPU 2 from service, CPU 1 became the primary processor of information for the ERIS. At 10:08 a.m. the licensee returned CPU 2 to service after the maintenance was completed. At 10:54 a.m., CPU 1 failed due to memory errors.

As a result of the failure of CPU1, CPU 2 became the primary system. However, CPU 2 failed again at 11:05 a.m. due to a faulty internal processing unit. After performing a system diagnostic evaluation, the licensee determined that this was an age-related failure. Delays occurred in restoring both systems due to obsolete spare parts.

At 6:08 p.m., the licensee determined that ERIS was out of service for greater than 8 hours and reported to the NRC a loss in emergency response capability per 10 CFR Part 50.72 (b)(1)(v). At 6:23 p.m., the licensee completed replacing the power supply, the internal processing unit, and the cooling fan for CPU 2. The licensee made the necessary NRC notifications following the complete loss of emergency response capability.

The inspectors reviewed corrective maintenance, the CARD, and Deviation Event Report history (since 1990) for the ERIS. Approximately 12 of 50 corrective action documents related to the ERIS computer monitor, communication system and power supply failures had been documented. Although the licensee replaced failed parts after the various components failed, a component replacement program to address age-related parts had not been developed for ERIS.

The licensee is scheduled to replace ERIS with an integrated process computer system by the next refueling outage under Technical Service Request 26016. This was initiated in 1993 to address obsolete equipment. Delays for installing the new system occurred from lack of available resources and other reasons. The inspectors determined that the licensee was slow in implementing Technical Service Request 26016.

c. Conclusions

On November 12, 1999, the licensee experienced a reportable failure of the Emergency Response Information System due to age-related component failures. The licensee made the necessary NRC notifications. The licensee initiated action to replace the system in 1993 but has not made much progress, due in part to lack of available resources. The licensee currently plans to replace the system in April 2000.

III. Engineering

E1 Conduct of Engineering

E1.1 Retraction of NRC Notification for Inoperable High Pressure Coolant Injection (HPCI) System

a. Inspection Scope (37551)

The inspectors reviewed the licensee's November 11, 1999, retraction of a 4-hour NRC notification for an inoperable HPCI system. The inspectors reviewed the following:

- heat load calculations,
- environmental qualification documents,

- associated CARDS,
- Sargent and Lundy Calculation Project No. 09471-074, "Fermi Unit 2 - Reactor Building Additional Run for Small Break Loss-of-Coolant Accident (LOCA) Case," and
- interviewed associated engineering personnel.

b. Observations and Findings

On October 11, 1999, the licensee shutdown Divisions 1 and 2 of the Emergency Equipment Service Water (EESW) system to repair leaking discharge check valves (See NRC Inspection Report 50-341/99014). Since the EESW system provided cooling to the Emergency Equipment Cooling Water (EECW) system for the HPCI room coolers, the operators declared the HPCI room cooler and HPCI system inoperable.

As part of their follow up review, the licensee contracted Sargent and Lundy to run a small break LOCA computer model per Design Calculation 5589, "Reactor Building Environmental Response for High Energy Line Break and LOCA Conditions." The licensee specified the following conditions: (1) A 3-hour run time for HPCI; (2) An initial ambient temperature of 80° F; and (3) Disabling of the Division 2 EECW room coolers.

The results indicated that the HPCI room temperature would reach a maximum of 150° F. The licensee performed an environmental evaluation of HPCI room components and determined that the system could operate under these conditions without affecting equipment qualification. As a result, the licensee determined that the HPCI system would remain operable with an inoperable room cooler. The licensee subsequently retracted the notification on November 8, 1999.

The inspectors reviewed the EESW tag out for October 11, 1999, and determined that the EECW could run during the assumed LOCA scenario since the EECW system was not tagged out. The operating closed loop EECW could heat up from other EECW loads and transfer the heat through the HPCI cooler and increase HPCI room temperature.

Annunciator Response Procedure (ARP) 2-D-14 required that operators manipulate temperature control valves, remove non-essential heat loads, or shutoff a reactor recirculation pump should fluid temperature at the EECW heat exchanger exceed 85° F. Since the Sargent and Lundy model disabled EECW, the calculation did not reflect actual conditions and did not consider heat loads introduced via the HPCI room cooler. The licensee did not recognize this condition before retracting the NRC notification.

The inspectors reviewed ARP 3D34, " Secondary Containment Temperature High-High Emergency Operating Procedure (EOP) Entry," and determined that the maximum normal operating temperature for the HPCI room was 148° F. Per the procedure, exceeding this temperature requires entry into EOP 29.100.01, "Secondary Containment and Radiation Release." Since the calculation showed that HPCI room temperature would be above 148° F (at 150° F), the inspectors questioned whether the licensee recognized that an EOP entry condition before issuing the retraction. The licensee did not review the procedure and, therefore, did not initially recognize this condition.

The inspectors reviewed ARP 1D70, "Steam Leak Detection," and ARP 1D66, "Steam Leak Detection Ambient Temperature High," and determined that the HPCI pump would stop at an ambient temperature of 154° F. According to the licensee, a 1 °F increase in the initial ambient temperature corresponds to a 1 °F temperature increase in the maximum ambient temperature after a 3-hour HPCI run. The inspectors reviewed the temperature strip chart recorder for the HPCI room on October 11, 1999, and determined that the average ambient temperature was 83° F, which would result in a final maximum temperature of 153° F.

Since the licensee used an initial ambient temperature of 80° F, actual conditions were not reflected. Further, the inspectors reviewed the tolerances for the temperature isolation logic and found that it was ±4° F. Since a temperature of 153° F would be within the trip set point tolerance, the HPCI pump could trip before the end of the 3-hour period. The licensee did not consider this fact before retracting the notification.

The inspectors also questioned whether a (pre-operational) test had been performed with the HPCI room cooler disabled and the HPCI pump running. The licensee did not conduct the test and therefore impact of an inoperable cooler on HPCI system operation could be determined.

Based on these findings, the inspectors questioned engineering management on the thoroughness of the engineering review before retraction. The licensee stated that a formal process (technical service request, emergency functional analysis (EFA), etc.) was not used that resulted in missing these issues. Consequently, the licencee initiated CARD 99-18815 to address these issues.

c. Conclusions

The licensee lacked rigor and thoroughness in their evaluation of a vendor calculation that was used as the basis for retracting a 4-hour notification regarding the inoperability of the HPCI room cooler and HPCI system. The site engineering organization did not use a formal review process, and a test for the configuration in question had never been performed. The licensee initiated a condition assessment resolution document to re-evaluate the issue.

E1.2 Failure of Voltage Regulator 480V Bus 72E

a. Inspection Scope (37551)

The inspectors reviewed the maintenance history, corrective action document history, the UFSAR, ITS, the vendor's manual, and interviewed engineers to follow up on the failure of Division II Voltage Regulator 72E.

b. Observations and Findings

On November 16, 1999, the licensee replaced degraded fans for Voltage Regulator 72E. The regulator adjusts voltage from the safety-related 4160 Volt Bus 65E to the safety-related 480 Volt Bus 72E. Regulation is accomplished through three individual motors that operate in parallel and are connected with a common drive shaft

to change phase voltages. The regulator is set to override voltage variations from the grid (the 345 kV system) to maintain Bus 72E voltages between 463.2 Volts-alternating current (VAC) and 503 VAC. This operability limit was documented in the EFA attached to CARD 98-14546, which documented the degraded condition of the fans.

During the fan replacement, the licensee discovered that one of the regulator motors had seized due to a bearing failure, causing the manual/auto function to be inoperable. Failure of the regulator motor could cause unacceptably low voltage conditions on Bus 72E. Operator instructions for low bus voltage were provided in ARP 10D43 "Division II Bus Voltage Low." Operators commenced monitoring of voltage on Bus 72E every 12 hours. The licensee initiated CARD 99-18535 to document the failed regulator. The inspectors reviewed a second EFA and noted that the licensee had changed the lower voltage operability limit to 451.2 VAC.

The licensee stated that since the first EFA was based on an operable regulator. Engineering personnel re-calculated the electrical loads using the Electrical Load Monitoring System AC computer program based on the present voltage ratio setting for the seized regulator. This re-calculation determined that bus voltage could degrade to 451.2 VAC, which was the lowest limit allowed per Design Calculation 919 for safety equipment powered from the bus.

The inspectors reviewed the corrective action document history and work history for the regulator and did not identify a similar failure mode or a previous regulator replacement activity. The inspectors reviewed Vendor Manual VME8-11, "General Electric Inductrol Type AIRT Voltage Regulators," and found that while the manual did not require periodic maintenance or periodic regulator replacement, the licensee had planned to replace the three motors on December 13, 1999.

c. Conclusions

A voltage regulator for 480 Volt Bus 72E failed due to a seized motor bearing on the voltage regulator. The licensee effectively determined the operability limits to justify continued operation with the inoperable regulator. The licensee implemented appropriate compensatory actions, including periodic monitoring of bus voltage.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls

R1.1 Improved TS Violation of Radiation Protection (RP) Requirements

a. Inspection Scope (71750)

The Inspectors conducted interviews and reviewed documents and procedures to assess an incident when a licensee engineer entered a locked high radiation area without having stay time being tracked.

b. Observations and Findings

On November 1, 1999, an engineer obtained a pre-job brief and key for entering the reactor water cleanup (RWCU) heat exchanger room to conduct an inservice inspection leakage surveillance of the piping. The RP supervisor did not verify the magnitude of the dose rate in the room from available survey sheets and thereby failed to recognize that the room was a locked high radiation area (an area > 1000 mrem/hr) prior to the individual entering the room. Further, the room key was not tagged requiring that an individual's stay time be tracked. Consequently, the RP supervisor did not inform the engineer that stay time be tracked per ITS 5.7.2 and RP Conduct Manual 06, "Accessing and Control of High Radiation, Lock High Radiation and Very High Radiation Areas."

Upon arriving at the RWCU heat exchanger room, the engineer did not recognize the locked high radiation posting and entered the room. The engineer remained in the room between 5 and 10 minutes and received approximately 9 mrem dose. The engineer exited the room and the radiological restricted area and informed RP personnel of a catch basin that was not properly attached to a valve. When decontamination personnel arrived at the RWCU heat exchanger room door to correct the catch basin, they contacted RP personnel for permission to enter the locked high radiation area. The RP supervisor then realized that the engineer had entered the room without stay time tracking.

The licensee initiated CARD 99-15113 to document the entry into the locked high radiation area without stay time tracking and implemented the following immediate corrective actions:

- unique tagging of all locked high radiation keys;
- adding a requirement to an RP log book to verify room posting before key issuance; and
- verifying all locked high radiation doors locked.

Improved TS 5.7.2 states, in part, that individuals accessing locked high radiation areas be assigned stay times. Contrary to the above, on November 1, 1999, an engineer entered the RWCU heat exchanger room, a locked high radiation area, without proper stay time monitoring. This Severity Level IV violation is being treated as an NCV consistent with Appendix C of the NRC Enforcement Policy (NCV 50-341/99015-02(DRP)). This violation is in the licensee's corrective action program as CARD 99-15113.

The inspectors reviewed the radiation worker training the engineer had received. The inspectors verified that subject of entry into locked high radiation areas was covered.

c. Conclusions

The licensee identified a TS violation when an engineer entered a locked high radiation area without stay time tracking. Procedural controls for tagging keys for locked high radiation areas did not exist. Inattention to detail and lack of a thorough review of the survey sheets by the radiological protection supervisor and the engineer involved

contributed to the event. The licensee's root cause investigation was thorough and corrective actions appeared comprehensive. This Severity Level IV violation is being tracked as a Non-Cited Violation and is in the licensee's corrective action system as CARD 99-15113.

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 December 3, 1999. 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.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Pierce, Training, Operations
D. Craine, Supervisor, Radiological Engineering
D. Williams, Assistance Manager, Radiation Protection
J. Moyers, Director, Nuclear Quality Assurance
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S. Stasek, Supervisor, Independent Safety Engineering Group
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W. O'Connor, Assistant Vice-President, Nuclear Assessment

NRC

A. Vegel, Chief, Reactor Projects Branch 6
S. Campbell, Senior Resident Inspector
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INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 62707:	Maintenance Observation
IP 71707:	Plant Operations
IP 71750:	Plant Support Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-341/99015-01	NCV	Failure to Perform Adequate Lineup Verification of MDCT Fan Brake System
50-341/99015-02	NCV	Engineered Entered Locked High Radiation Area Without Stay Time Tracking Being Performed

Closed

50-341/99015-01	NCV	Failure to Perform Adequate Lineup Verification of MDCT Fan Brake System
50-341/99015-02	NCV	Engineered Entered Locked High Radiation Area Without Stay Time Tracking Being Performed

Discussed

None

LIST OF ACRONYMS USED

ARP	Annunciator Response Procedure
CARD	Condition Assessment Resolution Document
CFR	Code of Federal Regulations
CPU	Central Processing Unit
CR	Control Rod
CRD	Control Rod Drive
ERIS	Emergency Response Information System
EECW	Emergency Equipment Cooling Water
EESW	Emergency Equipment Service Water
EFA	Emergency Functional Analysis
EOP	Emergency Operating Procedure
HPCI	High Pressure Coolant Injection
IR	Inspection Report
ITS	Improved Technical Specification
LOCA	Loss-of-Coolant Accident
MDCT	Mechanical Draft Cooling Tower
MG	Motor-generator
PSIG	Pounds Per Square Inch Gauge
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RP	Radiation Protection
RWCU	Reactor Water Clean-Up
UFSAR	Updated Final Safety Analysis Report
VAC	Volts-Alternating Current
WR	Work Request