

April 4, 2000

Mr. Thomas J. Palmisano  
Site Vice President and General Manager  
Palisades Nuclear Generating Plant  
Consumers Energy Company  
27780 Blue Star Memorial Highway  
Covert, MI 49043-9530

SUBJECT: PALISADES INSPECTION REPORT 50-255/2000001(DRP)

Dear Mr. Palmisano:

On March 8, 2000, the NRC completed an inspection conducted at your Palisades Nuclear Generating Plant. The enclosed report presents the results of that inspection.

The inspection covered a 5-week period. Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of a selective examination of procedures and representative records, interviews with personnel, and observations of activities in progress. The purpose of the inspection effort was to determine whether activities authorized by the license were conducted safely and in accordance with NRC requirements. During this inspection period, we observed that your staff demonstrated a positive focus on safety and an appropriate threshold for problem identification.

Human performance deficiencies were demonstrated during this inspection period which represented a concern with the effectiveness of your problem identification and resolution program. The errors were fundamental in nature and similar to previously identified issues regarding operator and security personnel performance.

Based on the results of this inspection, the NRC has determined that a violation of NRC requirements occurred. The violation involved failure to perform a Technical Specification required surveillance to verify the setpoint for the Power Dependent Insertion Limit alarm. This issue was identified by your staff and is being treated as a Non-Cited Violation, consistent with Section VII.B.1.a. of the Enforcement Policy. The Non-Cited Violation is described in the subject inspection report. If you contest the violation or severity level of this Non-Cited Violation, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region III, and the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, the enclosure, and your response, if you choose to provide one, will be placed in the NRC Public Document Room.

Sincerely,

Original signed by  
Michael J. Jordan

Michael J. Jordan, Chief  
Reactor Projects Branch 3

Docket No. 50-255  
License No. DPR-20

Enclosure: Inspection Report 50-255/2000001(DRP)

cc w/encl: R. Fenech, Senior Vice President, Nuclear  
Fossil and Hydro Operations  
D. Malone, Acting Director, Licensing  
R. Whale, Michigan Public Service Commission  
Michigan Department of Environmental Quality  
Department of Attorney General (MI)  
Emergency Management Division, MI Department  
of State Police

T. Palmisano

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In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, the enclosure, and your response, if you choose to provide one, will be placed in the NRC Public Document Room.

Sincerely,

/s/Michael J. Jordan

Michael J. Jordan, Chief  
Reactor Projects Branch 3

Docket No. 50-255  
License No. DPR-20

Enclosure: Inspection Report 50-255/2000001(DRP)

cc w/encl: R. Fenech, Senior Vice President, Nuclear  
Fossil and Hydro Operations  
D. Malone, Acting Director, Licensing  
R. Whale, Michigan Public Service Commission  
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Department of Attorney General (MI)  
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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No: 50-255  
License No: DPR-20

Report No: 50-255/2000001(DRP)

Licensee: Consumers Energy Company  
212 West Michigan Avenue  
Jackson, MI 49201

Facility: Palisades Nuclear Generating Plant

Location: 27780 Blue Star Memorial Highway  
Covert, MI 49043-9530

Dates: February 1, 2000, through March 8, 2000

Inspectors: J. Lennartz, Senior Resident Inspector  
R. Krsek, Resident Inspector

Approved by: Michael J. Jordan, Chief  
Reactor Projects Branch 3  
Division of Reactor Projects

## EXECUTIVE SUMMARY

### Palisades Nuclear Generating Plant NRC Inspection Report 50-255/2000001(DRP)

This inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a 5-week period of resident inspection activities.

#### Operations

- Conduct of operations was characterized by a professional atmosphere in the control room which was usually free of unnecessary distractions. Administrative controls, conservative to Technical Specification requirements, were implemented to maintain the plant in cold shutdown pending an operability assessment regarding an auxiliary feedwater pump. This demonstrated a positive focus on safety. (Section O1.1)
- Operator performance during plant shutdown on February 4, 2000, and subsequent startup activities on February 28 and 29, was characterized by strict procedure adherence. (Section O4.1)
- Ineffective "just-in-time" training, inadequate self checking (STAR), and ineffective senior reactor operator oversight resulted in tripping of two primary coolant pumps. A Nuclear Control Operator started two primary coolant pumps powered from the same electrical bus within 4 seconds of each other which caused the feeder breaker to nonsafety-related 4160 volt electrical Bus B to trip on timed overcurrent, as designed. No equipment damage or adverse safety consequences resulted from the error; however, this was an unnecessary challenge to plant equipment. The fundamental nature of the errors were similar to issues documented in NRC Inspection Report 50-255/99012 (DRP) and to a generic weakness that was identified during the administration of initial license examinations in June 1999. (Section O5.1)

#### Maintenance

- Maintenance activities were completed in accordance with the approved work packages. Maintenance technicians were knowledgeable of the tasks being performed. (Section M1.2)
- Maintenance personnel identified poor maintenance from a previous installation of a service water pump shaft seal packing. These practices contributed to the decreased service life of packing in at least one of the service water pumps shaft seal. (Section M1.2)
- Several equipment problems emerged during the inspection period which represented continued adverse material condition issues at the plant. Some of the problems unnecessarily challenged the control room operators and resulted in expanding the scope and duration of the maintenance outage. The self revealing emergent equipment problems included rupture of the alternate steam supply line to Turbine Driven Auxiliary Feedwater Pump P-8B, elevated moisture carryover in Steam Generator E-50A, control

rod drive seal assembly leakage, and a failed bearing on Motor Driven Auxiliary Feedwater Pump P-8A. (Section M2.1)

- Emergent equipment problems significantly increased accrued radiation dose during the maintenance outage. (Section R1.1)
- Licensee personnel addressed the emergent equipment problems in a conservative, safety conscious manner during the maintenance outage. (Section M2.1)
- On January 25, 2000, licensee personnel identified that the Power Dependent Insertion Limit Alarm Technical Specification surveillance had not been performed as required. The missed surveillance resulted in a Non-Cited Violation. (Section M8.1)

#### Engineering

- Engineering personnel supported, demonstrated ownership, and addressed the emergent equipment problems during the maintenance outage. Engineering personnel provided effective recommendations to outage planning personnel regarding required repairs with one isolated exception. (Section E1.1)
- Engineering personnel's root cause evaluation regarding the rupture of the alternate steam supply line to the turbine driven auxiliary feedwater pump was thorough. (Section E2.2)

#### Plant Support

- Radiation protection personnel accurately projected and effectively controlled accrued radiation dose for the maintenance outage. (Section R1.1)
- Emergency response personnel adequately completed assigned tasks during the emergency preparedness drill conducted on March 1, 2000. (Section P5.1)
- Licensee personnel generated several condition reports regarding self-revealing equipment problems and self-identified emergency preparedness issues. This demonstrated an appropriate threshold for problem identification and a safety conscious work environment. The identified deficiencies were considered minor and did not result in any violations of regulatory requirements. (Section P5.1)
- A human performance deficiency, similar to issues documented in NRC Inspection Report 50-255/99017(DRS), was identified regarding a security officer's ability to adequately perform vehicle searches. (Section P5.1)

## **Report Details**

### **Summary of Plant Status**

The plant was at full power when the inspection period started. The plant was shutdown on February 4, 2000, to hot shutdown for a planned maintenance outage (005001). Primarily, the plant was shut down to reduce the elevated sodium concentrations that were present in the secondary system and to allow for sodium chemical "hideout return" in the steam generators. Subsequent emergent equipment problems involving the Auxiliary Feedwater System and control rod drive seal assemblies required the plant to be placed in cold shutdown on two separate occasions. Consequently, the planned outage was extended for a total duration of 24 days. Following necessary repairs, the plant was taken critical on February 28 and synchronized to the grid on February 29. Subsequently, plant power was escalated and achieved full power on March 3. The plant remained at full power for the remainder of the inspection period.

## **I. Operations**

### **O1 Conduct of Operations**

#### **O1.1 General Comments (71707)**

The inspectors conducted frequent reviews of ongoing plant operations and oversight by control room operators. In general, conduct of operations was characterized by a professional atmosphere in the control room which was usually free of unnecessary distractions. Required plant equipment was appropriately identified and controlled during the outage with one isolated exception in which the inspectors identified the lack of prescribed administrative controls, including signs and barriers, for protected equipment. Following the discovery, licensee personnel took immediate corrective actions to appropriately place the protected equipment signs and barriers.

Also, operations personnel administratively maintained the plant in cold shutdown until the final operability assessment was completed for an auxiliary feedwater pump. The administrative controls were conservative with respect to Technical Specification (TS) requirements which demonstrated a positive focus on safety.

### **O4 Operator Knowledge and Performance**

#### **O4.1 Plant Shutdown and Startup Observations**

##### **a. Inspection Scope (71707)**

The inspectors frequently observed control room activities during the maintenance outage including plant shutdown and subsequent plant startup. The inspectors also reviewed applicable operating procedures, TSs, and condition reports.

b. Observations and Findings

The inspectors observed the plant shutdown for a planned maintenance outage on February 4, 2000. The inspectors noted that the Control Room Supervisor demonstrated pro-active command and control. Also, the inspectors noted effective and increased use of the plant paging system to announce equipment manipulations. Shutdown activities were completed in accordance with plant procedures and without any incidents.

Also, operations personnel placed the plant in the required condition for the scheduled maintenance activities in an effective and timely manner. Plant equipment required to be operable during the outage was effectively controlled in accordance with plant procedures.

Regarding the plant startup on February 28, the inspectors noted that the operators demonstrated effective self and peer-checking techniques during reactivity manipulations. Plant procedures were used and the control room was free of unnecessary distractions. Reactor engineering personnel effectively supported the operators as evidenced by reactor criticality being achieved within the prescribed limits of the estimated critical position.

Subsequently, the main generator was synchronized to the grid on February 29. The inspectors did not identify any significant findings regarding operator performance during the evolution to synchronize the main generator to the grid.

However, the inspectors noted that the Nuclear Control Operator did not manipulate the controls in a timely and accurate manner in response to expected changes in primary plant parameters. This resulted in an unnecessary deviation alarm regarding primary coolant system average temperature versus reference temperature. Subsequently, appropriate actions were taken to clear the alarm.

Also, the Nuclear Control Operator did not manipulate the controls in a timely manner to compensate for expected system parameter changes during the power escalation. Consequently, the Nuclear Control Operator had to be prompted by the Control Room Supervisor, on two separate occasions, to withdrawal control rods to increase reactor power as turbine power was increasing.

The inspectors noted that the Nuclear Control Operator was appropriately monitoring plant parameters. However, the operator demonstrated minor weaknesses in the ability to manipulate the controls in a timely and accurate manner to compensate for expected changes in plant parameters as evidenced by the unnecessary temperature deviation alarm and the required prompting from the Control Room Supervisor. The demonstrated weaknesses did not result in any significant adverse safety consequences.

c. Conclusions

The inspectors concluded that operator performance during plant shutdown and subsequent startup activities was characterized by strict procedure adherence. The

inspectors did not identify any significant findings regarding operator performance during plant shutdown activities on February 4, 2000, and subsequent plant startup activities on February 28 and 29, which were completed without incident.

However, the Nuclear Control Operator demonstrated minor performance deficiencies regarding the ability to manipulate the controls in a timely and accurate manner when the main generator was synchronized to the grid and during the subsequent power escalation. The deficiencies did not result in any significant adverse safety consequences.

## **O5 Operator Training and Qualification**

### **O5.1 Just-In-Time Training For Starting Primary Coolant Pumps**

#### **a. Inspection Scope (71707)**

The inspectors reviewed the circumstances surrounding an incident in which the feeder breaker to a nonsafety-related 4160 volt electrical bus tripped while starting primary coolant pumps during plant startup activities on February 26, 2000. The inspectors reviewed Condition Reports CPAL0000668, CPAL0000670, and CPAL0000776, Standard Operating Procedure - 1, "Primary Coolant System," Revision 47, Operations Department Standards on Self Checking, and plant computer data. Also, the inspectors discussed the issue with several licensed operators and operations management.

#### **b. Observations and Findings**

Control room operating crew members received "just-in-time" training on February 26, 2000, for starting the first two primary coolant pumps during plant startup activities following the maintenance outage. The crew selected Primary Coolant Pumps P-50B and P-50D to start which were both powered from non-safety related 4160 volt electrical Bus B. The crew had practiced the evolution four times in the plant simulator during the training session and, each time, the evolution was completed in the same manner without any significant problems noted.

However, when the crew started the primary coolant pumps in the plant on the same day, in the same manner that was practiced during the training session, the feeder breaker (252-202) to 4160 volt electrical Bus B tripped. Subsequently, plant operators and electrical maintenance personnel identified that the neutral timed overcurrent protective relay had actuated which tripped the feeder breaker.

Further evaluation of plant computer data revealed that the starting current on the first pump did not have time to decrease to running current prior to starting the second pump because the Nuclear Control Operator had started the two primary coolant pumps within 4 seconds of each other. Consequently, the neutral timed overcurrent protective relay was actuated and tripped the breaker.

Engineering and electrical maintenance personnel further investigated the incident and concluded that the protective relays had actuated as designed. The incident did not

result in any damage to plant equipment or any adverse safety consequences. However, the inspectors considered the incident as an unnecessary challenge to electrical bus protective relays.

Also, the inspectors noted the following deficiencies regarding this incident:

- The “just-in-time” training session was ineffective. The training instructor failed to correct the crews inability to perform adequate self-checking when two primary coolant pumps were started within 4 seconds of each other during the training session.

Also, a simulator modeling deficiency was revealed. The 4160 volt electrical Bus B feeder breaker did not trip on timed overcurrent when pumps P-50B and P-50D were started within 4 seconds of one another during the training session.

- Standard Operating Procedure - 1, “Primary Coolant System,” Section 7.2.3, Revision 47, “To Place Primary Coolant Pump in Operation,” did not contain any cautions on starting only one primary coolant pump at a time. However, the various steps in Section 7.2.3 specified starting a singular primary coolant pump. Specifically, Step 7.2.3.b stated, “start the AC or DC oil lift pump for the primary coolant pump to be started,” and Step 7.2.3.g stated, “when oil lift pumps have been operating for at least two minutes, then start the primary coolant pump.” The incident did not result in any equipment damage or any adverse safety consequences.
- The Nuclear Control Operator’s self-checking (STAR) techniques were inadequate and not in accordance with Operations Department Standards. Specifically, the expected system responses, such as primary coolant pump motor current and primary coolant system pressure response, after starting the first primary coolant pump were not verified prior to starting the second pump.

This issue was similar to a generic weakness that was identified during the administration of initial license examinations in June 1999 as documented in NRC Inspection Report 255/99301(OL). Specifically, the inspectors identified that both the reactor operator and senior reactor operator license applicants failed to consistently observe or verify system response during normal and abnormal evolutions.

- Senior reactor operator oversight was ineffective in that the Shift Supervisor observing the evolution, during both the training session and in the plant, allowed the Nuclear Control Operator to implement inadequate self-checking methods which were not in accordance with Operations Department Standards.
- The crew demonstrated an ineffective questioning attitude in that no crew members questioned the practice of starting two primary coolant pumps within 4 seconds of each other.

Operations personnel generated Condition Report CPAL0000668 to document the incident in the licensee’s corrective action program. The condition report was assigned

a significance level 2 which required a root cause evaluation and demonstrated an appropriate threshold for problem identification. The root cause evaluation had not been completed when the inspection period ended.

Also, Condition Reports CPAL0000670 and CPAL0000776 were appropriately generated to document the identified weaknesses regarding the “just-in-time” training that was conducted. Simulator Discrepancy Report 20-00-037 was generated to evaluate and correct the self-revealing simulator modeling deficiency.

The inspectors determined that the human performance deficiencies did not result in any adverse safety consequences. However, the inspectors noted that the human performance deficiencies demonstrated during this incident were similar to the issues documented in NRC Inspection Report 50-255/99012(DRP) in that they were fundamental in nature.

c. Conclusions

Ineffective “just-in-time” training, inadequate self checking (STAR), and ineffective senior reactor operator oversight resulted in tripping of two primary coolant pumps. A Nuclear Control Operator started two primary coolant pumps powered from the same electrical bus within 4 seconds of each other which caused the feeder breaker to nonsafety-related 4160 volt electrical Bus B to trip on timed overcurrent, as designed. No equipment damage or adverse safety consequences resulted from the error; however, this was an unnecessary challenge to plant equipment. The fundamental nature of the errors were similar to issues documented in NRC Inspection Report 50-255/99012 (DRP) and to a generic weakness that was identified during the administration of initial license examinations in June 1999.

## **II. Maintenance**

### **M1 Conduct of Maintenance**

#### **M1.1 Surveillance Test Observations**

a. Inspection Scope (61726)

The inspectors reviewed the applicable sections of the TSs and the Final Safety Analysis Report. Also, the inspectors reviewed the completed documentation and observed the performance of selected portions of the following surveillance tests.

- MO-7A-1 Emergency Diesel Generator 1-1 Monthly Surveillance
- MI-2A Thermal Margin Low Pressure Trip Units
- MI-2 Reactor Protective Trip Units

- QO-1 Safety Injection System
- PO-1 Operations Pre-Startup Tests

b. Observations and Findings

The inspectors noted that the correct procedures were utilized by operations personnel during the observed surveillance activities. Control Room personnel appropriately entered and exited TS Limiting Conditions of Operation. The inspectors also noted effective communications during the tests between the control room and auxiliary operators and active system engineering support. Test documentation was appropriately completed and the applicable acceptance criteria were met.

c. Conclusions

Observed surveillance activities were effectively completed and documented in accordance with applicable procedures and TSs.

M1.2 Maintenance Observations

a. Inspection Scope (62707)

The inspectors interviewed operations, engineering, and maintenance department personnel and, when applicable, reviewed the TSs, the Final Safety Analysis Report, and vendor equipment manuals. The inspectors reviewed the completed work order documentation and observed performance of selected portions of the following maintenance work orders:

- 24010087 Emergency Diesel Generator 1-1 Cylinder 2R
- 24912511 Emergency Diesel Generator 1-1 Jacket Water
- 24010069 Containment Isolation High Pressure Switch Calibration
- 24010814 Auxiliary Feedwater Pump P-8A
- 24010534 Steam Supply to Auxiliary Feedwater Pump P-8B Check Valve
- 24010714 Replace Pump Packing in Service Water Pump P-7A
- 24010810 Replace Pump Packing in Service Water Pump P-7B
- 24010748 Replace Pump Packing in Service Water Pump P-7C
- 24911737 Build and Test New N-9000 Mechanical Seal for Primary Coolant Pump P-50B

- 24010748 Remove Old Style (SU) Mechanical Seal and Replace with New N-9000 Mechanical Seal on Primary Coolant Pump P-50B

The inspectors also reviewed the following Condition Reports:

- CPAL0000303 "Un-releasing of Work Orders not Performed in Accordance with Administrative Procedure 5.01"
- CPAL0000319 "Repairman Not Given Advanced Notice to Review Work Order and Vendors Manual Prior to Diesel Generator 1-1 Being Tagged Out"
- CPAL0000323 "Diesel Generator Jacket Water Pressure Switch PS-1498 Found Out of As-Found Tolerance"
- CPAL0000330 "Problems identified on Diesel Generator 1-1 Output Breaker 152-207"
- CPAL0000613 "Service Water Pump P-7B Premature Packing Failure"
- CPAL0000618 "Service Water Pump P-7A Premature Packing Failure"
- CPAL0000631 "Service Water Pump P-7C Packing Installed in Incorrect Stack-Up"

b. Observations and Findings

Emergency Diesel Generator 1-1 Planned Maintenance Outage

The inspectors observed maintenance activities associated with the planned maintenance outage of Emergency Diesel Generator 1-1. The inspectors noted that maintenance technicians were knowledgeable of the tasks being performed. Work packages and working copies of procedures were used at the job sites. In addition, the inspectors did not identify any issues with the review of completed maintenance work order packages.

The inspectors noted that issues encountered by the maintenance technicians during the planned outage were appropriately documented in the licensee's corrective action system. Several condition reports were generated for issues identified while performing the maintenance on Emergency Diesel Generator 1-1.

The inspectors determined that licensee personnel demonstrated an appropriate threshold for problem identification. Also, licensee personnel planned to conduct a post job critique to assess the lessons learned during this diesel generator outage.

### Service Water Pump Packing

Licensee personnel noted excessive packing leakage on Service Water Pumps P-7A and P-7B during the inspection period. Anticipated service life on packing for the service water pumps, based on historical data, was several months; however, Pumps P 7A and P-7B had only two months of service when excessive leakage was noted. The inspectors observed portions of repacking activities for Pumps P-7A, P-7B and P-7C.

While observing maintenance activities, the inspectors noted that the maintenance technicians were knowledgeable of the tasks performed. In addition, work packages and working copies of the procedure were used at the job site.

Maintenance technicians noted several issues regarding the as-found condition of the packing removed from the pumps. On Pump P-7A, the maintenance technician noted that the rings of packing removed from the pump were not cut to the proper length. Also increased amounts of sand buildup were noted in the packing area. Increased amounts of sand buildup were also noted in the packing area on Pump P-7B. On Pump P-7C, the maintenance technicians noted that the rings of packing below the lantern ring were not stacked in accordance with the order specified in the procedure, and that the lengths of some packing rings were shortened. The discrepancies found on Pump P-7C, which was last repacked in June 1999, did not appear to have any adverse consequences in that the pump packing had normal service time.

The inspectors noted that maintenance technicians appropriately initiated condition reports to address the issues identified during the service water pump maintenance. The identification and initiation of corrective action system documents demonstrated an appropriate threshold for problem identification. However, the identified issues also highlighted performance deficiencies within the maintenance department, concerning the previous installation of pump shaft seal packing. The performance deficiencies identified by the maintenance personnel may have contributed to the decreased service time of the packing in Pump P-7A.

Observations regarding maintenance activities for the Auxiliary Feedwater Pumps P-8A and B, and the control rod drive mechanism seal assemblies are discussed in Section M2.1 of this report.

### c. Conclusions

The observed maintenance activities were completed in accordance with the approved work packages which were being used. Maintenance technicians were knowledgeable of the tasks being performed.

Maintenance personnel identified poor maintenance practices from a previous installation of a service water pump shaft seal packing. These practices contributed to the decreased service life of packing in at least one of the service water pumps. Condition reports were appropriately initiated for issues identified by maintenance personnel during work activities.

## **M2 Maintenance and Material Condition of Facilities and Equipment**

### **M2.1 Emergent Equipment Problems**

#### **a. Inspection Scope (62707, 37551)**

The inspectors reviewed the circumstances surrounding the multiple emergent equipment problems which occurred during the inspection period. The inspectors discussed the emergent issues with operations, engineering and maintenance department personnel. When appropriate, the applicable work orders, procedures, and TSs were reviewed. In addition, the inspectors observed selected portions of the emergent maintenance activities and reviewed the following condition reports:

- CPAL0000372 “Unanticipated Automatic Trip of Heater Drain Pump P 10B”
- CPAL0000373 “Turbine Reheat Stop Valve CV-0537 Failed to Open During Valve Testing”
- CPAL0000374 “Turbine Intercept Valve CV-0547 Failed to Open During Valve Testing”
- CPAL0000376 “Breaker 252-402 Charging Springs Did Not Recharge After Placing Bus 1G on Startup Power”
- CPAL0000377 “Loss of Breaker 252-402 Charging Spring Light”
- CPAL0000378 “Incorrect Indication On Reheat Stop Valve”
- CPAL0000655 “Information Copy of Procedure Used in Performance of Safety-Related Activity”
- CPAL0000719 “Standard Torque Tables Procedure MSM-M-48 Second Torque Pass Value Exceeded During Installation of Temporary Modification 2000-06, Blank Flange UpStream of Check Valve MS401”
- CPAL0000794 “Procedural Compliance Issues During Control Rod Drive Mechanism Seal Housing Testing”

#### **b. Observations and Findings**

##### **Rupture of the Turbine Driven Auxiliary Feedwater Pump P-8B Alternate Steam Line**

On February 5, 2000, while the plant was in Hot Shutdown, Auxiliary Feedwater Pump P-8A was placed in service using the alternate steam supply line. Approximately 30 minutes after the pump was placed in service, the control room was informed that steam was coming up through the floor under a drain cooler on the ground level of the

Turbine Building. The pump was immediately secured, which isolated the steam leak. Subsequently, the plant was taken to Cold Shutdown and plant management decided to implement a previously scheduled planned maintenance outage.

The failure was appropriately evaluated against maintenance rule requirements and was considered to be a functional failure of a safety significant standby system. It was not considered as a maintenance preventable functional failure because the underground piping was not required to be inspected in accordance with any program requirements nor was it practical to perform such inspections.

During the emergent maintenance activities on this system, the inspectors did identify some minor issues with regard to work performance. These issues were documented by licensee personnel in a condition report. Additional discussion regarding the regulatory issues associated with this piping failure and resolution of the issue are addressed in Section E2.2 of this report.

This self-revealing emergent equipment problem represented continued adverse material condition issues which unnecessarily challenged the control room operators.

#### Elevated Moisture Carryover from Steam Generator E-50A

Prior to the start of the maintenance outage, secondary side steam generator mass balance calculations, performed by the licensee's chemistry vendor, identified possible moisture carryover from Steam Generator E-50A. When plant management decided to initiate the planned maintenance outage, following the rupture of the Pump P-8B alternate steam supply line, the scope of the outage included the inspection of the secondary side of Steam Generator E-50A.

Initial entries into the secondary side of the steam generator identified that the deck hatch cover normally located between the moisture separator level and the tube bundle region was missing. The missing cover accounted for the moisture carryover identified in the aforementioned mass balance calculation. Licensee personnel subsequently retrieved the deck hatch cover from within the steam generator, noting that no significant damage had occurred from the unexpected movement of the deck hatch cover within the steam generator.

Engineering personnel subsequently reviewed the deck hatch cover design and identified required improvements to prevent recurrence. The appropriate design changes were made to the deck hatch covers in both steam generators and the deck hatch covers were reinstalled.

This self-revealing emergent equipment problem also represented continued adverse material condition issues and resulted in expanding the work scope for this maintenance outage.

#### Increased Leakage From Control Rod Drive Seals

On February 6, during the primary coolant system cooldown and depressurization for the planned maintenance outage, the control room operators observed that the No.12

control rod drive mechanism seal leakoff temperature was erratic and peaked at 180 degrees Fahrenheit. The decision was made by plant management to replace the No. 12 control rod drive mechanism seal assembly which appeared to be failing.

On February 16, while the plant was in Hot Shutdown the control room operators noted an increase in the control rod drive seal leakoff rate. Seal leakoff peaked at approximately 500 milliliters per minute from a normal value of approximately 10 milliliters per minute and temperature on No.6 control rod drive mechanism seal leakoff increased to 145 degrees Fahrenheit. The increased leakage did not exceed any TS limits but was a symptom that the seal assembly was degraded. Plant management conservatively decided to return the plant to cold shutdown to repair the degraded seal.

Based on a review of additional information, including historical seal data, the planned scope was expanded to rebuild six additional control rod drive mechanism seal assemblies. Condition Reports CPAL0000408 and CPAL0000559 were generated for the No. 12 and 6 seals. Condition Report CPAL0000559 for Seal No. 6 was assigned a Significance Level 2 which required a root cause analysis. The licensee's root cause investigation team subsequently formed included offsite expertise.

Inspectors observed some assembly and installation of seals that were completed after Seal No. 6 issues were identified. The inspectors did not identify any significant concerns regarding the work activities; however, the inspectors identified minor performance deficiencies. These issues were appropriately documented by licensee personnel in condition reports.

This self-revealing emergent equipment problem was addressed in a conservative and safety conscious manner, but also represented continued adverse material condition issues. This issue also contributed to the expanded scope of the planned maintenance outage during this inspection period. Licensee personnel were still investigating the root causes for this issue when the inspection period ended.

#### Outboard Bearing Failure of the Motor Driven Auxiliary Feedwater Pump P-8A

On February 23, during the performance of an annual motor bearing oil preventive maintenance activity, auxiliary operators identified metal filings in the waste oil from the outboard motor bearing. Further investigation by licensee personnel identified that the outboard bearing on Auxiliary Feedwater Pump P-8A was degraded due to wear on the external portion of the bearing. The external wear on the bearing appeared to be caused by the motor shaft "shoulder" rubbing on the bearing. Initial investigations identified that the pump-end half of the pump-to-motor coupling was misaligned. Licensee personnel concluded that the misalignment occurred when the coupling was installed in 1989. Licensee personnel documented this issue in a condition report.

The inspectors observed portions of the maintenance activities associated with the installation of a new outboard motor bearing in Pump P-8A and had no significant concerns. Licensee personnel were still investigating the root causes when the inspection period ended.

This self-revealing emergent equipment problem also represented continued adverse material condition issues at the plant and preliminarily appeared to be the result of past ineffective maintenance work practices. This issue also contributed to the expanded scope of the planned maintenance outage during this inspection period.

#### Balance of Plant Equipment Deficiencies Revealed During Plant Shutdown

Several self-revealing problems regarding balance of plant equipment emerged during the plant shutdown on February 4. Licensee personnel appropriately generated condition reports for the equipment problems which were entered into the licensee's corrective action program.

The inspectors did not identify any significant concerns regarding the emergent balance of plant equipment problems. Also, the plant equipment problems did not result in any adverse safety consequences; however, the self-revealing plant equipment problems represented adverse material condition issues and provided some unnecessary challenges to the control room operators.

#### c. Conclusions

Several equipment problems emerged during the inspection period which represented continued adverse material condition issues at the plant. Some of the issues unnecessarily challenged the control room operators and resulted in expanding the scope and duration of the maintenance outage. The self-revealing emergent problems included a functional failure of alternate steam supply line to Turbine Driven Auxiliary Feedwater Pump P-8B, elevated moisture carryover in Steam Generator E-50A, control rod drive seal assembly leakage, and a bearing failure for Motor Driven Auxiliary Feedwater Pump P-8A. The inspectors noted however, that licensee personnel addressed the emergent issues in a conservative, safety conscious manner. Licensee personnel appropriately entered minor performance issues that the inspectors identified into the corrective action program.

### **M8 Miscellaneous Maintenance Issues**

#### **M8.1** (Closed) Licensee Event Report (LER) 50-255/98-005-01: "Failure to Perform TS Surveillance of the Power Dependent Insertion Limit Alarm."

On January 25, 2000, during surveillance procedure reviews, licensee personnel identified that the Power Dependent Insertion Limit Alarm TS surveillance had not been performed as required. The surveillance was required to verify the alarm setpoints to assure setpoint calculator operability.

Technical Specification Table 4.17.6, Item 18, required that the Channel Functional Test for the Power Dependent Insertion Limit Alarm setpoint verification be performed every 31 days and TS Table 3.17.6 identified the applicable condition for the alarm as Hot Standby and above. Collectively, TSs 3.0.4 and 4.0.4 precluded entry into an operating condition when the conditions for the Limiting Conditions for Operation, including applicable surveillance requirements, were not met. The surveillance was last

completed on September 13, 1999. Therefore, the required test interval including the allowed extension time expired on October 21.

However, the test was not performed again until December 16, approximately 6 days after entry into Hot Standby. Consequently, the surveillance requirements were not met for the Power Dependent Insertion Limit Alarm prior to placing the plant in a condition where the alarm was required to be operable.

The surveillance procedure inappropriately contained a special requirement stating that the surveillance was to be performed within seven days following reactor criticality which contributed to the event. Licensee personnel also determined that this issue had been occurring following outages which lasted greater than 31 days since November of 1984.

There were no adverse safety consequences associated with this event. The surveillance on December 16, 1999, was completed satisfactorily and licensee personnel did not identify any past problems regarding setpoint calculator operability. Corrective actions to prevent recurrence were reasonable.

This licensee identified Severity Level IV Violation, which has recurred since 1984, is being treated as a Non-Cited Violation (NCV), consistent with Section VII.B.1.a of the NRC Enforcement Policy. This Violation is in the licensee's corrective action program as Condition Report CPAL0000242. (NCV 50-255/2000001-01)

## **ENGINEERING**

### **E2     Engineering Support of Facilities and Equipment**

#### **E2.1   General Comments (37551)**

The inspectors observed daily outage status meetings and observed several status meetings regarding emergent equipment problems. Engineering personnel supported, demonstrated ownership, and addressed the equipment problems that emerged during the maintenance outage (005001). Engineering personnel provided effective recommendations to outage planning personnel regarding necessary repair activities with one isolated exception regarding control rod drive mechanism No. 6 seal assembly. Also, engineering personnel led associated root cause evaluations which were in progress when the inspection period ended.

#### **E2.2   Auxiliary Feedwater System**

##### **a.     Inspection Scope (37551, 71707)**

The inspectors reviewed the circumstances and root cause evaluation regarding the rupture in the alternate steam supply line to Turbine Driven Auxiliary Feedwater Pump P-8B. The inspectors also reviewed TSs, Final Safety Analysis Report, the Design Basis Document, associated condition reports, and a resultant Temporary Modification.

b. Observations and Findings

On February 5, 2000, the underground alternate steam supply line to Turbine Driven Auxiliary Feedwater Pump P-8B ruptured while the pump was being run as part of a maintenance activity. Licensee personnel subsequently declared the pump inoperable and the plant was placed in cold shutdown to complete necessary repairs. Condition Report CPAL0000394 was generated to enter the emergent problem in the licensee's corrective action program. The condition report was appropriately assigned a significance level 2 which required a root cause evaluation.

Root Cause Evaluation

Engineering personnel provided repair plans which included excavation of the piping to facilitate external inspections. Also, the piping was viewed internally via a boroscope prior to excavation which identified the point of failure. Engineering personnel consulted with Consumers Energy Metallurgy laboratory regarding cause determination for the failed section of pipe. The following failure mechanisms were thoroughly evaluated in the root cause determination:

- steam erosion or other internally initiated mechanism;
- galvanic protection deficiencies;
- soil compaction and external forces;
- manufacturing or field fabrication defects;
- general corrosion; and,
- defective pipe coating.

Engineering personnel subsequently concluded that the failure was caused by degradation of the original piping protective coating that resulted in slowly corroding the underground piping from the exterior inward. The conclusions reached by engineering personnel were considered reasonable.

Safety Significance

The Turbine Driven Auxiliary Feedwater Pump P-8B was supplied with steam from two independent lines, one from each steam generator. The normal steam supply line was an above ground line which was supplied from Steam Generator E-50A. The underground line was supplied from Steam Generator E-50B and was considered as the alternate line. The alternate steam supply line provided no required safety function and no credit was taken for the alternate line in the Final Safety Analysis Report regarding mitigation of analyzed accidents. Also, the licensee's probabilistic safety assessment personnel concluded that the unavailability of the alternate steam line had no substantial impact on plant risk.

Corrective Actions

The licensee subsequently replaced the damage section of piping. However, approximately 100 feet of piping buried underground could not be accessed. Consequently, the integrity of the remainder of the underground piping could not be

quantitatively proven. Therefore, the licensee considered the alternate steam supply line inoperable on February 13.

However, TS Surveillance Requirement 4.9.a.2 specifically required testing of the alternate steam supply line. Consequently, the alternate steam supply line was a required feature to support operability of Pump P-8B. Therefore, the licensee requested and was granted Notice of Enforcement Discretion 00-6-002 on February 16, from the NRC, Office of Nuclear Reactor Regulation, to permit plant startup and subsequent operation until a TS change request could be processed. Licensee personnel submitted TS change request, as required by the Notice of Enforcement Discretion, on February 18. Pending completion and issuance of the TS amendment associated with Notice of Enforcement Discretion 00-6-002, this issue is unresolved. (URI 50-255/2000001-02).

Also, licensee personnel subsequently implemented Temporary Modification 2000-006 which isolated the alternate steam supply line from the turbine driven auxiliary feedwater pump. The temporary modification included locking closed the manual isolation valves MS152 and MS152A from Steam Generator E-50B to the alternate steam line and installing a blank flange to prevent backflow of steam from the normal steam supply line into the alternate steam supply line. The inspectors did not identify any significant findings regarding the temporary modification documentation and verified that the modification was installed as designed.

c. Conclusions

The inspectors concluded that engineering personnel's root cause evaluation regarding the rupture of the alternate steam supply line to the turbine driven auxiliary feedwater pump was thorough. Appropriate risk information was factored into the licensee's request for enforcement discretion to allow plant startup and subsequent operation with the turbine driven auxiliary feedwater pump alternate steam supply line inoperable pending a TS amendment.

#### **IV. Plant Support**

**R1 Radiological Protection and Chemistry Controls**

**R1.1 Radiation Accrued Dose During the Maintenance Outage**

a. Inspections Scope (71750)

The inspectors reviewed projected and actual data regarding accrued radiation dose for the maintenance outage. Also, the inspectors observed daily outage status meetings and discussed radiation dose controls with radiation protection personnel.

b. Observations and Findings

The inspectors reviewed radiation accrued dose data from the maintenance outage (005001). Radiation protection personnel projected a total accrued dose of 6.850 person-rem for the outage and actual accrued dose was 6.705 person-rem. The data represented accurate projections and effective methods for maintaining dose as low as reasonably achievable.

Also, the inspectors noted that the dose accrued during Primary Coolant Pump P-50B seal replacement was the lowest ever for that particular job. Therefore, the radiation protection methods for maintaining dose as low as reasonably achievable were more effective than during past years.

However, equipment problems that emerged during the maintenance outage significantly expanded the outage scope. Consequently, the accrued radiation dose was significantly increased. For example, emergent issues regarding control rod drive mechanism seal assembly repairs and the steam generator deck hatch cover repairs resulted in approximately 2.4 person-rem of accrued dose.

c. Conclusions

The inspectors concluded that radiation protection personnel accurately projected accrued radiation dose for the maintenance outage (005001). Also, radiation protection methods were effective in that total accrued radiation dose was less than projected. However, emergent equipment problems significantly increased accrued radiation dose during the maintenance outage.

**P5 Staff Training and Qualification in Emergency Planning**

**P5.1 Emergency Drill Observations**

a. Inspection Scope (71750)

The inspectors observed the performance of emergency response personnel in the Technical Support Center and the post-drill critique for an emergency preparedness drill that was conducted on March 1, 2000. In addition, the inspectors reviewed the process for conducting personnel accountability and the following condition reports that were generated regarding the drill:

- CPAL0000728 "Error Found In Protective Action Recommendation Procedure"
- CPAL0000730 "Activation of the Technical Support Center"
- CPAL0000713 "Assistant Site Emergency Director Not Authorized For Security Safeguards Information"

- CPAL0000722 “Site Emergency Director Telephone Not Working”
- CPAL0000757 “Federal Telephone System Line Would Not Dial Out”

b. Observations and Findings

Emergency preparedness personnel adequately monitored emergency response personnel performance in the Technical Support Center. The drill players generally performed emergency preparedness functions in a professional and effective manner. The inspectors did not identify any significant findings regarding emergency response personnel performance.

One human performance deficiency regarding a security officer's ability to conduct vehicle searches was identified. A fully trained and qualified security officer failed to complete an adequate vehicle search which was a planned security task for the drill. Consequently, the security task was not completed satisfactorily. Security personnel appropriately generated Condition Report CPAL0000726 to document this incident in the licensee's corrective action program.

However, the inspectors noted that the human performance deficiency demonstrated by security personnel during the drill was similar to the issues documented in NRC Inspection Report 50-255/99017(DRS). Specifically, the inspectors identified weaknesses in a security officer's ability to conduct adequate vehicle searches in October 1999.

Several self-revealing emergency response equipment problems, such as fax machines and telephones, emerged during the drill. The failures did not significantly impact the ability to perform emergency response tasks. Licensee personnel appropriately generated condition reports for the identified deficiencies which were entered into the corrective action program. This demonstrated an appropriate threshold for problem identification.

Also, several other issues related to emergency preparedness were identified by licensee personnel who participated in the drill. This demonstrated a self-critical and safety conscious work environment. The inspectors did not identify any significant findings or violations of regulatory requirements.

c. Conclusions

The inspectors concluded that the emergency response personnel adequately completed assigned tasks during the emergency preparedness drill conducted on March 1, 2000. Also, licensee personnel generated several condition reports regarding self-revealing equipment problems and self-identified emergency preparedness issues which demonstrated an appropriate threshold for problem identification and a safety conscious work environment. The identified deficiencies were considered minor and did not result in any violations of regulatory requirements.

However, a human performance deficiency was identified regarding a security officer's ability to adequately perform vehicle searches. Consequently, the planned security task

for the drill was not completed satisfactorily. The issue was appropriately identified and entered into the licensee's corrective action program. The human performance deficiency demonstrated by security personnel during the drill was similar to the issues documented in NRC Inspection Report 50-255/99017(DRS).

## **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 March 08, 2000. 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

G. R. Boss, Operations Manager  
J. R. Brunet, Emergency Planning  
D. E. Cooper, General Manager, Plant Operations  
P. D. Fitton, System Engineering Manager  
G. A. Katt, System Engineering  
K. M. Haas, Director, Engineering  
D. G. Malone, Acting Director, Licensing  
R. L. Massa, Shift Operations Supervisor  
T. J. Palmisano, Site Vice President  
R. M. Rice, Maintenance and Planning  
L. J. Ross, Acting Maintenance Manager

### NRC

D. Hood, Project Manager, NRR  
T. Madedo, Safeguards Inspector, RIII

## INSPECTION PROCEDURES USED

IP 37551: Onsite Engineering  
IP 61726: Surveillance Observations  
IP 62707: Maintenance Observations  
IP 71707: Plant Operations  
IP 71750: Plant Support Activities

## ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

50-255/2000001-01	NCV	Failure to perform TS Surveillance of the Power Dependent Insertion Limit Alarm
50-255/2000001-02	URI	Resolution of Notice of Enforcement Discretion Issues associated with the Auxiliary Feedwater Pump P-8A Alternate Steam Line

### Closed

50-255/2000001-01	NCV	Failure to perform TS Surveillance of the Power Dependent Insertion Limit Alarm
50-255/2000-001	LER	Failure to perform TS Surveillance of the Power Dependent Insertion Limit Alarm

### Discussed

None