

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-440
License No:	NPF-58
Report No.	50-440/98009(DRP)
Licensee:	Centerior Service Company P.O. Box 97, A200 Perry, OH 44081
Facility:	Perry Nuclear Power Plant
Location:	Perry, Ohio
Dates:	March 11 - April 20, 1998
Inspectors:	C. Lipa, Senior Resident Inspector J. Clark, Resident Inspector D. Butler, Reactor Engineer
Approved by:	Thomas J. Kozak, Chief Reactor Projects Branch 4

## EXECUTIVE SUMMARY

### Perry Nuclear Power Plant NRC Inspection Report 50-440/98009(DRP)

This inspection report included resident inspectors' evaluation of aspects of licensee operations, maintenance, and engineering. The report covers a six-week period of resident inspection.

#### Operations

- Shift turnovers and activity briefings continued to be thorough and the overall conduct of operations was conservative and professional. Annunciators were consistently and appropriately responded to and emergent equipment issues were resolved promptly (Section O1.1).

#### Maintenance

- Maintenance and surveillance activities were completed effectively and satisfactorily, without problems. There were appropriate briefings prior to the activities, adequate controls in place during the activities, and results were reviewed in a timely manner. Activities during a reactor downpower and complex surveillance tests such as high pressure core spray system and main steam isolation valve tests were well coordinated and performed without incident (Section M1.1).
- Although the human factor problems associated with a poorly designed diesel generator (DG) jacket water level gage have been known for several years, the licensee has not resolved the problem and, therefore, operators were unable to always accurately monitor jacket water level when the DG was in a standby readiness condition (Section M1.2).
- The licensee acted in a thorough and conservative manner in response to a Division II DG surveillance test failure by conducting extensive testing, including tests of associated and redundant systems. The licensee also demonstrated conservative judgement in common mode failure considerations, and by increasing the frequency of testing during its investigation for the cause of the DG load swings experienced during the initial surveillance test (Section M1.3).
- The inspectors concluded that applicable procedural steps were not followed when the ESW pump house crane was left unattended with a load engaged and the electrical disconnects closed (Section M1.4).

## Report Details

### Summary of Plant Status

The plant began this inspection period at 100 percent power and remained at that power level for most of the inspection period. On April 18, power was reduced to approximately 50 percent for a control rod sequence exchange. The power reduction was extended to allow surveillance testing on main steam isolation valves (MSIV) and turbine control valves, and maintenance on balance of plant equipment. The plant was operated at approximately 100 percent for the remainder of the period.

### I. Operations

#### **O1    Conduct of Operations**

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

###### **a.    Inspection Scope**

The inspectors followed the guidance of Inspection Procedure 71707 and conducted frequent reviews of plant operations. This included observing routine control room activities, reviewing system tagouts and operator logs, attending shift turnovers and crew briefings, and performing panel walkdowns.

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

The conduct of operations was professional and appropriately focused on safety. The inspectors observed strict use of procedures and thorough shift turnovers. Crew briefings contained discussion of plant status, priorities, and expected shift activities. Emergent equipment issues, such as low jacket water level and load swings during emergency diesel generator tests (see Sections M1.2 and M1.3), were promptly addressed. Operator response to alarms was consistent and appropriate. On April 14, 1998, the inspectors observed the operators' response to an unexpected seismic alarm. The operators followed the appropriate Off-Normal Instruction and initiated required actions. The alarm was later determined by engineering personnel to be related to another test activity and the Off-Normal Instruction was properly exited.

###### **c.    Conclusions**

Shift turnovers and activity briefings continued to be thorough and overall conduct of operations was conservative and professional. Annunciators were consistently and appropriately responded to and emergent equipment issues were resolved promptly.



## O2 Operational Status of Facilities and Equipment

### O2.1 General Plant Tours and System Walkdowns (71707)

The inspectors followed the guidance of Inspection Procedure 71707 in walking down accessible portions of several systems, including:

- safety-related battery rooms
- cable spreading rooms
- switchgear rooms
- emergency service water (ESW) pump house
- emergency diesel generators (DG)

Equipment operability and material condition were acceptable. Several minor discrepancies such as an improperly secured abandoned section of conduit in the Unit 2 Division 3 battery room, an oil leak in the Division 1 DG room, and a loose hanger in the Division 3 DG room were brought to the licensee's attention and were corrected. The general condition of the Unit 2 Division 3 battery room did not meet the housekeeping standards maintained in other areas of the plant. Plant management acknowledged that the condition of the room did not meet their expectations and corrective actions were taken for the housekeeping problems.

## O8 Miscellaneous Operations Issues (92700, 92901)

O8.1 (Closed) Licensee Event Report (LER) 50-440/96003-00: Diesel Generator (DG) Technical Specification (TS) Action Statement Time Limit Exceeded. On April 29, 1996, while the Division 1 DG was inoperable for monthly testing, TS 3.8.1.1, Action b, which requires verifying the availability of off-site power sources within one hour, was not met. This resulted in a five minute period when the surveillance requirement was not complete and the DG was inoperable. The DG System Operating Instruction, SOI-R43, was revised to require completion of the surveillance to verify the off-site power sources immediately upon declaring the DGs inoperable for testing or maintenance. The inspectors determined that these actions were adequate to prevent recurrence of this event. The failure to meet the TS 3.8.1.1, Action b, surveillance requirement is a violation of TS. This non-repetitive, licensee identified and corrected violation is being treated as a non-cited violation (NCV) consistent with Section VII.B.1 of the NRC Enforcement Policy (NCV 50-440/1998009-01(DRP)).

O8.2 (Closed) Unresolved Item (URI) 50-440/96017-01: Inadvertent Power Change Caused by Recirculation System Flow Control Valve Movement. Escalated enforcement action was taken for this issue as described in the NRC letter to Centerior Service Company, dated November 18, 1997. This item was cited as Violation A (EA 97-047). The URI is closed.



## II. Maintenance

### M1 Conduct of Maintenance

#### M1.1 General Comments

##### a. Inspection Scope (62707) (61726)

The inspectors observed or reviewed all or portions of the following work activities:

- SVI-P45-T0371-A, "ESW Flow to Division 1 Diesel Heat Exchanger," Rev. 1
- SVI P45-T1254, "ESW System Valve Position Verification," Rev. 3
- SVI-B21-T0368, "Safety/Relief Valve Tail Pipe Pressure Switch Channel Functional/Calibration," Rev. 2
- SVI-R43-T1317, "Division 1 Diesel Generator Start and Load,"
- SVI-R43-T1318, "Division 2 Diesel Generator Start and Load,"
- SVI-C71-T0039, "MSIV Closure Channel Functional," Rev. 4
- SVI-E22-T1319, "Diesel Generator Start and Load, Division 3"
- SVI-E22-T2001, "HPCS Pump and Valve Operability Test," Rev. 7
- Trouble shooting for reactor recirculation valve B33F023B, WO 98-0496

##### b. Observations and Findings

In general, most activities were completed effectively and satisfactorily, without problems. The inspectors observed that there were appropriate briefings prior to the activities, adequate controls in place during the activities, and that results were reviewed in a timely manner. For example, the inspectors observed that the appropriate personnel attended a briefing conducted prior to commencing troubleshooting activities for reactor recirculation Valve B33F023B and that the briefing included a thorough discussion of potential plant effects, personnel assignments, and contingencies. In addition, effective controls were in place during the troubleshooting activities.

Complex surveillance tests observed by the inspectors such as the high pressure core spray system pump and valve operability test and MSIV tests were well coordinated and performed without incident. The inspectors also observed portions of the activities conducted during the scheduled down power to approximately 50 percent reactor power on April 18 through 19. The activities were effectively coordinated and two balance of plant problems, including a moisture separator reheater drain tank valve steam leak, were addressed while area dose rates were low.

##### c. Conclusions

Maintenance and surveillance activities were completed effectively and satisfactorily, without problems. There were appropriate briefings prior to the activities, adequate controls in place during the activities, and results were reviewed in a timely manner. Activities during a reactor downpower and complex surveillance tests such as high pressure core spray system and main steam isolation valve tests were well coordinated and performed without incident.

M1.2 Problems With Jacket Water Level Prior to Division 1 DG Surveillance Testing

a. Inspection Scope (61726)

The inspectors observed portions of the monthly Division 1 DG surveillance test on March 29, 1998. This included field observations and a review of surveillance test data, the results of pre-start checklists, applicable TSS, the Updated Safety Analysis Report (USAR), and the System Operating Instruction (SOI).

b. Observations and Findings

The inspectors noted that operators needed to respond to several alarms during the surveillance test. Previously tagged deficiencies for low DG fuel oil pressure and low ESW flowrate to a residual heat removal heat exchanger caused two of the alarms. The operators were able to verify that the alarms were not caused by the surveillance test and continued with testing. Work orders for the deficiencies were written in October 1997, and were planned to be worked in June 1998, during the next DG system work week.

A third alarm was received during the "engine roll" just prior to the surveillance test. This was for low jacket water level. The licensee filled the standpipe and proceeded with the test, which was subsequently completed satisfactorily. The inspectors had several questions regarding the low jacket water level that had existed prior to the test:

- The inspectors asked how much margin there was between the low level alarm and the level required for operability of the DG. While the applicable Annunciator Response Instruction specified that the alarm set point was 21 inches below normal water level, it did not specify what level would constitute an operability concern. The licensee stated that the DG was operable with the level at the alarm set point.
- The inspectors questioned whether the DG was losing jacket water inventory and whether this could impact the ability of the DG to perform its design basis function. The inspectors reviewed operator logs and noted that operators needed to periodically fill the jacket water system to maintain an adequate level in the standpipe.
- The inspectors questioned the ability of the operators to verify jacket water standpipe level while the DG was in the standby readiness condition. A Potential Issue Form (PIF) was subsequently generated by the licensee (98-0700) to document this issue. The gage design for the standpipe level did not allow an operator to determine when the gage was off scale. A reading of six o'clock on the indicator could indicate acceptable level, off scale high, or off scale low. Several weeks before the surveillance test, the inspectors questioned operators how the level in the standpipe was determined to be acceptable. The operators responded that according to engineering personnel, a six o'clock reading was acceptable. The inspectors verified that from March 2 through March 29, the daily reading recorded on operator logs was a six o'clock position.



- The inspectors reviewed previous licensee concerns with the design of the water level indicator. Potential Issue Form 96-3784 had documented previous occurrences of low level alarms, high jacket water temperature alarms, and problems with the design of the level gage. One of the corrective actions was to initiate modification suggestions to improve jacket water level monitoring capabilities. Engineering staff had provided modification suggestions via a memorandum, however, the PIF was closed without any tracking of which, if any, suggested modifications were implemented. Also, PIF 96-3784 referred to previous PIFs that had not resulted in resolution of this issue. The inspectors were concerned that this issue had not been effectively resolved.

The inspectors determined that the gage design was not a significant condition adverse to quality because the DG remained operable at the low jacket water alarm level. However, the inspectors will review available information to determine if jacket water inventory loss is a DG operability concern. This is an unresolved item (URI 50-440/1998009-02(DRP)).

c. Conclusions

Although the human factor problems associated with a poorly designed DG jacket water level gage have been known for several years, the licensee has not resolved the problem and therefore, operators were unable to always accurately monitor jacket water level when the DG was in a standby readiness condition.

M1.3 Division 2 Diesel Generator Load Swings

a. Inspection Scope (71707, 92901, and 92903)

The inspectors reviewed the circumstances surrounding observed load swings during a surveillance test on the Division 2 DG.

b. Observations and Findings

On April 10, 1998, the Division 2 DG was tested under surveillance instruction (SVI) SVI-R43-T1318, "Division 2 Diesel Generator Start and Load." While unloading the DG, operations personnel observed erratic swings of approximately 1500 kW in electrical loading and secured the DG. The load swings were considered to originate from a problem with the DG regulator. The licensee initiated PIF 98-685 for the investigation of this problem. The surveillance test was initially considered satisfactory, but subsequently the licensee considered the test a failure upon a more detailed review of computer data. Technical Specification Limiting Condition for Operation (LCO) 3.8.1 was entered after declaring the DG inoperable. Surveillance Test SVI-R10-T5217, "Electrical Distribution System Energization Check," was satisfactorily completed to verify adequacy of other electrical sources during the time that the DG was considered inoperable.

Additional inspections and maintenance runs were conducted on the Division 2 DG on April 11 and 12, 1998. The Division 1 DG was also tested in accordance with the TS since a common mode failure could not be eliminated. While no obvious cause for the DG regulator problem was identified during inspections and testing, a loose connection was found and retightened on the electrical controller portion of the governor. Similar



load swings did not occur during subsequent runs on April 12, 1998, with additional instrumentation installed. Another SVI-R43-T1317 test was conducted satisfactorily on April 12, 1998, and the DG was declared operable.

A category 2 PIF (98-685) was initiated for investigation of the load swing problem. Licensee personnel kept the inspectors informed of DG status throughout the investigation efforts. The licensee decided to conduct more frequent surveillance testing of the Division 2 DG, with another satisfactory test conducted on April 16, 1998. The inspectors will continue to monitor the ongoing DG problem investigation and the status of the equipment. Since a definite cause of the problem could not be determined by the end of the inspection period, this issue is considered an inspection follow up item (IFI 50-440/1998009-03), pending further evaluation of the licensee's root cause identification efforts during a future inspection.

c. Conclusions

The licensee acted in a thorough and conservative manner in response to a Division II DG surveillance test failure by conducting extensive testing, including tests of associated and redundant systems. The licensee also demonstrated conservative judgement in common mode failure considerations, and by increasing the frequency of testing during its investigation for the cause of the DG load swings experienced during the initial surveillance test.

M1.4 Emergency Service Water (ESW) Pump House Crane Control

a. Inspection Scope (62707)

The inspectors toured the ESW pump house to observe activities associated with ESW sluice gate repair Work Order (WO) 98-0753.

b. Observations and Findings

A walkdown of the ESW Pump House was conducted on March 26, 1998, to observe safety-related maintenance activities in progress. At that time, the inspectors identified that the building crane was unattended and was attached to the ESW "B" sluice gate with some load indicated on the lifting load scale. It was further noted that the crane was still energized, in that the electrical disconnects were closed.

Technical Specification 5.4.1 requires, in part, that written procedures/instructions shall be established, implemented, and maintained covering certain activities. One of the activities listed is: "The applicable procedures recommended in Regulatory Guide (RG) 1.33, Revision 2, Appendix A, February 1978." Appendix A of RG 1.33 recommends procedures for equipment control and maintenance activities.

Perry Administrative Procedure, PAP-1313, "Control of Lifting Operations," Revision 0, and General Maintenance Instruction, GMI-003, "Crane Operating Guidelines," Revision 2, address crane control during maintenance activities. According to PAP-1313, ESW pump house crane operation shall be conducted in accordance with GMI-003, which states, in part, that when a crane is unattended, the load shall be landed and the disconnects opened. One reason to open the disconnects is to prevent inadvertent lifting

of the load should power be lost and regained. However, another means was in place to prevent this from occurring, thus minimizing the safety concerns associated with not following the procedural step.

Leaving the ESW pump house crane unattended while attached to a load, with the main power disconnects still closed was a violation of TS 5.4.1. However, this violation was of minor significance and is being treated as a Non-Cited Violation (NCV 50-440/1998009-04), consistent with Section IV of the NRC Enforcement Policy.

c. Conclusions

The inspectors concluded that applicable procedural steps were not followed when the ESW pump house crane was left unattended with a load engaged and the electrical disconnects closed.

18 **Miscellaneous Maintenance Issues (92902)**

- 18.1 (Closed) URI 50-440/96011-03: Incorrectly Wired Electrical Breaker for Control Room Emergency Recirculation System. This configuration was caused by the installation of a new electrical breaker which had been incorrectly wired during manufacture. The NRC cited this issue as a Severity Level III violation in a letter to the licensee dated November 18, 1997 (EA 96-542). This URI is closed.
- 18.2 (Closed) Violation (VIO) 50-440/97007-01: Three Examples of Procedure Violations. Examples 01a and 01c were rescinded by NRC letter, dated January 28, 1998. Example 01b concerned the failure to verify that required safety tags were hung prior to beginning work. For Example 01b, the inspectors reviewed the licensee's corrective actions as discussed in the Notice of Violation response letter, dated November 24, 1997. The inspectors concluded that corrective actions for the specific example were adequately implemented; however, there have been recent problems with safety tagging. Corrective actions for the broader concerns will be reviewed in response to the Violation in Inspection Report No. 50-440/98007(DRS). This item is closed.
- 18.3 (Closed) VIO 50-440/96-542 E1: Inoperable Breaker Causes TS Violations. As discussed in an NRC letter dated November 18, 1997, the licensee was not required to respond to this violation because corrective actions were adequately addressed in Licensee Event Report (LER) 50-440/96008. Inspection Report 50-440/97007 documents review and closure of the LER. This item is closed based on the previous review of this issue.



### III Engineering

#### **E1 Conduct of Engineering**

##### **E1.1 General Comments (37551)**

The inspectors evaluated engineering staff involvement in resolution of emergent material condition problems and other routine activities. The inspectors reviewed areas such as operability evaluations, root cause analyses, safety committees, and self-assessments. The effectiveness of the licensee's controls for the identification, resolution, and prevention of problems was also examined.

The inspectors observed that engineering personnel effectively supported activities, such as investigation of a Division 2 DG test failure, ESW sluice gate repair and testing, and HPCS quarterly surveillance testing. In general, identification and resolution of problems were noted to be acceptable; however, one concern with the resolution of a problem is discussed in Section M1.2.

##### **E1.2 Cable Tray Discrepancies**

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

The inspectors conducted walkdowns of the cable spreading rooms for assessment of plant material condition.

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

On March 23, 1998, the inspectors toured the cable spreading rooms and identified several cable trays with 4" siderails that were filled beyond 50 percent of their volume. Section 8.3 of the Perry USAR states that cable trays have 4" or 6" siderails and that, by design, will be filled to no more than 50 percent by volume. When extra fill capacity was needed for cable trays with 4" siderails, plant design drawings and construction techniques incorporated the use of 2" extender rails. However, these extenders were not present in the trays that were identified as overfilled. Potential Issue Form 98-550 was initiated by the licensee to address this issue.

Ampacity, cable separation, and seismic qualification concerns were raised by the inspectors during several meetings and walkdowns of the cable spreading rooms with licensee engineering personnel. Potential ampacity derating is based upon fill criteria. The initial fill calculations that were presented to the inspectors assumed a 6" tray, and showed fill values from approximately 48 percent to about 54 percent. However, without siderail extensions, fill values were approximately 90 percent. It was also determined by the inspectors that seismic loading values for 6" cable trays were used instead of values for 4" trays. Section 3.10 of the Perry USAR specifies cable tray loading of 15 lb/ft<sup>2</sup> for 4" trays and 25 lb/ft<sup>2</sup> for 6" trays.



Measures for design control are specified in 10 CFR Part 50, Appendix A, Criterion III. This criterion states, in part, that the design basis shall be correctly translated into specifications, drawings, procedures, and instructions. Also, 10 CFR 50.71e specifies, in part, that each licensee shall update the final safety analysis report (FSAR), to assure that the information included in the FSAR contains the latest material developed.

Contrary to the above, the Perry cable trays were designed to be constructed and filled in a modified method which was not described in the USAR. Also, the modified cable trays, and the use of different design values, were not incorporated into an update of the FSAR.

Further discussions with the licensee's design engineering personnel are ongoing with both resident and regional inspectors. Preliminary operability determinations by the licensee show that conservative assumptions, such as lower cable ampacity and higher stress loading, were initially used. Therefore, although the trays have been filled past the value listed in the USAR (i.e., over 50 percent volume), the licensee has indicated that the cables were still able to perform their required functions. These assumptions and design calculations were not provided to the inspectors by the end of the inspection period, and will require further review. Therefore this issue will be considered an unresolved item (URI 50-440/1998009-05) to be further addressed during a subsequent inspection.

c. Conclusions

Cable tray overfilling may not be sufficiently supported by plant design documents and may be in conflict with the USAR. Since further review is necessary on this issue, definite conclusions will be reserved for a subsequent inspection report.

**Miscellaneous Engineering Issues (92902)**

- E8.1 (Closed) URI 50-440/96004-04 : Division 3 Battery Room Condition in Unit 2. The Unit 2 Division 3 battery can be placed in service to allow maintenance on the Unit 1, Division 3 battery. Therefore, the inspectors were concerned about holes in the wall between the battery room and adjacent spaces. The licensee evaluated the condition of the room, as documented in PIFs 96-2081 and 96-2833. The evaluation considered possible effects on ventilation, 10 CFR Part 50, Appendix R analysis, Station Blackout analysis, and seismic evaluations. The licensee concluded that the holes in the wall were acceptable. The inspectors concluded that the licensee's evaluation and battery room condition were adequate. This item is closed.

## 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 April 20, 1998. 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

see

ers, Vice President, Nuclear  
rgendahl, Director, Nuclear Services Department  
nner, Director, Nuclear Maintenance Department  
nda, General Manager, Nuclear Power Plant Department  
rney, Superintendent, Plant Operations  
ssina, Operations Manager  
usch, Director, Quality and Personnel Development Department  
rauder, Director, Nuclear Engineering Department  
rs, Radiat Protection Manager



## INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 61726:	Surveillance Observation
IP 62707:	Maintenance Observation
IP 71707:	Plant Operations
IP 71750:	Plant Support
IP 92700:	Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities
IP 92901:	Followup - Operations
IP 92902:	Followup - Engineering
IP 92903:	Followup - Maintenance
IP 93702:	Prompt Onsite Response to Events at Operating Power Reactors

## ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

50-440/1998009-01	NCV	Failure to meet TS 3.8.1.1, Action b, Surveillance Requirement
50-440/1998009-02	URI	DG Jacket Water Level Gage
50-440/1998009-03	IFI	Division 2 DG Load Swings
50-440/1998009-04	NCV	Crane Attached to ESW Sluice Gate
50-440/1998009-05	URI	Cable Tray Loading Not in Conformance With USAR

### Closed

50-440/96003-00	LER	DG Action Statement Time Limit Exceeded
50-440/96004-04	URI	Condition of Unit 2 Division 3 Battery Room
50-440/96017-01	URI	Inadvertent Power Change Caused by Recirculation System Flow Control Valve Movement
50-440/96011-03	URI	Miswired Electrical Breaker for Control Room Emergency Recirculation System
50-440/96-542 E1	VIO	Inoperable Breaker Causes TS Violations
50-440/97007-01	VIO	Three Examples of Procedure Violations
50-440/98007-01	VIO	Tagging Error
50-440/1998009-01	NCV	Failure to meet TS 3.8.1.1, Action b Surveillance Requirement
750-440/1999809-04	NCV	Crane Attached to ESW Sluice Gate

## LIST OF ACRONYMS USED

ARI	Annunciator Response Instruction
CFR	Code of Federal Regulations
DG	Diesel Generators
DRP	Division of Reactor Projects
EA	Enforcement Action
ESW	Emergency Service Water
FSAR	Final Safety Analysis Report
GL	Generic Letter
GMI	General Maintenance Instruction
HPCS	High Pressure Coolant Injection
IEEE	Institute of Electrical and Electronics Engineers
IFI	Inspection followup item
IP	Inspection procedure
IR	Inspection report
LCO	Limiting Condition for Operation
LER	Licensee Event Report
MSIV	Main Steam Isolation Valve
NCV	Non-cited violation
NOV	Notice of violation
NRC	Nuclear Regulatory Commission
PAP	Perry Administrative Procedure
PIF	Potential Issue Form
RG	Regulatory Guide
RHR	Residual heat removal
SOI	System Operating Instruction
SVI	Surveillance Instruction
TI	Temporary Instruction
TS	Technical Specification
USAR	Updated Safety Analysis Report
URI	Unresolved Item
VIO	Violation
WO	Work Order