February 23, 2001

Mr. L. W. Myers
Senior Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Post Office Box 4
Shippingport, Pennsylvania 15077

SUBJECT: BEAVER VALLEY POWER STATION, UNIT 1
NRC INSPECTION REPORT 05000334/2001-003

Dear Mr. Myers:

During the period from January 22 to 26, 2001, the NRC performed a supplemental inspection at the Beaver Valley Unit 1 reactor facility. The purpose of the inspection was to review FirstEnergy Nuclear Operating Company's (FENOC) evaluation and corrective actions associated with the failed river water pumps on February 8, 2000. The NRC had issued a Severity Level III Notice of Violation (NOV) in a letter dated May 3, 2000, based on the failure to adequately review the suitability of a temporary modification to the Unit 1 river water pump seal water supply system and a Severity Level III NOV for design deficiencies and inadequate testing of the seal cooling water. The preliminary results of this inspection were discussed with you and other members of your staff on January 26, 2001. The enclosed report presents the results of the inspection.

The NRC determined your staff's evaluations of the failure to adequately review the suitability of a temporary modification to the Unit 1 river water pump seal water supply system and the design deficiencies and inadequate testing of the seal cooling water were broad in scope and identified the extent of the problems. The NRC further determined your completed corrective actions address the causes identified in your evaluations although your staff did agreed corrective actions should have been included to address adverse system interactions when applying a temporary modification or temporary operating procedure. Your staff issued Condition Report 01-0300 to address this omission. Based on the adequacy of your evaluations, corrective actions, and the information contained in your letter dated June 2, 2000, Escalated Action (EA) 00-045, item numbers 02013 and 03013 are closed.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/NRC/ADAMS/index.html (the Public Electronic Reading Room).

Sincerely,

/RA/

David C. Lew
Performance Evaluation Branch
Division of Reactor Safety

Docket No: 05000334
License No.: DPR-66

Enclosure: Inspection Report 05000334/2001-003

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No.:	05000334
License No.:	DRP-66
Report No.:	05000334/2001-003
Licensee:	FirstEnergy Nuclear Operating Company
Facility:	Beaver Valley Power Station, Unit 1
Location:	Post Office Box 4 Shippingport, PA 15077
Dates:	January 22 - 26, 2001
Inspector:	M. Modes, Sr. Reactor Inspector
Approved by:	David C. Lew, Chief Performance Evaluation Branch Division of Reactor Safety

SUMMARY OF FINDINGS

Beaver Valley Power Station, Unit 1
NRC Inspection Report 05000334/2001-003

IR 05000334/2001-003, on 1/22-1/26/01; FirstEnergy Nuclear Operating Company, Beaver Valley Unit 1. Supplemental inspection of two Severity Level III Notice of Violations in a letter dated May 5, 2000.

This supplemental inspection was performed by the NRC to assess the licensee's evaluation and corrective actions associated with the failed river water pumps on February 8, 2000. In NRC Inspection Report Nos. 05000334 and 05000412/2000-001 and 2000-002, the NRC identified apparent violations involving the licensee's failure to adequately review the suitability of a temporary modification to the Unit 1 river water pump seal water supply system and for design deficiencies and inadequate testing of the seal cooling water. On April 13, 2000, the NRC held a pre-decisional enforcement conference in the Region 1 office with the licensee to discuss the apparent violations. The NRC subsequently issued two Severity Level III Notices of Violations (NOV) in a letter dated May 3, 2000. The NRC received FirstEnergy Nuclear Operating Company's (FENOC's) reply to the NOV in a letter dated June 2, 2000, in which FENOC identified the causes and corrective actions taken in response to prevent recurrence.

Although the failure to adequately review the suitability of a temporary modification to the Unit 1 river water pump seal water supply system and the design deficiencies and inadequate testing of the seal cooling water occurred before implementation of the NRC's new reactor oversight process (ROP), the NRC followed up this issue with a supplemental inspection under the new ROP. This supplemental inspection was in lieu of a regional initiative inspection that would have been conducted under the previous inspection oversight process. The supplemental inspection was performed in accordance with Inspection Procedure 95001.

Cornerstone: Mitigating Systems

- The licensee's evaluations of the suitability of a temporary modification to the Unit 1 river water pump seal water supply system and the design deficiencies and inadequate testing of the seal cooling water were adequate to identify the causes and appropriately broad in scope to determine the extent of the problems. The licensee's evaluations identified the primary root cause for the pump binding to be an adverse system interaction caused by the application of a temporary operating procedure to the filtered water system and the inadequate screen size of the original seal water supply system for pump starts. However, the licensee did not address whether changes to include consideration of adverse system interactions were warranted for the temporary modification and temporary operating procedure processes. Overall, the licensee adequately identified corrective actions to address each root cause.

Report Details

01 Inspection Scope

This supplemental inspection was performed by the NRC to assess the evaluation completed by First Energy Nuclear Operating Company (FENOC) in response to the failure of the river water pumps. The licensee submitted Licensee Event Report (LER) 2000-002-00 to notify the NRC of the condition outside the design basis for one train of river water system inoperable on March 8, 2000. Although the new NRC reactor oversight process (ROP) was not applicable to the licensee at the time, the licensee used the ROP "significance determination process" (SDP) to assess the increase in risk that resulted from the unavailability of two river water pumps due to shaft binding and operating the plant with one of two river water system pumps inoperable for a period of time due to seal water strainer clogging. The licensee determined the delta CDF associated with the unavailability of two river water pumps due to the shaft thermal expansion event was low to medium risk. Using SDP the event would be categorized as white. The licensee determined the annual delta core damage frequency change associated with the river water pump seal water issues was also low to medium risk. This event would also translate, using SDP, into a white event.

02 Evaluation of Inspection Requirements

02.01 Problem Identification

a. Determine that the evaluation identifies who (i.e., licensee, self revealing, or NRC), and under what conditions the issue was identified.

Both issues were self revealing. The river water pump binding was a self revealing issue as a consequence of the pump's failure to operate. The seal water strainer clogging issue was revealed as a consequence of the actions taken to correct the heat differential caused by the filtered water delivered to the river water pump. An Event Response Team was assembled by the licensee to evaluate the causes of the pump shaft binding. This Event Response Team developed a time line describing the event and conditions leading to the event and was subsequently consulted about the strainer clogging issue. The licensee captured, in sufficient detail the conditions under which the issue revealed itself.

b. Determine that the evaluation documents how long the issue existed, and prior opportunities for identification.

The licensee looked at the opportunities in the past when the problem of shaft binding could have been recognized including prior occasions when the filter water system was being worked on, and the number of times the temporary operating procedure was implemented. The strainer clogging was not an issue until actions were taken to remove the filtered water system feed to the river pump seals. It was after the realignment that the original design deficiency was revealed. The licensee evaluated the river water pump surveillance program to determine if the original design deficiency could have been discovered prior to the occurrence. The river water pump binding existed since the filter water system was used to supply cooling water to the river water pump seal.

c. Determine that the evaluation documents the plant specific risk consequences and compliance concerns associated with the issue.

As part of the process to determine if a Licensee Event Report (LER) was required, the licensee evaluated the regulatory and compliance concerns associated with both the shaft binding and strainer clogging. Because the river water system was already analyzed as a risk significant system the licensee refined the analysis for the specific conditions that occurred during the event. These evaluations were thoroughly documented as part of the condition report and LER. The risk increase for the river water pump failure was 5.6E-6, whether caused by shaft binding or strainer clogging.

02.02 Root Cause and Extent of Condition Evaluation

a. Determine that the problem was evaluated using a systematic method to identify root causes and contributing causes.

The licensee evaluated the shaft binding failure of the river water pump using a systematic method called TapRoot™ to identify root causes and contributing causes. The licensee's TapRoot™ evaluation uses an Events and Casual Factors analysis to identify the sequence of events and a barrier analysis to identify root causes. While the licensee did not use the TapRoot™ method to review the strainer clogging problem, the level of review was appropriate. The evaluation of the shaft binding identified the temperature differential introduced by the low river water temperature coupled with the higher temperature of the filtered water system when under the temporary procedure. The analyses included Event & Casual Factor charts, detailed time lines and documented interviews with cognizant personnel.

b. Determine that the root cause evaluation was conducted to a level of detail commensurate with the significance of the problem.

The licensee's evaluation of the shaft binding failure was thorough and identified the primary root cause. In addition to the root cause undertaken with TapRoot™ the licensee Event Response Team generated problem statements, event chronologies for each pump event, trouble shooting chronologies, response evaluation, probable risk evaluation, operating experience evaluation, and operability determinations.

c. Determine that the root cause evaluation included a consideration of prior occurrences of the problem and knowledge of prior operating experience.

The inspector determined the licensee's evaluation identified prior occurrences of problems with the river water pumps and considered operating experience. The licensee's Event Response Team reviewed the maintenance work history for previous on both pumps and a chronology of the events was generated.

The licensee concluded the root causes were temperature increase of the river water pump seal cooling water as a result of the application of a temporary procedure applied to the filter water
system and strainer undersized due to an inadequate design. The licensee concluded the problem would not have been discovered prior to the failure because prior occasions did not exist with the same circumstances.

d. Determine that the root cause evaluation included consideration of potential common causes and extent of condition of the problem.

The licensee's evaluation considered the potential for common cause and extent of condition of other components. The licensee evaluated the possibility of similar failures in the Unit 2 service water system and the alternate intake pumps as well as determining if other pumps in the plants, not related to service or river water, could fail in a similar fashion.

The licensee concluded that the potential for common causes did not exist and that the extent of the condition was limited to the river water system.

02.03 Corrective Actions

a. Determine that appropriate corrective actions are specified for each root/contributing cause or that there is an evaluation that no actions are necessary.

The inspector determined that appropriate near and long term corrective actions were specified for each root cause identified in the licensee's root cause evaluations. The licensee took immediate corrective action to meet technical specification requirements and to restore the river water pumps to operability upon discovering the extended shaft and its seal binding. Upon discovery of the filter clogging the licensee took corrective actions to modify the pump test procedure and implement a modification of the screen to preclude clogging. The licensee completed inspections and evaluations of the SWS pumps in Unit 2 and the alternate intake pumps.

b. Determine that the corrective actions have been prioritized with consideration of the risk significance and regulatory compliance.

Because the licensee had previously determined these pumps to be of high risk significance they gave the corrective actions a high priority. For example the modification to the seal water screen was completed in less than a month after the discovery of the screen clogging. All the corrective actions identified by the licensee were completed at the time of this inspection.

c. Determine that a schedule has been established for implementing and completing the corrective actions.

The corrective actions for both the shaft binding and the filter clogging were implemented on a schedule appropriate for the risk significance of the system. All the corrective actions were complete at the time this inspection was implemented. Except for the inclusion of adverse system interaction in the temporary operating procedure process, which was identified by the inspector, all the corrective actions were completed at the time of this inspection.

d. Determine that quantitative or qualitative measures of success have been developed for determining the effectiveness of the corrective actions to prevent recurrence.

No specific quantitative or qualitative measures of success were developed to determine the effectiveness of the corrective actions. The pumps were tested after the modifications were implemented and returned to service. The pumps are routinely tested for operability by

procedures that have been revised to take into account the lessons learned from these events and the pumps continue to perform their safety function.

4. OTHER ACTIVITIES [OA]

0A6. Meetings, Including Exit

A meeting was held on January 26, 2001 with licensee staff and the Region I Branch Chief of Performance Evaluation, during which the results of this inspection were acknowledged by FENOC without objections. During this meeting FENOC acknowledged the NRC did not review proprietary information.

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened
None

Opened and Closed
None

Closed

EA-00-045, Item 02013 “Inadequate Temporary Modification of RW Pump Seal Water System”
EA-00-045, Item 02014 “Design Deficiencies and Inadequate Testing of Seal Cooling Water”

PARTIAL LIST OF PERSONS CONTACTED

Larry Freeland	Manager, Corrective Actions
Bob Garver	System Engineer
Richard Hecht	Plant Technical Support Manager
Lew Myers	Senior Vice President - Nuclear
Brian Sepelak	Senior Licensing Supervisor

PARTIAL LIST OF DOCUMENTS REVIEWED

CR No. 00-0531	Corrective Action River Water Pump
CR No. 00-00751	Corrective Action WR-P-1B Seal Water Y-Strainer
CR No. 00-1001	Corrective Action Unit 1 River Water Seal Water Strainer Problem
LER 2000-002-01	Condition Outside Design Basis for One Train of River Water System Inoperable.

LIST OF ACRONYMS USED

ADAMS	Agency wide Documents Access and Management System
CFR	Code of Federal Regulations
CR	Condition Report
EA	Escalated Action
FENOC	FirstEnergy Nuclear Operating Company
IST	In-Service Test
LER	Licensee Event Report
MDAT	Multi-Disciplined Analysis Team
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
NPDAP	Nuclear Power Division Administrative Procedure
PARS	Publicly Available Records System
PM	Preventive Maintenance
ROP	Reactor Oversight Process
RWS	Beaver Valley Unit 1 River Water System
SDP	Significance Determination Process
SWS	Service Water System