U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-457/93013(DRP) EA 93-063

Docket No. 50-457

License No. NPF-77

Licensee: Commonwealth Edison Company
Opus West III
1400 Opus Place - Suite 300
Downers Grove, IL 60515

Meeting Conducted: April 16, 1993

Meeting Location: Region III Office
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Type of Meeting: Enforcement Conference

Inspection Conducted: Braidwood Station
March 11 through 18, 1993

Inspector: J. R. Roton, Jr.

Approved By: _____ 4/23/93
M. J. Farber, Chief Date
Reactor Projects Section 1A

Meeting Summary

Enforcement Conference on April 16, 1993 (Report No. 50-457/93013(DRP)
Areas Discussed: An apparent violation identified during the inspection was discussed, along with the corrective actions taken or planned by the licensee. The apparent violation involved operating Unit 2 with the reactor head vents isolated for a period of approximately 16 months, contrary to the requirements of Braidwood Technical Specification 3.4.11.

DETAILS

1. Persons Present at Conference

Commonwealth Edison Company (CECo)

S. Berg, Site Vice President
K. Kofron, Station Manager
R. Flessner, Executive Assistant
D. Cooper, Operations Manager
R. Ward, Director Regulatory Performance
D. Saccomando, Regulatory Performance Administrator
A. Haeger, Regulatory Assurance Supervisor
T. Simpkin, Nuclear Licensing Administrator
R. Spear, Oversight & Analysis Group
S. King, Mechanic Maintenance Department
D. Pettit, Nuclear Station Operator

U. S. Nuclear Regulatory Commission

H. Miller, Deputy Regional Administrator, RIII
W. Forney, Deputy Director, DRP, RIII
B. Berson, Regional Counsel, RIII
R. DeFayette, EICS, RIII
M. Farber, Chief, Section 1A, DRP, RIII
B. Jorgensen, Chief, Section 2A, DRP, RIII
* R. Assa, Project Manager, NRR
J. Roton, Resident Inspector, Braidwood Station

* Denotes those who participated via telephone

2. Enforcement Conference

An enforcement conference was held in the NRC Region III Office on April 16, 1993. This conference was conducted as a result of the findings of an inspection conducted March 11 through March 18, 1993, in which an apparent violation of NRC regulations was identified. Inspection findings were documented in Inspection Report No. 50-457/93006(DRP), transmitted to the licensee by letter dated April 2, 1993.

The purpose of this conference was to discuss the violation, root causes, contributing factors, and the licensee's corrective actions.

During the enforcement conference, the licensee acknowledged the violation of Technical Specification 3.4.11. The licensee's presentation thoroughly covered the Manual Reactor Vessel Head Isolation Valve (2RC8070) event investigation including a synopsis of the event, investigation results, safety significance, and corrective actions. A copy of the licensee's slide presentation is attached to this report.

Attachment: As stated

BRAIDWOOD
REACTOR HEAD VENT VALVE
ENFORCEMENT CONFERENCE

APRIL 16, 1993

INTRODUCTION	K. KOFRON
EVENT CHRONOLOGY	D. COOPER
SAFETY SIGNIFICANCE	D. COOPER
CAUSES	D. COOPER
CORRECTIVE ACTIONS	D. COOPER
ADDITIONAL PROGRAM ENHANCEMENTS	D. COOPER
CONCLUSIONS	S. BERG

INTRODUCTION

Braidwood acknowledges that we violated our Technical Specification 3.4.11 by having our reactor head vent valve locked closed.

Safety Significance was determined to be minimal.

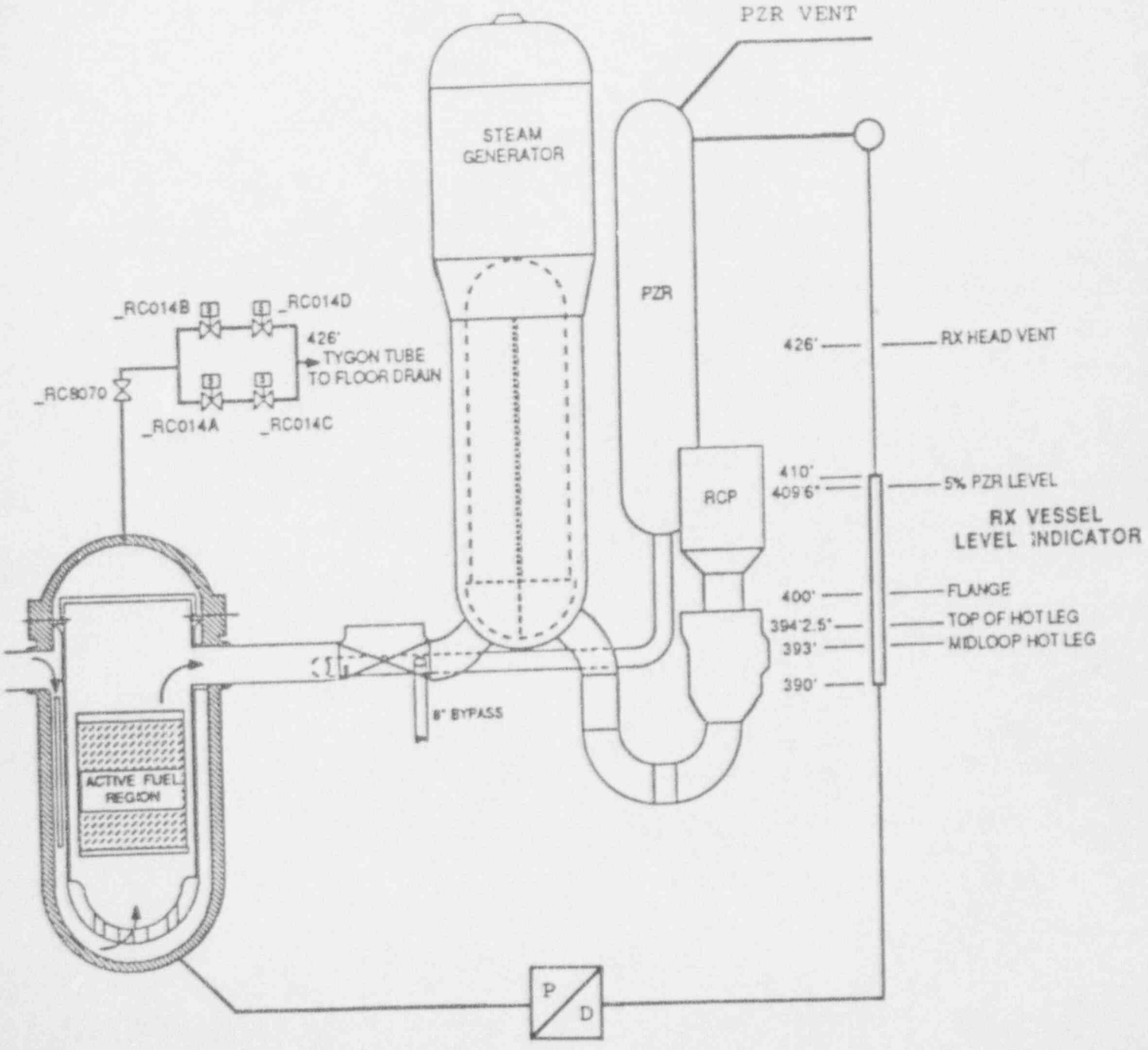
The cause of the event was that established barriers to ensure proper component configuration were not adequately utilized and therefore were ineffective.

Mispositioned valve was self identified at the earliest opportunity, promptly corrected, and promptly reported to the NRC.

Braidwood conducted an extensive investigation which utilized root cause analysis techniques. Braidwood performed a thorough review of configuration control practices.

Corrective actions taken were prompt and comprehensive.

HEAD VENT SUBSYSTEM



HEAD VENT DESCRIPTION

* The reactor head vent subsystem consists of a manual locked valve in series with two redundant sets of two solenoid-operated vent valves. The manual valve (2RC8070) is required to be maintained in the locked open position when the unit is in Modes 1 thru 4.

* During RCS draining, the RC 014 solenoids are opened to provide a vent path (in addition to PZR vent path).

* This path must also be maintained open for the level indicator to be accurate. (Modes 5 and 6)

* The head vents are also used during RCS fill and during surveillances to vent non-condensible gases.

COMPONENT CONFIGURATION CONTROL
(IN 1991)

Once a system lineup is performed, valve position is tracked by one of the following:

- Procedural direction
- Out-of-Service system
- Abnormal Component Position Log

One of these three mechanisms must be in place to provide positive control of component position. In addition, surveillances periodically verify component position. When surveillances direct manipulation of components, they also must provide positive control of final component position.

Current procedures require that changes to locked components be logged in the Abnormal Component Position Log if carried over to the next shift, unless already part of an Out-of-Service or controlled by some other procedure.

CHRONOLOGY

March 11, 1993

Operations was in the process of draining the RCS down to the reactor flange level in preparation for the removal of the reactor head. Concurrently, the incore thermocouple conoseals were being disconnected. The NSO brought the vessel level down to 399' and was beginning to stabilize the level. He then noticed that level indication was increasing. The NSO contacted his supervision who immediately ordered all RCS draining stopped.

The Field Supervisor was sent to investigate the RCS vent paths for proper alignment. He identified that the 2RC8070 valve was in the locked closed position. He then proceeded to open the valve. At this point the reactor level indication had stabilized at 404'. No water had spilled.

ENS notification was made.

An investigation team was established to determine the cause of the 2RC8070 being placed in the locked closed position. This committee utilized root cause analysis techniques.

Results of the Investigation

November 3, 1991

Unit 2 was in Refuel Outage A2R02. Operations personnel independently verified that the Reactor Head Vent Valve (2RC8070) was locked open. The configuration was documented on BwOP RC-M2, "Mechanical Lineup."

November 5, 1991

Operations performed 2BwOS 4.11.B-1, "Reactor Head Vent Paths Valve Cycle 18 Month Surveillance." This Tech Spec required surveillance cycled the 2RC8070 and indicated that the valve was left in the locked open position.

Operations performed BwOS 4.11.A-1, "Reactor Head Vent Paths Locked Valve 18 Month Surveillance." This surveillance was performed to verify that the Reactor Head Vent Valve (2RC8070) was locked open.

November 6, 1991

Tech Staff performed BwVS 0.5-2.SI.2-3, "Safety Injection System Check Valve Stroke Test," to verify the SI system valves stroke to their specified engineered safety positions. To accomplish this surveillance, the four solenoid-operated vent valves were cycled to vent any accumulated gases. To perform this test, the 2RC8070 valve was placed in the open position. This surveillance did not provide direction for the manipulation of the 2RC8070 valve.

November 6-9, 1991

The 2RC8070 valve was then manipulated numerous times over the next several days to vent the Reactor Coolant System (RCS) using BwOP RC-3b,"Reactor Vessel Fill and Vent". This procedure generally describes the venting operation but does not specifically describe the manipulation of the 2RC8070 valve.

The venting process is as follows:

The field operator unlocks and closes the 2RC8070 valve.

The field operator calls the control room and has the NSO open the solenoid-operated vent valves.

The field operator throttles open the 2RC8070 valve until water is observed in a vent bottle.

The field operator closes the 2RC8070 valve and notifies the control room to close the solenoid-operated vent valves. This practice of leaving the 2RC8070 valve in the closed position was not a concern since the valve is not required to be open until Mode 4.

CHRONOLOGY (CONTINUED)

November 9, 1991 — Operations performed 2BWVS 0.5-2.RC.2, "Reactor Coolant System Valve Stroke Test." This surveillance verifies flow through the head vent paths during venting operations at cold shutdown or refueling. The surveillance addresses the manipulation of the solenoid valves but does not provide direction for the manipulation of 2RC8070 which must be done.

November 10-11,1991 — Operations vented the reactor head after running the reactor coolant pumps using BwOP RC-3b.

November 15, 1991 — Operations changed the chain on 2RC8070 due to seismic concerns.

November 17, 1991 — Operations personnel prepared to enter Mode 4, using BwGP 100-1, "Plant Heatup." Operations appropriately completed the Mode 5 to Mode 4 Checklist. The checklist verified all required surveillances and lineups were complete. This included BwOP RC-M2, 2BwOS 4.11.B-1, 2BwOS 4.11.A-1, and 2BwVS 0.5-2.RC.2.

Unit 2 entered Mode 4.

Condition of the 2RC8070 valve did not meet Technical Specification 3.4.11, which requires that the reactor head vent valve be locked open for Modes 1 through 4. Valve remained locked closed throughout the cycle.

SAFETY SIGNIFICANCE

CECo believes that the actual and potential safety consequences of the event were minimal.

- The reactor head vent valves are not modeled in any current accident analysis. Failures in excess of design requirements would have to occur in order to require use of these valves.

- The reactor head vent valves are used to respond to accidents which occur at power in the following scenarios:

  - In the Functional Restoration Procedures for the response to the loss of heat sink and inadequate core cooling, opening the head vents was added as a last resort as a plant specific means of depressurizing. Because of their small size, these vents are recognized in Probabilistic Risk Assessment, as having minimal benefits in the situations described.

  - In the Functional Restoration Procedure for inventory, the head vent valves are opened to remove non-condensible voids from the vessel. This is allowed only as long as RCS subcooling and pressurizer inventory are maintained. Thus, the conditions under which these valves would be used are of lower significance than the loss of heat sink and inadequate cooling situations described above. If core conditions degrade due to the unavailability of the vents, the operator would ultimately be directed to the functional restoration for core cooling.

- Probabilistic Risk Assessment:

  - Based upon evaluation of Zion PRA data and estimates of applicability to Braidwood, the frequency of events in which these valves would be needed falls below 10 E-7 per year.

  - Events below this frequency are considered of minimal risk.

Though the consequences were minimal, Braidwood views the event as serious and has taken aggressive corrective actions.

CAUSES

Braidwood believes that mechanisms were available to control the configuration of the 2RC8070 valve. However, these mechanisms were not effectively utilized.

2BwOS 4.11.A-1 (Reactor Head Vent Path Locked Valve 18 month Surveillance) and the RCS venting activities were not sequenced to allow for verification of proper configuration before entering Mode 4.

BwOP RC-3b (Reactor Vessel Fill and Vent), BwOS 0.5-2.SI.2-3 (Safety Injection System Check Valve Stroke Test), and BwVS 0.5-2.RC.2 (Reactor Coolant System Valve Stroke Test) did not describe the operation of the 2RC8070. While the 2RC8070 was commonly used for controlled venting in these procedures, it's use was never proceduralized.

The Abnormal Position Log was not used to track the position of 2RC8070. Valves operated outside the guidance of approved procedures (BwOPs or surveillances) are required to be tracked in the Abnormal Position Log if not restored by the end of the shift. This log was not used because the operators involved believed the BwOP RC-3b would restore 2RC8070 to its proper position.

CORRECTIVE ACTIONS

IMMEDIATE

* Once recognizing the increase in vessel level, Operations personnel promptly stopped all RCS inventory changes.

* 2RC8070 valve was restored to the locked open position.

* Braidwood initiated an extensive team investigation using Root Cause Analysis Techniques.

* On March 11, 1993, a Lesson Learned Initial Notification was issued to all CECo nuclear sites describing this event.

EVENT SPECIFIC

* Braidwood has reviewed associated paperwork for Unit 1 and determined that the 1RC8070 valve was properly left in the open position.

* Daily Operating Orders were issued describing this event.

* Braidwood has developed procedure BwOP RC-15, "Reactor Head Vent," which governs the venting of the reactor vessel head.

* BwOP RC-3a/b,"Reactor Vessel Fill and Vent," have been revised to ensure the 1/2RC8070 valves have been locked open.

* BwGP 100-1, "Plant Heatup," has been revised to specify the sequence for performing BwOS 4.11.A-1.

* BwVS 0.5-2.RC.2, "Reactor Coolant System Valve Stroke Test," and BwVS 0.5-2.SI.2-3, "Safety Injection System Check Valve Stroke Test," have been revised to control the as-left position of the 1/2RC8070 valves.

CORRECTIVE ACTIONS (CONTINUED)

* Braidwood has reviewed additional surveillances that specify steps for the manipulation of locked valves to identify any surveillances that did not control the as left position of the valves. This review identified BwVS 6.1.2.D-1.9, "Primary Containment Type C Local Leakage Rate Tests of Chemical and Volume Control System." Subsequently, Braidwood has verified that valves referenced in this procedure were left in the appropriate configuration. This procedure has been revised.

* Reading package on this event will be issued by April 30, 1993, to licensed and non-licensed operators.

ADDITIONAL PROGRAM ENHANCEMENTS

* An Operating Department task force was created to study configuration control from a broad perspective. The task force, composed of Operations management and bargaining unit personnel, reviewed previous events and contacted various utilities. Based upon their recommendations, Braidwood will implement the following:

  * The locked valve program has been revised to require:

    - Each valve key tag to specify the valve's normal required position
    - Operations personnel to log the as-left position of the valve in the locked valve log.
    - Each valve manipulation to have as left position independently verified.
    - Records retention of completed locked valve logs.

  * A Configuration Control Coordinator has been assigned to the current refueling outage to coordinate lineup performance and provide current status to Operations Management. The plant shutdown procedure, BwGP 100-5, will be revised to determine the need for this position during each outage, based on outage complexity. This revision will completed by July 30, 1993.

  * BwAP 335-1, "Operating Shift Turnover and Relief," and attachments will be revised to include the requirement to record BwOPs and step numbers in progress. This revision will be completed by May 29, 1993.

  * The Abnormal Component Position Log procedure will be revised to improve ease of use. This revision will be completed by May 29, 1993, and will include:

    - Elimination of unnecessary controls that discourage use.
    - Evaluate improved display and retrieval of entries.
    - Periodic review of log.

ADDITIONAL PROGRAM ENHANCEMENTS (CONTINUED)

* Critical Operating Lineup Procedures will be formatted to better reflect plant conditions during restoration from outages. A schedule for procedure revisions will be developed by June 30, 1993.

* A training module on the component configuration control process will be developed and incorporated into the initial and continuing training for licensed operators and non-licensed operators. Training will also include the use of: initial lineups, procedures, the component abnormal position log, and the locked valve log. Classroom training will be completed by October 30, 1993.

CONCLUSIONS

Braidwood acknowledges the violation.

We believe that mechanisms were in place to control the configuration of the valve, although they were not properly utilized.

Safety Significance was minimal.

Braidwood has taken prompt comprehensive corrective actions which will prevent recurrance.

* Event Related

  Operations personnel promptly stopped all RCS inventory changes , identified that the valve was closed and restored it to the proper configuration.

  Discovery was evidence of our questioning attitude; this event was tied to monitoring another evolution which had symptoms other than what was expected or anticipated.

  Mispositioned valve was self identified at the earliest opportunity and promptly reported.

* Root Cause Task Force

  Immediately conducted extensive investigation to determine the cause of the event.

  Identified the event specific procedure revisions and necessary training.

  Reviewed the associated paperwork for Unit 1 to ensure the 1RC8070 valve is in its required position.

* Operating Department Task Force was formed to study configuration control from a broad perspective.

  Identified comprehensive program enhancements.

Braidwood believes that our good past performance in the operating area, as recognized by the NRC is indicative of our commitment to continued excellence.