U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-237/249-94007(DRP)

Dockets Nos. 50-237; 50-249 License Nos. DPR-19; DPR-25

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

Facility Name: Dresden Nuclear Power Station, Units 2 and 3

Meeting Conducted: March 21, 1994

Meeting Location: NRC Region III Office
801 Warrenville Road
Lisle, Illinois

Type of Meeting: Enforcement Conference

Inspection Conducted: Dresden Site
Morris, Illinois
January 11 to February 22, 1994

Inspectors: M. N. Leach
A. M. Stone

Reviewed By: Patrick L. Hiland, Chief — 3/30/94 Date
Reactor Projects Section 1B

Approved By: Brent Clayton, Chief — 3/30/94 Date
Reactor Projects Branch 1

Meeting Summary

Enforcement Conference on March 21, 1994 (Report No. 50-237/249-93026(DRP))
Areas Discussed: An apparent violation identified during the routine resident inspection was discussed, along with the corrective actions taken or planned by the licensee. The enforcement options pertaining to the apparent violation were also discussed with the licensee. The apparent violation concerned: (1) failures to implement corrective actions to preclude recurring drift and failures and of the reactor water level switches prior to 1994 and (2) failures to determine the root causes of the failures or excessive drifts, contrary to 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions."

DETAILS

1. Persons Present at Conference

Commonwealth Edison Company

M. Lyster, Site Vice President, Dresden
G. Spedl, Plant Manager, Dresden
R. Aker, Technical Services Superintendent
H. Massif, Manager, Site Engineering and Construction (SEC)
R. Robey, Director, Site Quality Verification
P. Garrett, Regulatory Assurance Engineer
S. Friant, Control Systems Technician
A. Brewer, Supervisor, Instrument Maintenance
P. Piet, Nuclear Licensing Administrator
J. Shields, Regulatory Assurance Supervisor
D. Spencer, Lead Electrical, SEC
R. Ralph, System Engineering
M. Lesniak, Regulatory Services
J. Schrage, Licensing Administrator
D. Paquette, Engineering Support
S. L. Trubatch, Counselor, Winston & Strawn

U. S. Nuclear Regulatory Commission

J. B. Martin, Regional Administrator
R. W. DeFayette, Director, Enforcement and Investigation Coordination Staff
B. A. Berson, Regional Counsel
T. O. Martin, Deputy Director, Division of Reactor Projects
H. B. Clayton, Chief, Reactor Projects Branch 1
P. L. Hiland, Chief, Section 1B, Division of Reactor Projects
W. D. Shafer, Chief, Maintenance and Outage Section
M. N. Leach, Senior Resident Inspector, Dresden
A. M. Stone, Resident Inspector, Dresden
P. R. Pelke, Enforcement Specialist
C. L. Vanderniet, Reactor Inspector
L. Love-Tedjoutomo, Quality Specialist, AECB, Canada
D. M. Chyu, Reactor Engineer

2. Enforcement Conference

An Enforcement Conference was held in the Region III office on March 21, 1994. This conference was conducted as a result of the preliminary findings of the inspection conducted from January 11 to February 22, 1994, in which an apparent violation of NRC regulations was identified. Inspection findings were documented in Inspection Report 50-237/249-94002(DRP), transmitted to the licensee by letter dated March 11, 1994. The purpose of this conference was to: (1) discuss the apparent violation, causes, and the licensee's corrective actions; (2) determine if there were any escalating or mitigating circumstances; and (3) obtain any additional information which would help determine the appropriate enforcement action.

Following an introduction by the Regional Administrator, the apparent violation was presented. The licensee's representatives provided additional information concerning the apparent violation. The licensee's representatives described the events which led to the apparent violation, including root causes and corrective actions taken.

At the conclusion of the meeting, the licensee was informed that they would be notified in the near future of the final enforcement action.

Attachments:
1. NRC Presentation
2. CECo Presentation

U.S. NRC REGION III

DRESDEN STATION

ENFORCEMENT CONFERENCE

MARCH 21, 1994

2:00 P.M. (CST)

EA 94-048

REPORT NUMBERS 50-237/94002 AND 50-249/94002

REGION III OFFICE

801 WARRENVILLE ROAD

LISLE, ILLINOIS

MAJOR NRC CONCERNS

INADEQUATE AND UNTIMELY CORRECTIVE ACTION

PROBLEM REPORTING

ROOT CAUSE EVALUATION

MANAGEMENT AGGRESSIVENESS TO RESOLVE TECHNICAL ISSUES

COMMERCIAL GRADE DEDICATION PROCESS

DRESDEN STATION

ENFORCEMENT CONFERENCE

Agenda

INTRODUCTION AND OPENING REMARKS:
Tom Martin, Deputy Director, Division of Reactor Projects (DRP)

NRC ENFORCEMENT POLICY:
Bob DeFayette, Director, Enforcement and Investigation Coordination Staff

SUMMARY OF APPARENT VIOLATIONS:
Ann Marie Stone, Resident Inspector - Dresden

LICENSEE PRESENTATION AND DISCUSSION:

NRC CLOSING REMARKS:
Jack Martin, Administrator, Region III

APPARENT VIOLATION

10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures be established to assure that conditions adverse to quality are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action shall be documented and reported to the appropriate levels of management.

CONTRARY TO THE ABOVE

Prior to 1994, the licensee did not implement corrective actions to preclude recurring drift and failures of the reactor water level switches commensurate to safety significance. The root causes of the failures or excessive drifts were not determined and resulted in repeated failures.

The apparent violation discussed in this enforcement conference is subject to further review and may be subject to change prior to any resulting enforcement action.

BACKGROUND

DRESDEN REACTOR WATER LEVEL SWITCHES

Logic:

- Four Yarway level instruments, each with two mercury switches, initiate ECCS systems on low-low level in a one-out-of-two twice logic.
- Two instruments have one additional mercury switch used to isolate HPCI on high water level. The logic is two-of-two.
- TS requires initiation at +84 (+4,-0) inches above the top of active fuel (-59 on instrument range). A TS change was initiated in 1989; however was not submitted until March 1993. The TS change should be approved by April 1994.

History of Out-of-tolerances and Failures:

- In 1992 Vulnerability Assessment Team (VAT) reviewed 1989 through 1991 data and concluded twenty-five percent of the thirty out-of-tolerance events were complete failures to trip. The VAT report stated licensee should finalize the planned corrective actions.
- Since January 1991, the switches have been out-of-tolerance or completely failed to actuate at least 50 times. In 1993 alone, 29 switches as-found settings were unacceptable.
- Unit 2 level instruments were replaced like-for-like in March 1993. Seventeen switches have not actuated properly since this replacement.
- Yarway problem placed on Top 50 Issues list in March 1993. However, no appreciable work was completed.

Safety significance:

- Automatic initiation and isolation from the level switches are assumed in the following accident scenarios:

  1. Section 15.6.5. Loss of coolant accidents resulting from piping breaks inside containment: ECCS is assumed to automatically actuate on <u>either</u> low-low water level or high drywell pressure.
  2. Section 15.2.7. Loss of normal feedwater flow: HPCI initiates at low-low level setpoint. (Analysis determined that without HPCI makeup level would remain five feet above core.)
  3. Section 15.6.1. Inadvertent Opening of a safety/relief valve: During a concurrent loss of offsite power, HPCI automatically actuates on low-low level.

4. Section 15.5.1. Inadvertent initiation of HPCI: vessel level increases until HPCI pump turbine is tripped by hi level signals.

- The licensee performed a detailed engineering evaluation and determined the Yarway instruments were operable.
- The licensee determined the failure rate for 1992 and 1993 to be 10^{-4} per hour whereas the failure rate assumed in the IPE was $5x10^{-6}$ per hour.
- Level switch failures affected the assumed failure rate of the common actuation system (CAS)) in the IPE. The baseline IPE has a core damage frequency (CDF) of $1.85x10^{-5}$/year. The bounding case for level switch failures (failure of CAS) resulted in a CDF of $4.35x10^{-5}$/year, an increase of 135%.
- In January 1993, the as-found settings of two switches affected the actuation logic. Assuming this condition existed for 10 days, the licensee determined that this event increased the CDF by 1%.
- This issue was identified in the VAT, was placed on the Top 50 list but little action was taken to resolve it.

Examples of inadequate corrective action include the following:

1. Prior to 1994, the licensee failed to initiate actions commensurate to safety significance to resolve Yarway instrument failures. Several feasibility studies to review possible design change were initiated; however, were not completed or no actions taken to resolve long term problem. Also, the proposed TS change was not submitted timely and was not appropriately prioritized.

2. Following identification of problems during bench testing and installation in March 1993, the licensee did not determine root causes of the Unit 2 switch failures prior to declaring the instruments operable.

3. Prior to 1994, the licensee did not determine root causes to prevent recurrence of reactor water level switches. Mercury switches were disposed of without failure determinations.

4. In 1993 the licensee failed to recognize precursors to individual instrument failures and significance of Unit 2 adverse trend.

Previous Inadequate Corrective Actions Violations

Inspection report	Details of violation
93034	Corrective actions for a previous violation were inadequate with regards to control of portable carts
93030	Measures were not established to assure that deficiencies and deviations identified by contractors were corrected
93024	Corrective actions taken to re-establish CCSW train separation in October 1992 were inadequate to prevent the loss of train separation in June 1993.
93020	Contaminated water leak not properly contained
93003	HPCI piping deformation caused by a 1970 water hammer was not analyzed until 1993

Additional Previous Violations Related to Engineering Support

Inspection report	Details of violation
93034	Violation of Order - engineering evaluation permitted isolation of HPCI room coolers
93017 (UNR)	System engineer response to ECCS strainer bulletin poor - containment closeout support poor
93009	Two SL III violations for inadequate 50.59 - unreviewed safety questions existed in CCSW system

Preliminary Conclusions:

Overall: Poor identification and resolution of technical issues. NRC identified the adverse trend in instrument performance.

Engineering and Technical Support

- did not recognize the significance of the 1993 Unit 2 trend
- PIFs were handled by individual system engineers and all referenced TS change and feasibility studies. No root cause determinations were performed.
- Engineering personnel were unaware of the magnitude of problems since the PIFs were not handled by the same individual.

\+ Site engineering performance after bringing issue to their attention was aggressive.

Maintenance

- Recognized poor manufacturing; however, installed same instruments.
- No root cause determinations since licensee discarded switches.
- Failed to recognize significance of Unit 2 failure trend
- Receipt inspection was not comprehensive. Did not identify repeatability problems nor manufacturing defects.

Additional concerns:

- NRC identified failure to report events. (separate Level IV violation)

Attachment 1: UNIT 2 Emergency Core Cooling System Reactor Water Level Switches

INSTRUMENT	CONTACT SWITCH	INITIATION LOGIC	DATE	AS FOUND LEVEL (INCHES)	REQUIRED LEVEL (TS/FSAR) (See #1)	PROBLEM (F)AILURE (D)RIFT (See #2)	NOTES
263-72A	7-8	CS, ADS and DG	06/11/93	(-88.6) wouldn't trip	-59 (TS)	F	B logic was operable and would have initiated ECCS.
			07/12/93	didn't trip		F	B logic was operable and would have initiated ECCS.
			08/09/93	didn't trip		F	B logic was operable and would have initiated ECCS.
263-72B	3-4	* HPCI ISOLATION	08/10/93	42.9	+48 (FSAR)	D	
			09/03/93	27.6		F	
			10/01/93	didn't trip		F	Operator action necessary to isolate HPCI on hi level
	5-6	LPCI	07/15/93	didn't trip	-59 (TS)	F	A logic was operable and would have initiated ECCS.
263-72C	5-6	LPCI and HPCI	06/11/93	-60.8	-59 (TS)	D	
			07/19/93	-60.4		D	
			09/03/93	(-68.4) may not have tripped		F	As found setpoint was approximately equal to the elevation of variable leg sensing tap.
			10/01/93	-62.5		D	
			10/29/93	-52.3		*	Conservative setting
			11/23/93	-65.5		F	
			12/22/93	-52.8		*	Conservative setting
	7-8	CS, ADS and DG	10/01/93	-62.5	-59 (TS)	D	
			10/29/93	-52.5		*	Conservative setting
			11/23/93	-62.9		D	

Attachment 2: UNIT 3 Emergency Core Cooling System Reactor Water Level Switches

INSTRUMENT	CONTACT (SWITCH)	INITIATION LOGIC	DATE	AS FOUND LEVEL (INCHES)	REQUIRED LEVEL (TS/FSAR) (See #1)	PROBLEM (F)AILURE (D)RIFT (See #2)	NOTES
263-72A	3-4	*HPCI ISOLATION	01/28/93	44.2	+48 (FSAR)	D	
	5-6	LPCI and HPCI	01/13/93	-59.9	-59 (TS)	D	ECCS initiation delayed (both A & B logic OOT.)
	7-8	CS, ADS and DG	01/13/93	-59.9	-59 (TS)	D	
263-72B	3-4	*HPCI ISOLATION	01/28/93	41.4	+48 (FSAR)	D	
			02/25/93	50.5		D	
			04/21/93	44.2		D	
	5-6	LPCI	01/13/93	-59.7	-59 (TS)	D	ECCS initiation delayed (A & B logic OOT)
			02/25/93	-59.9		D	
	7-8	CS, ADS and DG	06/16/93	-61.3	-59 (TS)	D	
			07/14/93	-65.4		F	
			08/16/93	-66.9		F	
			01/19/94	didn't trip		F	A logic was operable and would have initiated ECCS

NOTES

1. The technical specification limit is +84 inches above the top of active fuel which corresponds to -59 inches on the Instrument range.

2. DRIFT is defined as ± 6.6 inches from ideal setpoint (-57 or +46 inches). A FAILURE is considered any setpoint outside this drift band or a failure to actuate.

COMMONWEALTH EDISON

ENFORCEMENT CONFERENCE

CORRECTIVE ACTIONS
TAKEN IN ASSOCIATION WITH
RESOLUTION OF THE YARWAY TECHNICAL ISSUE

MARCH 21, 1994

AGENDA

M. LYSTER

INTRODUCTION

H. MASSIN

SUMMARY OF RESPONSES TO MAJOR CONCERNS

CHRONOLOGY

SAFETY SIGNIFICANCE

R. AKER

CORRECTIVE ACTION CONCERNS

DEDICATION PROCESS CONCERNS

M. LYSTER

CONCLUSION

INTRODUCTION

We are here to discuss an apparent violation of the Dresden response to Yarway level switch concerns and the resolution of technical issues related to the Yarways.

- Yarways have a long history of problems.
- Lack of Management awareness of increased failure rates precluded increasing the priority.
- Broad comprehensive program enhancements have increased Management involvement in the resolution of technical issues and will avoid recurrence.
- Program enhancements regarding root cause determination of performance failures and out-of technical specification limit issues will be illustrated.
- Modifications will be implemented in the next two outages which will eliminate the need for Yarways. In the interim, actions will be taken to reduce the Yarway failure rate to 10^{-5}/hour by the end of June 1994.

SUMMARY OF RESPONSES TO MAJOR CONCERNS

- Corrective actions for recurring Yarway drifts/failures

  Prior to U-2 failure rate increase, the station actions leading to replacement of the Yarway instruments in U-2 were commensurate with our understanding of the safety significance

- Lack of station response to increase in failure rate at U-2 in 1993

  Agree that processes were insufficient to involve right level of management attention and review of engineering judgement - recurrence should be prevented by comprehensive program enhancements.

- Failure of dedication process to identify manufacturing flaws in U-2 instruments.

  Some flaws, which were among the characteristics listed in the EPRI-NCIG-based program, were found and fixed - others were beyond program purpose but were later added to accommodate station.

MAJOR CONCERNS
(Continued)

- Actions to ensure that previously known or currently emerging safety significant issues are identified, prioritized, and corrected.

- Comprehensive Programmatic enhancements to identify, prioritize, and correct problems along with evaluating the corrective actions to these problems.

To Identify:	Integrated Reporting Program • Trending and Analysis of IRP data Maintenance Strategy Implementation Technical Issues Resolution Program
To Prioritize:	Issues Management Program Technical Issues Resolution Program Modification Approval Process (TRB/BRC)
To Correct:	Modification Process Maintenance Strategy Implementation
To Evaluate:	Integrated Reporting Program • Effectiveness Reviews • Trending and Analysis of IRP data Corrective Action Audits

- We recognize that we have much to do.

- Dresden has many long standing equipment problems.

- Our record to date indicates significant progress on upgrading material condition. These actions illustrate our commitment and ability to plan and follow through.

CHRONOLOGY

- Measures reactor water level
- Senses decreasing reactor water level
- Initiates LPCI/Core Spray/ADS/HPCI

  Initiates at level of -59" which is 84" above the top of active fuel

Repeated history of setpoint drift/failure

- Tech Specs restrict setpoint to a limit which is difficult to maintain. (other licensees have less restrictive tech spec limits)

- Failure rate perceived as not high enough to result in significant probability of multiple, simultaneous failures needed to interfere with safety function initiation. (Redundancy lost only once over the past two years)

Solutions pursued since 1986

- Low priority based on safety significance

- Three recommended actions were identified

  Tech Spec Change
  New Yarways
  Different Instruments

- Tech Spec applied for in 1990 as part of multi-spec amendment request (withdrawn in 1992 for non-Yarway reasons)

CHRONOLOGY

(Continued)

1991 - Two studies on feasibility of alternative instruments - low priority for recommendations because low safety significance of Yarway failure rate and safety concerns associated with alternatives did not warrant high costs.

1992 - VAT report recommended implementation of like-for-like replacement despite inability to find root cause of failures.

Early 1993- Tech Spec amendment request submitted separately to focus alteration on setpoint issue

Vat recommendation implemented to replace like-for-like

Difficulties with calibrating new switches
Vendor assistance obtained
Part 21 reportability assessed

Top technical issues list compiled - Yarway in top 10 of 50 issues
Encouraged continuation of efforts to determine "final solution"

Mid 1993 - Failure rate of new Yarways exceeds rate of old Yarways. Not brought to Management's attention. Unit 3 replacement <u>not</u> scheduled based on Unit 2 results.

Feasibility study to use analog trip system instead of Yarways.

Late 1993 - Reasonable alternative solution finally found and agreed to

Early 1994 - Solution approved and scheduled for both Units

SAFETY SIGNIFICANCE OF YARWAY DRIFT/FAILURE

FAILURE RATE SOURCE	FAILURE RATE	CORE DAMAGE FREQUENCY
IPE	5×10^{-6}/hr.	1.85×10^{-5}/yr.
1993	10^{-4}/hr.	1.85×10^{-5}/yr.
Bounding Case	100 % *	4.35×10^{-5}/yr.

* The bounding case is based on a failure probability of 100%.

- We acknowledge that these numbers have only become available recently
- This PRA evaluation validates that our engineering judgment regarding the impact of the measured failure rate was correct.

  Compensatory actions initiated pending completion of planned fixes.

  No realistic concern that failure probability could reach 100%.
- Despite the low quantitative safety significance, the failure rate is inconsistent with the appropriate safety focus.
- We recognize the need for a process which alerts management to applications of engineering judgement which involves a substantial level of uncertainty and, thus, should be subjected to management review.

CORRECTIVE ACTIONS

- Chronology shows continual attention to problem culminating in replacement of U-2 Yarways.

- Acceptance of problem consistent with low safety significance and other, higher safety significant issues.

- Too much emphasis was placed on amelioration expected from TS amendment request to adopt broader tolerance already authorized for other stations.

- VAT recognized issue and elevated management attention.

- U-2 Yarway replacement recognized to be an effort to address the symptoms.

  The decision to replace the Yarways on Unit 2 was based on the increased trend of failures over the years (1989 through 1991) compared to a significantly lower failure rate on Unit 3.

- The Yarway experience is an example of long standing equipment problems that we expect to deal with by using the enhanced processes.

- Acknowledge failure to appreciate possible generic impact of increased failure rate -

  Resulted from lack of process for bringing technical issues to appropriate level of management.

- Station recognized process weaknesses prior to this event.

- Comprehensive processes and enhancements initiated and planned are expected to substantially reduce potential for recurrence.

CORRECTIVE ACTIONS
(Continued)

- Agree that station processes needed to be enhanced.

  Enhancements are underway.

  First will describe enhancements in general.

  Then will show how they apply to concerns about:

  root cause determination of reasons for failure of new switches and

  out-of-tolerances during surveillance testing

- General Description of Program Changes

  Integrated Reporting Program

  Lower threshold for reporting events

  Issues Management Program

  Modification Approval Process

  Efficiency results in increased approval of lower safety significance modifications

  Technical Issues Resolution Program

  Periodic self-assessment of Top Technical Issues

  Established more systematic process for priortization

  Maintenance Strategy

  Trending and Analysis

  Effectiveness Reviews

  Perform reviews of corrective actions to determine effectiveness of the actions

CORRECTIVE ACTIONS
(Continued)

- Application to Determination of Root Causes of Switch Failures

  Impaired spiral wells were addressed promptly through discrepancy records.

  Identification would now be addressed through PIF process which includes root cause analyses under specified guidelines.

- Similarly, other deficiencies in components would be documented through PIFs and result in root cause analyses in accordance with IRP program.

- Trending and analysis of PIF data points will help to more quickly identify recurring problems.

- The IQE position has been filled to provide dedicated focus to the improvement of the trending and analysis process.

- Application to Determinations of Root Causes of Out-of-Tolerance Surveillances

  Historically, DVRs/LERs had been written and root cause had been determined to be intrinsic inability of Yarway to meet narrow TS limits.

  More recently, PIFs were written but no new root cause evaluations were performed because station believed the cause was unchanged.

  IRP trending will be improved to enhance the ability to recognize adverse trends and trigger an independent analysis of the root cause when appropriate.

DEDICATION PROCESS

- Dedication process based on EPRI-NCIG-07.

- Dedication process discovered and corrected some unacceptable conditions.

  Other problems were determined either not to affect switch performance (cold solder joint) or appear to have arisen after receipt inspection (spiral well and switch performance).

- Dedication was deficient in not requiring demonstration of repeatable actuation.

  This was corrected.

  Workmanship criteria also were added to accommodate station expectations.

- Dedication process appeared to be fundamentally sound.

  Enhancements like repeatability testing are expected to be identified as process is used and refined.

CONCLUSION

LESSONS LEARNED

CORRECTIVE ACTIONS

RESULTS TO DATE