U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-454/94002(DRS); No. 50-455/94002(DRS)

Docket Nos. 50-454; 50-455 Licenses No. NPF-37; No. NPF-66

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

Facility Name: Byron Nuclear Power Station - Units 1 and 2

Inspection At: Byron, IL

Inspection Conducted: January 3-21, 1994

Telephone Exit: February 9, 1994

Inspectors: Andrea Dunlop 2-15-94
A. Dunlop Date

Rogelio Mendez 2-15-94
R. Mendez Date

Accompanied By: L. Sage, Illinois Department of Nuclear Safety
January 3-7 and 18-21, 1994

Approved By: D.V. Butler for R.N. GARDNER 2-15-94
R. N. Gardner, Chief Date
Plant Systems Section

Inspection Summary

Inspection conducted January 3-21, 1994 (Reports No. 50-454/94002(DRS); No. 50-455/94002(DRS))

Areas Inspected: Announced safety issues inspection of the licensee's incorporation of Generic Letter (GL) 89-04, "Guidance on developing acceptable Inservice Test Programs" into the Inservice Testing (IST) Program (TI 2515/114), the licensee's program on check valves (TI 2515/110), and licensee's self-assessment in these areas.

Results: One violation was identified during the inspection concerning several valves that were not included in the IST program (Paragraph 2.c.(1)). One inspection followup item (IFI) (Paragraph 2.c.(1)) was identified concerning the inclusion of several component cooling water manual valves in the IST program. Based on this inspection, TI 2515/114 and TI 2515/110 are considered closed.

The inspection identified the following strengths and weaknesses:

- Based on the number of valves with safety functions that were not included, the IST program scope was considered a weakness. This concern was also applicable to Braidwood due to the similarities in the programs.

- The check valve program was considered good. The use of disassembly/inspections and non-intrusive testing provided useful indications of valve conditions.

- Inservice tests were conducted in a professional manner.

TABLE OF CONTENTS

		Page
1.	Persons Contacted	1
2.	Inservice Testing (IST) of Pumps and Valves	1
	a. Scope	1
	b. Pump Testing	4
	c. Valve Testing	4
	d. Trending	5
	e. Test Observations	5
3.	Check Valve Program	5
	a. Scope	6
	b. Preventive Maintenance	6
	c. Inservice Testing	7
	d. Resolution of Audit Concerns	7
4.	Licensee Self-Assessment	8
5.	Inspection Follow-up Items	8
6.	Exit Meeting	8

DETAILS

1. Persons Contacted

Commonwealth Edison Company (CECo)

*G. K. Schwartz, Station Manager
#T. J. Tulon, Operations Manager
#D. E. St. Clair, Site Engineering and Construction Manager
*T. K. Schuster, Site Quality Verification Director
*E. J. Campbell, Support Service Director
#T. E. Gierich, Maintenance Superintendent
*A. L. Javorik, System Engineering Supervisor
#J. R. Van Laere, Assistant System Engineering Supervisor
#*D. G. Goldsmith, Performance Engineering Group Leader
#*P. G. Enge, NRC Coordinator
#M. Fulkerson, Performance Monitoring
*D. W. Zebrauskas, Corporate Inservice Testing Coordinator
*J. A. Vega, Corporate Check Valve Coordinator
#*T. V. Robinson, Inservice Testing Coordinator
*K. J. Welty, Check Valve Coordinator
J. Davis, Zion Regulatory Assurance
#*W. E. Grundmann, Site Quality Verification

Illinois Department of Nuclear Safety (IDNS)

*L. Sage, Head, Code Compliance Section

U. S. Nuclear Regulatory Commission (NRC)

#*H. Peterson, Senior Resident Inspector
#*C. H. Brown, Resident Inspector
#J. Dawson, Intern

*Denotes those personnel attending the exit meeting on January 21, 1994.

#Denotes those personnel involved in the telephone exit on February 9, 1994.

2. Inservice Testing (IST) of Pumps and Valves

The inspectors reviewed IST procedures and completed IST surveillances. Generally, the methods used for the testing of pumps and valves were adequate. The test frequencies and acceptance criteria were specified and provisions were made for prompt operability determinations. Areas reviewed are discussed below.

a. Scope

Selected plant systems were reviewed to ensure adequate program scope in accordance with ASME Boiler and Pressure Vessel Code Section XI requirements. Technical Specifications (TS), Updated Final Safety

Analysis Report (UFSAR), NRC Safety Evaluation Report (SER), and Emergency Operating Procedures (EOPs) were also reviewed to evaluate the program scope. The following issues were identified.

(1) The following valves were identified with safety related functions that were not included in the IST program.

(a) Component cooling water (CCW) loop isolation valves 1/2CC9415 (normally open) were identified in the UFSAR as active valves (Table 3.9-16) with a safety function in the closed direction to isolate non-essential loads and non-code class piping during an accident. Failure to include these valves in the IST program in accordance with the Code is an example of a violation of TS 4.0.5 (454/455/93002-01a).

(b) CCW system manual valves 1/2CC9459B and 1/2CC9467B align the common CCW heat pump and heat exchanger to either of the two units (normally Unit 1). NRC's approval of the CCW system as stated in the SER was based on the ability to align the common heat exchanger to the unit undergoing post-LOCA recovery. The valves should be tested to verify the ability to realign the common heat exchanger. Failure to include these valves in the IST program in accordance with the Code is an example of a violation of TS 4.0.5 (454/455/93002-01b).

(2) Residual heat removal (RHR) pump mini flow valves 1/2RH610 and 1/2RH611 (normally open to protect the pumps during starting) were identified in the UFSAR as active valves (Table 3.9-16) with a safety function in the closed direction when flow through the RHR system reaches 1400 gpm. UFSAR Table 6.3-10 stated that if the mini-flow valve failed open, flow would be diverted from the reactor coolant system (RCS) and the opposite RHR train would meet the minimum flow requirements. In order to meet the single failure criteria, both trains should be able to meet the design flow requirements in the event of a failure in the opposite train.

A commitment was made to include the valves in the IST program pending the completion of an analysis that determines if the required flow to the RCS would be met if the mini-flow valve failed open. This was considered acceptable.

(3) Service water (SX) pump cubicle cooler outlet check valves 1/2SX116 (normally open) were required to be open to provide cooling to the pump room. These valves had been considered passive category C valves which would exclude them from the IST program. These valves may, however, momentarily close during an accident if power to the SX pump was lost and would have to reopen when the pump restarts. A discussion with NRR indicated that normally open check valves could not be considered passive. As an active valve, it performs a safety function in the open direction and should be included in the IST program. Since the valves were

in regular use during plant operations, IWV-3414 stated that no additional testing was required.

A commitment was made to include the valves in the IST program. The valves safety function will be verified and documented on a quarterly basis as required by the Code.

(4) CCW system manual valves 1/2CC9458, 1/2CC9459A, and 1/2CC9467A (normally open) were identified in UFSAR Table 5.4-18 with a potential safety function to close to separate the CCW system into two redundant subsystems to meet single failure analysis in the event of a pipe break. It was unclear if credit was taken for this function in the safety analysis. This will be considered an inspection followup item (454/455/93002-02) pending licensee resolution of this issue and review by the inspectors.

(5) An NRC inspection at Braidwood performed in May 1993 identified several valves requiring inclusion in the IST program that were also applicable to Byron. These valves included the RHR system cross connect valves (1/2RH8716A/B), the discharge check valves for the refueling water storage tank (RWST) to the RHR pumps (1/2SI8958A/B), the RWST to charging pump suction isolation valves (1/2CV112D/E), and the volume control tank (VCT) outlet check valves, (1/2CV8440).

Based on the Braidwood inspection results, testing on these valves had commenced and the valves were to be incorporated into the IST program at the next revision.

(6) Two inaccuracies were identified with the IST program valve table. First, valves 1/2SI8806 were identified as normally open with the stroke direction in the open direction, although the safety function and testing indicated the stroke direction as closed. Second, valves 1/2RH8705A/B were identified as both normally open and closed, although the valves should indicate normally closed. A commitment was made to correct these errors during the next program update.

The IST program valve scope appeared weak considering the number of valves with safety functions that were not included in the IST program. It appeared the program was not adequately maintained in compliance with the Code. A review of the Braidwood/Byron plant IST programs and UFSAR was in progress to support the submittal of a combined IST program for the next 10-year update (Spring of 1995). As valves with a required safety related function are determined, they will be included in the IST program and properly tested. In conjunction with the program update will be the development of an IST basis document. This will provide an understanding as to why valves were included or excluded from the program. These actions should identify any additional valves that need to be included in the IST program. The updated program and basis document will be reviewed during future inspections.

Although the valves identified in Paragraph 2.a.(1) should have been tested in accordance with the IST program, the valves were exercised on a periodic basis to alleviate any operability concern. A commitment was made to include the valves identified in Paragraphs 2.a.(1), 2.a.(2), 2.a.(3), and 2.a.(5) in the IST program during the next program revision scheduled to be submitted in February 1994. Tracking items were generated to ensure valve testing would be performed at the Code required frequency.

b. Pump Testing

The IST procedures for pumps included flow tolerance bands, but not a specific flow reference value as required by the Code. The NRC recognized in NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," that obtaining a fixed reference value for each test can be difficult. The guidance in the NUREG allowed establishing a 2% tolerance band around the reference value, although flow should be set as close as possible to the reference value. The licensee committed to include reference values such that operators can attempt to set flow at a specific rate, while still including the tolerance band in the test procedures. This should ensure consistent pump data is obtained for trending pump degradation.

c. Valve Testing

In most cases the guidance of GL 89-04 was incorporated into the valve IST program. Areas reviewed are discussed below.

(1) Several power operated valves (1/2CV8106 and 1/2RC014A-D) were identified with safety functions in both the open and closed directions, but only stroke timed in one direction. IWV-3413 required stroke timing in both safety directions. This issue was previously identified at Braidwood. CECo responded to the concern in a D. L. Farrar to NRC letter dated August 3, 1993. The response did not agree that the 1983 Edition of the Code clearly stated this requirement, but indicated CECo would enhance the IST program to include stroke timing in all safety directions. The NRC did not consider this an enhancement, rather a requirement. This was based on the Code section clarification in OM-10, "Inservice Testing of Valves in Light-Water Reactor Power Plants," and the NRC's response to question 41 in the meeting minutes for GL 89-04, dated October 25, 1989.

A commitment was made to stroke time test the valves during their next scheduled IST surveillance and clarify the position on stroke timing testing in the program. This was considered acceptable.

(2) Two issues were identified concerning the bench testing of the RHR relief valves. First, the test did not appear to be performed in the as-found condition since, prior to testing, the valve nozzle ring was adjusted. This could affect the valve lift setpoint. Since the licensee was unable to conclude that adjusting the

nozzle ring would not affect the lift setpoint, the procedure (BMP 3119-3) will be revised to test the valve prior to adjusting the nozzle ring. In addition, other relief valve test procedures will be reviewed to determine if the testing was being conducted in the as-found condition.

The second issue concerned the as-found setpoint test maintenance procedure (BMP 3119-2) that was incorrectly referenced in the surveillance procedure (BVS 4.9.3.2.c-2). The referenced BMP was recently revised and split into two separate procedures, BMP 3119-2 for valve disassembly and BMP 3119-3 for performing the as-found setpoint test. Although the system engineer reviewed the revised BMPs, the incorrect reference in the surveillance procedure was not identified. The BVS will be revised to include the correct reference. Searches can now be conducted on the new word processing system to ensure that when a procedure is revised, all procedures that reference the revised procedure can be identified for possible revision. This should alleviate this problem in the future.

(3) The test procedures to verify the open function of valves 1/2AF014A-F, 1/2AF029A/B, 1/2AF0001A/B, and 1/2AF003A/B were unclear as to what the acceptable flow rate was for each valve. This issue was identified at Braidwood, but was not corrected at Byron. The licensee committed to revise the procedure to specify required flow rate acceptance criteria.

d. Trending

The IST coordinator maintained a computer database to trend performance of all pumps and valves in the IST program. Graphic representation allowed easy interpretation and comparison of test results to the appropriate alert and required action ranges. The trending program allowed the IST coordinator to monitor component performance and initiate necessary administrative processes and plan corrective actions before components became inoperable.

e. Test Observation

Testing of the 1SX-01PA pump and 1CC-01PB pump were observed. The test procedures were properly followed, test equipment was in calibration, good communications were maintained between the system engineer performing the test and the control room, and the test was conducted in a professional manner. No concerns were identified.

3. Check Valve Program

An NRC audit was conducted in July 1991 using draft TI 2515/110 as a guide to assess the effectiveness of the check valve program (CVP). The audit results were documented in a letter to T. Kovach, dated October 25, 1991. Five concerns were identified and were responded to in the following letters to the NRC: T. Schuster to T. Murley, dated

November 27, 1991, and D. Chrzanowski to T. Murley, dated August 18, 1992. Based on the July 1991 audit, a complete review of the CVP using the TI was not performed. This inspection was limited to reviewing the program scope, preventive maintenance, inservice testing, and resolution to the five concerns identified by the audit.

a. Scope

In response to INPO SOER 86-03, "Check Valve Failures and Degradation," an evaluation was performed to determine which check valves should be included in the program. The valves identified in the evaluation were subsequently incorporated into Byron's program as delineated in procedure BVP 200-21, "Check Valve Preventive Maintenance Program." There were approximately 544 valves in the CVP, including all the licensee identified check valves which were in the IST program. Valves were categorized into three priority levels based on certain criteria, such as flow stability, maintenance history, and system severity. Priority level A valves (207) were determined to be the most likely to experience wear and should be disassembled and inspected (D/I). Priority level B valves (165) were less likely to experience wear or degradation, but still required monitoring by diagnostic testing. Priority level C valves (172) did not exhibit failure characteristics, but would be periodically reviewed to determine if the priority level should be increased.

The scope of the CVP was consistent with the SOER and had the proper amount of management support. Interactions between corporate and other CECo stations were noted and included the quarterly check valve coordinator meetings held to discuss CVP activities and to exchange information on check valve issues.

b. Preventive Maintenance

Preventative maintenance of check valves was divided into two parts: disassembly and inspection (D/I); and non-intrusive testing (NIT).

A significant amount of D/I was identified as the preventive maintenance requirement for the CVP. The licensee was using D/I to gather baseline data on each valve. In most cases, although the program did not require it, NIT was being performed on valves prior to and after D/I. By performing both types of PM, the licensee should be able to validate the results of diagnostic testing. This baseline data should be valuable information for the optimization phase of the CVP that would revise valve priority levels after obtaining sufficient data.

The D/I identified valve internals that required replacement or cleaning to ensure the valve would continue to function as designed. Although a significant amount of D/I was performed, only one valve failure had been identified. Valve 1SX116A failed in the open position due to the buildup of corrosion on internal valve components. Since the valve safety function was in the open direction to provide service water to SX pump room cubicle cooler, operability was not a concern. Based on this

failure, the three similar valves were also inspected. Although some corrosion was identified on valve internals, the valves functioned as required.

The check valve inspection data form, CVI-1, did not include documentation that the valve disc would travel its full-stroke in the as-found condition. Although not specifically included in the inspection procedure, the check valve coordinator stated this verification was performed prior to manipulation of any valve internal. In order to document this action, a procedure change was initiated to include a verification signoff.

Non-intrusive testing of valves as implemented by BVS XII-15, "Check Valve Acoustic Monitoring," has been used extensively in the CVP to identify valve degradation. The licensee uses an acoustic monitoring system to identify the disc hitting the seat, backstop, or the side of the valve to detect possible hinge pin problems.

c. Inservice Testing of Check Valves

Test procedures verified check valves were tested in accordance with the Code requirements and the guidance contained in GL 89-04. The only exception identified was discussed in Paragraph 2.c.(3) of this report.

d. Resolution of Licensee Audit Concerns

(1) RHR pump discharge check valves 1/2RH8730A/B were not included in the CVP. These valves were inadvertently omitted from the CVP and were subsequently included.

(2) The seismic qualification of the diesel generator starting air system dryers were questioned since they were designated Safety Class II D. If the pressure integrity of the air dryers was lost during a seismic event, the 1/2SA181A-D check valves would be required to function to prevent the loss of air pressure in the receivers.

An analysis provided by the licensee indicated that the air dryers were seismically qualified. The analysis resolved this concern.

(3) Six containment isolation valves 1/2RY8046 and 1/2WO0007A/B were in the IST program, but not included in the check valve program.

The valves were reviewed and added to the program as Priority level B valves.

(4) This issue concerned the generic exclusion of 2 inch diameter and smaller check valves from the check valve program without addressing criteria such as system cleanliness, operational frequency, chemical stressors or component wear.

There were 70 valves reviewed using the criteria addressed in the concern. All valves were added to the program; 1 as priority level A and the remaining 69 as priority level C. This was considered acceptable.

(5) The Corporate Nuclear Operations (NO) Directive NOD-TS.9, "Check Valve Directive," allowed the use of IST results as an indicator of check valve degradation in lieu of preventive maintenance (PM) (i.e., D/I or NIT).

CECo corporate issued a letter to all CECo stations, dated December 31, 1991, to not defer check valve PMs based on IST results. A commitment was made to revise the NOD by January 1, 1994, however, the NOD was still in revision at the time of the inspection. A revised commitment date of March 31, 1994, was sent to the NRC on January 14, 1994. Although the commitment date for revising the NOD was not met, adequate controls were in place to resolve the concern.

4. Licensee Self-Assessment

Periodic field monitoring was conducted during IST, check valve inspections, and NIT performance. No significant concerns were identified with in-field performance in these areas. This inspection also confirmed good in-field performance in the IST area. No audits were performed on the IST program scope. As part of the combined Byron/Braidwood program review process a program assessment was being conducted by the group designated to develop the updated program. Periodic assessments in other programmatic areas would ensure the programs were being adequately maintained.

5. Inspection Follow-up Items

Inspection follow-up items are matters which have been discussed with the licensee which will be reviewed further by the inspector and which involve some action on the part of the NRC or licensee or both. One inspection follow-up item was identified during this inspection and is described in Paragraph 2.c.(1).

6. Exit Meeting

The inspectors met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on January 21, 1994. The inspectors re-exited with the licensee representatives (denoted in Paragraph 1) during a telephone conference on February 9, 1994. The inspectors summarized the purpose, scope and findings of the inspection and discussed the likely informational content of the inspection report. The licensee identified none of the documents or processes reviewed by the inspectors during the inspection to be proprietary.