Commonwealth Edison Company
Braidwood Generating Station
Route #1, Box 84
Braceville, IL 60407-9619
Tel 815-458-2801

ComEd

April 19, 1996
BW/96-0050

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

To All Concerned:

The enclosed Licensee Event Report from Braidwood Generating Station is being transmitted in accordance with the requirement of 10 CFR 50.73(a)(2)(i)(B), which requires a 30-day report.

This report is number 96-004-00, Docket No. 50-456.

Yours truly,

T.J. Tulon
Station Manager
Braidwood Nuclear Station

TJT/PZ/djm
I:\shared\admin\bw960050.doc

Encl: Licensee Event Report
No., 456-96-004-00

cc: NRC Region III Administrator
NRC Resident Inspector
INPO Record Center
ComEd Distribution Center
I.D.N.S.
I.D.N.S. Resident Inspector

230016

IE22

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Braidwood Unit 1	05000456	1 OF 11

TITLE (4)
Spray Additive System Surveillance Deficiency Results In Flow Rates For Sodium Hydroxide Being Set Higher Than Technical Specification Limits

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Braidwood Unit 2	05000457
3	21	96	96	-- 004 --	00	4	19	96	FACILITY NAME Byron Units 1 and 2	DOCKET NUMBER 05000454/455

OPERATING MODE (9)	5/6	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	0/0	20.2201(b)	20.2203(a)(2)(v)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Haksoo Kim, System Engineering Department	(815) 458-2801 x2544

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
				N						

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On March 21, 1996, while reviewing the Containment Spray Additive Flow Rate Verification surveillance, it was discovered that the procedure verifies water flow rate between 68 to 74 gpm based on Control Room flow indication, while the flow indication is calibrated for 30% NaOH solution. As a result, both Units 1 and 2 CS021A/B valves had been throttled to provide a higher flow rate than the Tech Spec requirement of 68-74 gpm. Upon discovery, Byron Station was notified and was found to have a similar problem. The Unit 1 Spray Additive Flow Rate has been readjusted to an actual flow rate of 68-74 gpm and Unit 2 will be tested during the current refueling outage. The appropriate surveillance was corrected, and a review is underway to identify similar problems.

A. PLANT CONDITIONS PRIOR TO EVENT:

UNIT: Braidwood Unit 1 EVENT DATE: 3/21/96
EVENT TIME: 1600
MODE: 5 RX POWER: 0
RCS [AB] TEMPERATURE/PRESSURE: 135 deg F / 0 psig

B. DESCRIPTION OF EVENT:

There were no systems or components inoperable at the beginning of this event that contributed to the severity of the event.

On March 21, 1996, while reviewing the Containment Spray Additive Flow Rate Verification surveillance (BwVS 6.2.2.d-1) System Engineering (nonlicensed) discovered that the present surveillance procedure verifies a water flow rate between 68 to 74 gpm using the Control Room flow indication (1/2 FI-CS015 and 016) without properly converting the indicated flow to actual water flow. The flow indicator 1/2 FI-CS-015 and 016 are calibrated for 30% NaOH solution with specific density of 1.3.

The Technical Specification surveillance section for Spray Additive System (TS 4.6.2.2.d) states, in part, that the Spray Additive System shall be demonstrated operable "At least once per 5 years by verifying each water flow rate equivalent to 55(+5, -0) gallons per minute for 30% NaOH from the eductor test connections in the Spray Additive System: 1) CS26A 68(+6, -0) gpm (Train A), and 2) CS26B 68(+6, -0) gpm (Train B)".

An in-depth review of past surveillances was performed. A brief summary is provided in the following paragraphs.

The first CS Additive Flow Rate Verification surveillances for Units 1 and 2 were performed in November 1986 and November 1987 respectively. Even though Revision 0 of surveillance procedure did not include a correction factor to compensate for the specific density difference, the correction factor was incorporated into the procedure using Temporary Changes TCR#3b and Temp Change #1975.

B. DESCRIPTION OF EVENT (continued)

The next surveillances were performed in April 1991 for Unit 1 using Revision 1 of the procedure and in November 1991 for Unit 2 using Revision 2 of the procedure. Both revisions of the procedure did not include the correction factor to compensate for the specific density difference. As a result both Unit 1 and 2 CS021A/B valves had been throttled to provide higher flow rate than the Tech Spec requirement of 68-74 gpm.

The third surveillance for Unit 1 was performed in October 1995 using Revision 6 of the surveillance. This revision also did not include the correction factor. The third surveillance for the Unit 2 is currently on hold pending engineering review.

After discovery, Braidwood Site Engineering and Byron System and Site Engineering were contacted to inform them of the discrepancy between the Tech Spec requirement and the actual procedure methodology. Based on the preliminary engineering calculation, Braidwood Site Engineering recommended testing Unit 1 with the assumption that the Spray Additive Tank level is the Mid Tank level and the flow should be set between 62 and 64 gpm as indicated using the Control Room indication 1FI-CS015 and 016.

The Unit 1 Spray Additive Flow Rate test was performed on March 23, 1996. Both trains A and B passed the test with 63-63.5 gpm with 2.5 psig as a back pressure that simulated the Spray Add Tank level at Mid Tank. The Unit 2 Spray Additive Flow Rate test is scheduled during the current outage.

This event is being reported pursuant to 10CFR50.73 (a)(2)(i)(B), which requires the reporting of any event or condition prohibited by the plant's Technical Specifications. Unit 1 was set to provide higher than the required flows of Sodium Hydroxide for the period of April 1991 through March 23, 1996, and Unit 2 was set to provide higher than the required flows of Sodium Hydroxide for the period from November 1991 through April 1996.

Attachment A to this LER provides a tabulation of the actual settings from all previous Spray Additive surveillances.

C. CAUSE OF EVENT:

The cause of this event was Procedural Deficiency. Surveillance BwVS 6.2.2.d-1 did not contain the required correction factor to compensate the indicated flow for the differences in specific density between water and Sodium Hydroxide. The System Engineer that authored the revision of the procedure that was used in 1991 could not recall why the temporary procedure changes that were in place prior to the revision were not incorporated into the permanent procedure revision. A review of documentation for these revisions also did not provide any insight as to the cause of the failure.

D. SAFETY ANALYSIS:

Containment Spray has sodium hydroxide added to raise the pH to greater than or equal to 8.5 to provide the primary means of reducing the radioiodine concentrations in the containment atmosphere following a design basis large break LOCA. This post-LOCA iodine control function can be effectively performed by sprays having no additive and by deposition on the containment surfaces. However, it is still necessary to have NaOH solution in the containment sump to maintain minimum pH of 7.0 to assure retention of iodine in solution and to protect against chloride induced stress corrosion cracking of stainless steel to maintain long term cooling capability after the design basis accident.

The effect of pH on iodine adsorption is addressed in ANSI/ANS-56.5-1979. Iodine removal is sensitive to pH in that the partition factor is directly related to the pH. The partition coefficient is the ratio of iodine in the liquid phase to the concentration in the gas phase, at equilibrium. Figure 8.3-1 of ANS-56.5 provides that the same partition factor is allowed for NaOH solutions with a pH from 8.5 to 11.

D. SAFETY ANALYSIS (cont.):

In addition, Westinghouse analysis states that the specification of CS pH for fission product control was based upon the assumptions that iodine removal capability of unadjusted boric acid spray is low, that iodine removal efficiency is greatly enhanced at pH values greater than 8.5, and that gaseous elemental iodine is the dominant species released from the reactor core. As a result, the spray system design is constrained to limit the spr pH to greater than 8.5 to ensure iodine removal and less than 11 for EQ concerns. (The above evaluation addresses the EQ concerns.) Since it has been shown that the spray pH will be greater than 8.5, there are no concerns with the iodine adsorption ability of the CS system.

Since the spray additive flow control valves had been throttled to provide a higher flow rate than the Tech Spec requirement, the concern was that the pH of the injection phase could be outside the Environmental Qualification (EQ) limit of 8.5 to 10.5.

The potential for a pH of greater than 10.5 during the beginning of the CS injection phase will have no deleterious effect on EQ equipment located in the containment for the following reasons:

The CS system is designed to add sufficient NaOH to achieve the desired pH in the sump solution within a short period of time following the initial CS injection phase. The wide dispersion of the NaOH in the containment provided by the spray ensures that the sump solution pH is quickly and uniformly adjusted. The CS injection phase is assumed to terminate at two hours into the accident at which time the spray additive tank is already empty even with one Containment Spray system. After the Containment Spray injection phase the recirculation phase commences, and the design basis pH spray solution collected in the sump is recycled. Therefore, the time of exposure, i.e., 31 minutes, at the higher pH is negligible.

D. SAFETY ANALYSIS (cont):

The emphasis for ensuring acceptable environmental qualification of equipment, relative to chemical spray, has been specific to the protection of the electrical components by excluding the containment environment from the interior of equipment. This concern, which could potentially induce internal electrical short circuits due to steam condensation and the ingress of chemical spray, was raised by Westinghouse irrespective of the pH. The Braidwood EQ Program has evaluated EQ equipment based on operability requirements and sensitivity to moisture intrusion. Except for cables, EQ equipment in the containment is typically provided with its own protective enclosures. However, EQ qualified seals have been installed as required. Therefore, no moisture intrusion will take place regardless of the pH.

Electrical shorting, enhanced by conductivity, appears to be primarily affected by the ionic strength of the contacting fluid, rather than pH. Discussions between ComEd Systems Materials Analysis Department and the Braidwood EQ Group, indicate that there is no appreciable difference in conductivity between 10.5 pH and greater values, since a pH of 10.5 is conductive by nature. However, the EQ terminations that can either be as Raychem splices, Okonite tape splices or terminal blocks, are typically afforded physical protection from direct chemical spray by means of junction boxes, termination boxes, etc. Furthermore, these boxes are equipped with weepholes to drain condensate accumulation and, in cases where top entry conduits are utilized in boxes containing terminal blocks, drip shields are installed above the terminal blocks. Spliced terminations on the inboard side of the penetrations are afforded protection, in a manner similar to cable jacket material (e.g., mechanical protection by means of Jacketing Tape No. 35, as described below). Therefore, the equipment configurations described above provide a high degree of protection from the effects of increased conductivity resulting from the spray.

D. SAFETY ANALYSIS (cont.):

With respect to the effect on cables exposed to chemical spray, the jacketing will provide protection of the insulation. In the environmental qualification of the cables, no credit is taken for the cable jacket material, which has no safety function and is used for mechanical protection only. Data from DuPont documents the excellent caustic chemical resistance of Hypalon when exposed to either boric acid or sodium hydroxide solutions at very high temperatures. Hypalon is the jacket material used for Okonite and Samuel Moore cables which are predominantly used at Braidwood for power, control and instrumentation circuit applications. In addition, as explained above, the contact time with higher pH solution will be much less than 2 hours. Therefore, the effect of wetting of the jacket with a chemical pH concentration higher than 10.5 is negligible.

Therefore, it is concluded that the effects of having a higher than desired pH being delivered from CS Additive system has no consequence with respect to EQ and iodine adsorption pH requirements.

E. CORRECTIVE ACTIONS:

Surveillance BwVS 6.2.2.d-1 was revised to include the correction factor. The surveillance was reperformed on Unit 1 prior to startup of the unit from its forced outage. The surveillance is scheduled to be performed on Unit 2 prior to reaching Mode 4 coming out of the current refueling outage (A2R05).

Additional surveillances are being reviewed as they are performed during the current refueling outage to identify problems with correction/conversion factors and acceptance criteria. When identified these items will be reviewed for potential impact and resolutions. These reviews will be tracked to completion by NTS item #456-200-96-01301.

F. PREVIOUS OCCURRENCES:

A review of the RABR database revealed three previous events concerning defective procedures caused by personnel error. These events occurred after the 1991 procedure revision. Therefore those events corrective actions could not have prevented this event from occurring.

G. COMPONENT FAILURE DATA:

MANUFACTURER	NOMENCLATURE	MODEL	MFG PART NO.
None			

Attachment A - Flow Rate History

*Note : Underlined values indicate Tech Spec non-compliance.

Unit 1 CS Additive Flow Rate Verification History

Tech Spec Requirement : 55 - 60 gpm (30-36% NaOH Solution)
68 - 74 gpm Water Flow through _CS026A/B valve

Unit 1 Startup Test using Water (6/84) BwTP CS-10

A- Eductor Flow 130 gpm
Spray Additive Flow 67 gpm (Acceptance Criteria using MCR Indication 1FI-CS015: 64.5 - 69.5 which is equivalent to 73.5 - 79.23 gpm water flow through 1CS026A/B)

B- Eductor Flow 130 gpm
Spray Additive Flow 67 gpm

Unit 1 First Surveillance (11/86)

Rev. 0 - SAT had NaOH Solution therefore for the test PW water was used to simulate the Add. Flow. Rev. 0 of Surveillance Procedure did not include 1.14 correction factor but during the actual surveillance incorporated 1.14 correction factor per TCR#3b (which is equiv. to current TPC)

A- Eductor Flow 130 gpm
Indicated Flow: 62 gpm (using 1FI-CS015)
Actual Water Flow: 70.68 gpm (62 * 1.14) which is within 68-74 gpm acceptance criteria

B- Eductor Flow 130 gpm
Indicated Flow 61 gpm (using 1FI-CS-016)
Actual Water Flow: 69.54 gpm which is within 68-74 gpm

Attachment A - Flow Rate History (cont.)

Unit 1 Second Surveillance (4/91)

Rev. 1 - Rev. 1 of Surveillance Procedure did not include the correction factor.

A-	Eductor Flow	140 gpm
	Indicated Flow	55 gpm (using 1FI-CS015)
	Indicated Flow	68.5 gpm (using 1FI-CS-015) after Throttle Open 1CS021A
B-	Eductor Flow	140 gpm
	Indicated Flow	64 gpm (using 1FI-CS-016)
	Indicated Flow	72 gpm (using 1FI-CS-016) after Throttle Open 1CS021B

Unit 1 Third Surveillance (10/95)

Rev. 1 - SPP-95-048 (in lieu of Rev. 6) of Surveillance Procedure did not include the correction factor.

A-	Eductor Flow	130 gpm
	Indicated Flow	72.5 gpm (using 1FI-CS015)
B-	Eductor Flow	130 gpm
	Indicated Flow	75 gpm (using 1FI-CS-016)
	Indicated Flow	70 gpm after Throttle Open 1CS021B

Unit 2 CS Additive Flow Rate Verification History

Unit 2 Startup Test using Water (4/87) BwTP CS-50

A-	Eductor Flow	140 gpm
	Spray Additive Flow	64 gpm (Indication 2FI-CS015) (Target 59.8-65)
	Corrected Actual Flow	73.5 gpm which is within 68-74 gpm

Attachment A - Flow Rate History (cont)

B- Eductor Flow 139 gpm
Spray Additive Flow 63 gpm (Indication 2FI-CS015) (Target 59.8-65)
Corrected Actual Flow 71.8 gpm which is within 68-74 gpm

Unit 2 First Surveillance (11/87)

Rev. 0 - SAT has NaOH Solution therefore for the test PW water was used to simulate the Add. Flow. Rev. 0 of Surveillance Procedure did not include 1.14 correction factor but during the actual surveillance incorporated 1.14 correction factor per Temp Change #1975 (which is equiv. to current TPC)

A- Eductor Flow 140 gpm
Indicated Flow 61 gpm (using 2FI-CS015)
Actual Water Flow 69.5 gpm (within 68-74 gpm accept. criteria)

B- Eductor Flow 130 gpm
Indicated Flow 61 gpm (using 2FI-CS-016)
Actual Flow 69.54 gpm which is within 68-74 gpm

Unit 2 Second Surveillance (11/91)

Rev. 2 - Rev. 2 of Surveillance Procedure did not include the correction factor.

A- Eductor Flow 140 gpm
Indicated Flow 64 gpm (using 2FI-CS015)
Indicated Flow 70 gpm (using 2FI-CS-015) after Throttle Open 2CS021A

B- Eductor Flow 154 gpm later to 140 gpm
Indicated Flow 48 gpm (using 2FI-CS-016)
Indicated Flow 68.5 gpm (using 2FI-CS-016) after Throttle Open 2CS021B