

EXPIRES: 5/31/95

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Brunswick Steam Electric Plant, Unit 1

DOCKET NUMBER (2)

05000325

PAGE (3)

1 of 5

TITLE (4) Multiple Chlorine Sensors Used For Control Building Isolation Logic Were Found To Be Outside Technical Specification Tolerances During Routine Calibration.

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
3	23	95	95	- 02 -	00	5	8	95	BSEP Unit 2	05000324
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following)(11)							
POWER LEVEL (10)	100	20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)	
		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)	
		20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER	
		20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract and Text)	
		20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)			
		20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)			

LICENSEE CONTACT FOR THIS LER (12)

NAME

Glen M. Thearling, Regulatory Affairs Specialist

TELEPHONE NUMBER

(910) 457-2038

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
B	VI	DET	R369	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)			X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single space typewritten lines) (16)

During the March 23, 1995, annual Chlorine Detection System Channel Calibration five of eight chlorine sensors were found to be outside the Technical Specification tolerances. These sensors provide for chlorine gas leak detection and the chlorine isolation logic for the common Control Room ventilation system. Four of the failed sensors were taken from the unfiltered high flow area of the Control Buildings 70' air intake plenum, and had a coating of loose dirt affixed to the sensors surface. An annual sensor replacement schedule was not sufficient in this environment to keep the dirt accumulation from affecting sensor operability. The other sensor failure is considered an isolated case of calibration drift. All 8 sensors were replaced and calibrated. Calibration checks performed April 23, 1995, as part of an augmented staggered test program found that the four Control Building sensors installed March 23, 1995, did not pass. Corrective actions include installation of a "weather shield" and establishing a series of accelerated staggered calibration checks.

During a historical review of earlier sensor failures it was also revealed that, after two earlier sensor replacements, the calibration required as part of post-maintenance testing had not been performed. The post-maintenance testing package did not include a calibration. The review of previous chlorine sensor replacements was completed and required testing is current.

The cause classification for the sensor failures, per the criteria of NUREG-1022, is Design Deficiency. The inadequate post maintenance testing is attributed to Defective Procedure.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

TITLE

Multiple Chlorine Sensors Used For Control Building Isolation Logic Were Found To Be Outside Technical Specification Tolerances During Routine Calibration.

INITIAL CONDITIONS

On March 23, 1995, both Units were operating at 100% power and a 55 ton railway chlorine tank car was on site to support the Circulating/Service Water intake structures routine chlorination requirements.

EVENT NARRATIVE

In February of 1993 Rosemount Analytical Model 5324B Ambient Chlorine Detection Systems were installed by Plant Modification 92-108. These sensors provide for chlorine isolation logic for the common Control Building ventilation system. In January 1994, the monthly functional test detected two sensor failures, but no conclusion as to the cause was determined. When a third sensor failure was detected during the March functional test, Maintenance Engineering had CP&L's Laboratory Services Section perform a failure analysis. The results were issued in the October 1994 report indicating that soil/dirt deposits may be clogging the sensors permeable membrane. No action was taken at that time. A forth sensor failure (the second within 18 months on the same sensor) in December 1994 triggered a repetitive failure program inquiry, but discussion with Systems Engineering resulted in the decision to take no immediate action based on what was felt to be limited data.

During the March 23, 1995, Chlorine Detection System Channel Calibration (OMST-CLDT21A) all eight chlorine sensors were undergoing their annual replacement. The "as-found" calibration found five of eight chlorine sensors to be outside the Technical Specification tolerances for response time (5 seconds at 5 ppm chlorine gas). It should be noted that prior to March 23, 1995, the annual sensor replacement did not include an "as-found" calibration check. All 8 sensors were replaced and calibrated.

At the time of the event, the three remaining operable sensors at the Service Water Building were determined to be adequate to insure the safety function provided by the system remained available.

The investigation into the chlorine sensor failures implemented a series of staggered calibration checks as part of a program to gather data needed to support a new long term corrective action.

The Control Building sensors did not pass the first calibration check, performed on April 23, 1995, a month after replacement. The system was declared Technical Specification inoperable and the Control Room ventilation system was placed in the Chlorine Protection Mode. These results lead to concerns with the test methodology and the quality of the chlorine test gas. The age of the test gas (- one year) resulted in a slight lowering of the chlorine concentration and would have conservatively effected the test results. The test methodology was determined to be valid. Retesting the sensors with new test gas on April 28, 1995, resulted in two sensors passing, one failure attributed to short within the sensor, and a single failure that may be attributed to the dirt buildup alone. The last sensor was then rinsed and passed the response time test. It is now believed that the detection range in which the chlorine

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sensors are required to operate makes the test results very susceptible to lower concentrations of chlorine test gas. This is critical when you must also consider a buildup of dirt on the sensor permeable membrane was also occurring. Followup testing on May 1, 1995, found all four sensors responding within the required response time. "Weather shields" were installed on May 4, 1995, to minimize dirt impingement on the sensors.

During the investigations historical review of data from the earlier sensor failures, it was noted that the sensor (2-X-AE-2977) replaced on March 23, 1994, and another (2-X-AE-2977-1) on December 1, 1994, had not received the calibration necessary to complete the Technical Specification required Post Maintenance Test Requirements (PMTR). In each case, the new sensor had been functionally tested, but no calibration had been specified.

In each case the Work Request/Job Order (WR/JO) was processed as emergent by personnel not familiar with the system. In the first case, inadequate use of available tools (i.e. procedures, technical Manuals, Drawings, etc.) in the preparation of a work package, and not contacting others more knowledgeable of the system, resulted in the calibration not being included in the post maintenance test package. In the second case the need for the calibration as post maintenance testing was questioned and System Engineering was contacted for guidance. Miscommunication resulted in the planner believing that just the monthly functional test was required. The Work Control Unit PMTR Developer noting the reference on the WR/JO to the System Engineers involvement in determining the PMTR, did not question the System Engineer's statement and only assigned the "recommended" monthly functional test. Each sensor was replaced and a new sensor calibrated during the next routine performance of the annual calibration. The calibrations were performed on May 4, 1994, for the first sensor (2-X-AE-2977), and on March 23, 1995 for the second sensor (2-X-AE-2977-1).

These events are being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as operation prohibited by technical specifications.

CAUSE OF EVENT

Four of the failed sensors (1-X-AE-2977, 1-X-AE-2977-1, 2-X-AE-2977, 2-X-AE-2977-1), were from the Control Buildings 70' air intake plenum, and had loose dirt affixed to the sensors permeable surface membrane. A coating of dirt can interrupt the chemical/electrical function of the sensor, such that it may not respond in accordance with the design specifications. The fifth sensor (2-X-AE-2979), is one of four located at the Service Water Building, and near the chlorine tank car. The sensors located at the Service Water Building are not in a ventilation plenum and the failure is considered to be an isolated case of sensor calibration drift. Sensors located here have not exhibited the coating of surface dirt present on the four Control Building sensors.

The design process failed to determine the sensors limitations in an environment of high velocity unfiltered air such as is present in the Control Building's 70' air intake plenum. Previous experience existed with chlorine sensors in HVAC ductwork applications, but not at the velocities present in the Control Building plenum (10-15 fps vs 29 fps). System design reviews did not indicate that the dirt present in a plenum 50' above plant grade would be a concern. An annual sensor replacement schedule was not sufficient in this environment to keep the dirt accumulation from affecting sensor operability.

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The cause of the four previous post-modification sensor failures detected during the monthly Functional testing were not linked to an adverse trend and, as such, no modified preventive maintenance schedule was established. When the failure analysis report was received at BNP in October 1994, no action was initiated. The sensors were treated as consumables and therefore no "as-found" calibration data was collected that could have aided in detecting latent failures.

In summary, the impact of the repetitive clogging failures of the Chlorine sensors on the overall system response time was not recognized. As such, the detectors were treated as consumables and replaced on an as needed basis rather than establishing a preventive maintenance schedule. The "as found" response time data collected during the March 23, 1995, testing revealed a more generic sensor problem.

There are separate causes for the two incidents where the required Post Maintenance Test Requirements were not been performed. In the first case, inadequate use of available tools (i.e. procedures, technical Manuals, Drawings, etc.) in the preparation of a work package resulted in the calibration not being included. The second case was the result of the breakdown of verbal communication when the need for the calibration was questioned.

CORRECTIVE ACTIONS

Based on the April 23, 1995, calibration check results the original program developed to define the prevent maintenance or design changes necessary to maintain Control Building sensor operability were re-evaluated. Engineering has developed a course of action that includes an accelerated staggered test program for the Control Building sensors along with the installation of "weather shields" on May 4, 1995, to minimize dirt impingement on the sensors. The effectiveness of this change will be evaluated by engineering.

The lessons learned relating to the importance of conservative decision making and the various methods of dispositioning equipment problems will be reviewed with appropriate Technical Support personnel and the Repetitive Failure Review Board members.

Maintenance personnel involved in the missed PMTR event will be counseled on the need to utilize approved procedures in the development of work package repair instructions. This will also be reviewed with other appropriate Maintenance and Operations personnel.

The PMTR event will be reviewed with appropriate Systems Engineering personnel to stress the need for accurate communications.

The functional surveillance (OMST-CLDET11M) will be revised to refer any repair/replacement activities associated with the sensors/detectors to the calibration surveillance (OMST-CLDET21A).

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SAFETY ASSESSMENT

The safety significance of this event is minimal. At the time of the event, the three remaining operable sensors at the Service Water Building were determined to be adequate to insure the safety function provided by the system remained available.

The five sensor failures were detected and replaced during the routine surveillance and were not challenged by an actual chlorine event. Testing determined that four of the five sensors while not in tolerance would have responded, providing isolation capability during the type of catastrophic chlorine event that could threaten the Control Room habitability.

During the worst case accident with complete failure of the Control Room ventilation isolation system, the maximum concentration in the Control Room should be no more than 10 ppm. The toxicity limit is 15 ppm for two minutes without physical incapacitation (i.e., severe coughing, eye burn, or severe skin irritation). Within two minutes after Control Room ventilation isolation, the Abnormal Operating Procedure for Chlorine emergencies (AOP-34.0) requires the Shift Supervisor to have made the determination to don the available emergency air breathing equipment.

PREVIOUS SIMILAR EVENTS

None

EIIS COMPONENT IDENTIFICATION

System/Component

EIIS
Code

Engineered Safety Features Actuation System

JE

Control Building Control Complex Environmental Control System

VI

Enclosure
List of Regulatory Commitments

The following table identifies those actions committed to by Carolina Power & Light Company in this document. Any other actions discussed in the submittal represent intended or planned actions by Carolina Power & Light Company. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Manager-Regulatory Affairs at the Brunswick Nuclear Plant of any questions regarding this document or any associated regulatory commitments.

Commitment	Committed date or outage
The lessons learned relating to the importance of conservative decision making and the various methods of dispositioning equipment problems will be reviewed with appropriate Technical Support personnel and the Repetitive Failure Review Board members.	06/15/95
Maintenance personnel involved in the missed PMTR event will be counseled on the need to utilize approved procedures in the development of work package repair instructions. This will also be reviewed with other appropriate Maintenance and Operations personnel.	6/01/95
The PMTR event will be reviewed with appropriate Systems Engineering personnel to stress the need for accurate communications.	06/15/95
Revise the functional surveillance (OMST-CLDET11M) to refer any repair/replacement activities associated with the sensors/detectors to the calibration surveillance (OMST-CLDET21A).	06/15/95