

U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION

Report No: 99901311/97-01

Organization: Caldon, Inc.

Contact: Calvin R. Hastings  
President and Chief Executive Officer  
412/341-9920

Nuclear Industry Activity: Flow monitoring systems

Date: January 21, 1997

Inspector: Anil S. Gautam, Senior Engineer

Approved by: Gregory C. Cwalina, Chief  
Vendor Inspection Section  
Special Inspection Branch  
Division of Inspection and Support Programs

Enclosure

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## 1 INSPECTION SUMMARY

During this inspection, the NRC inspector reviewed activities associated with the adequacy of Caldon's corrective actions in response to the Point Beach Nuclear Plant, Unit 2, Licensee Event Report (LER) 94-001-01, "Potential Feedwater Flow Measurement Inaccuracies," dated July 29, 1994, regarding degradation of signals from the leading edge flow meter (LEFM) Model 601 transducers when installed in the Point Beach Nuclear Plant, Unit 2, and whether Caldon informed other licensees of problems with the Model 601. The inspector also assessed Caldon's screening and reporting of issues for Part 21 applicability.

The inspection bases were as follows:

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50).
- 10 CFR Part 21, "Reporting of Defects and Noncompliance."
- LER 94-001-01, "Potential Feedwater Flow Measurement Inaccuracies, Point Beach Nuclear Plant, Unit 2," dated July 29, 1994.

For the areas inspected, the inspector did not identify any instances in which Caldon's practices did not conform to NRC requirements.

## 2 STATUS OF PREVIOUS INSPECTION FINDINGS

This was the first NRC inspection of Caldon.

## 3 INSPECTION FINDINGS AND OTHER COMMENTS

### 3.1 Response to Point Beach Nuclear Plant, Unit 2, LER 94-001-01

#### a. Inspection Scope

The inspector examined Caldon's corrective actions in response to LER 94-001-01, ascertained whether Caldon informed licensees of corrective actions, and evaluated Caldon's screening and reporting of issues for Part 21 applicability.

#### b. Observations and Findings

About 1980, Westinghouse Electric Corporation manufactured and sold the LEFM Model 601 to licensees for correction of the feedwater flow venturi readings. The correction for the venturi was needed because water corrosion and fouling in the throat of the venturi had resulted in reactor power being reduced. The feedwater flow readings are used to calibrate the power range instruments, calculate reactor coolant system flow, and as the basis for the over temperature delta temperature and over pressure delta temperature setpoint calculations.

Model 601 was a digital ultrasonic flow measurement system consisting of a pressure-retaining spool piece (pipe section) installed in the main feedwater header. Each spool piece contained four pairs of high-temperature transducers (see Figure 1) to measure feedwater flow velocities along four ultrasonic paths. The feedwater flow measurement was based on the difference in transit times of upstream and downstream ultrasonic pulses between the transducers. The LEFM main feedwater reading was considered by licensees to be more reliable than the venturi reading and was used to determine a correction factor applied to the feedwater venturi reading to account for fouling of the venturi. The correction factor was normally calculated at the beginning of each operating cycle and verified approximately once a month to ensure no significant changes had occurred during the cycle.

The LEFM Model 601 had the potential to develop inaccurate flow readings because of inadequate detection of any degraded transducer signals. In June 1989, Caldon purchased the LEFM technology from Westinghouse but did not sell the Model 601 to the industry. Caldon used the LEFM technology to develop an upgraded LEFM Model 8300 capable of improved detecting and compensating for degraded transducer signals. Between 1992 and 1996, Caldon upgraded the Model 601 to Model 8300 at several facilities, including Point Beach Units 1 and 2.

Wisconsin Electric Power Company (WEPC) identified conditions which indicated that feedwater flow in Unit 2 may have been underestimated since the beginning of Cycle 20 on October 30, 1993. WEPC established a team of engineers to evaluate the problem, including contracting Caldon to conduct an assessment of the Point Beach Nuclear Plant feedwater flow measurement system. The assessment centered around the accuracy of the LEFM Model 601. On December 15-17, 1993, Caldon temporarily installed the LEFM Model 8300 to provide an independent measure of the feedwater flow in both units. Caldon's assessment indicated that the Model 601 was accurately measuring Unit 1 feedwater flow but was underestimating Unit 2 feedwater flow by approximately 1%. Other factors evaluated by WEPC increased this estimation to approximately 2%. On July 29, 1994, WEPC issued LER 94-001-01 which identified underestimation of feedwater flow by approximately 2% at Point Beach Unit 2 and believed this problem to be caused by degradation of signals from the LEFM Model 601 transducers. About April 1995, Caldon permanently upgraded the LEFM Model 601 to Model 8300 at Point Beach. The inspector determined that the LEFMs were classified as non-safety-related at Point Beach and not included in its calibration program.

The inspector observed that Caldon did not notify other licensees about the Model 601 problems at Point Beach, and did not have information on which licensees operated Model 601 in their facilities. Caldon stated that it did not inform licensees of the event because the LEFM Model 601 was sold to licensees as a commercial-grade item, and because Caldon did not have a Part 21 program. Caldon stated that Westinghouse did not tell Caldon the names of licensees who had purchased the Model 601 from Westinghouse, but that based on its sale of the upgraded LEFM Model 8300 to licensees it currently believes that the Model 601 is no longer used in the industry.

The inspector contacted a representative of Westinghouse who informed the inspector that Westinghouse sold the LEFM Model 601 commercial-grade to the following licensees: Northern States Power Company (Prairie Island 2), Consolidated Edison Company (Indian Point 2), Wisconsin Electric Power Company (Point Beach 1 and 2), TU Electric Company (Comanche Peak 1 and 2), Southern Nuclear Operating Company (Farley 1 and 2), Duquesne Light Power Company (Beaver Valley 1), and Kansas Gas & Electric Company (Wolf Creek). The inspector contacted licensees and reviewed evidence of Caldon's sales of Model 8300 to licensees, and determined that the Model 601 LEFMs purchased by the aforementioned licensees were no longer operable in those nuclear plants.

The inspector observed that Caldon did not evaluate the LEFM 601 problem in accordance with Part 21. Caldon stated that it did not evaluate under Part 21 because both LEFM models were sold as commercial-grade items to licensees.

c. Conclusions

In general, Caldon's corrective actions were adequate. Based on records and discussions with Caldon and Westinghouse, Model 601 is no longer used in the industry. Caldon did not inform licensees of the Model 601 problems because it was sold commercial-grade.

3.2 Entrance and Exit Meetings

In the entrance meeting on January 21, 1997, the NRC inspector discussed the scope of the inspection, outlined the areas to be inspected, and established interactions with Caldon's management. In the exit meeting on January 21, 1997, the inspector discussed his observations.

4 PERSONNEL CONTACTED

Caldon

Calvin R. Hastings, President  
Ernest M. Hauser, Sales Manager  
Don Augustine, Engineer

Licensees (contacted by telephone)

William Hennessy, Senior Project Engineer, Point Beach Nuclear Plant  
Kirk Castell, Licensing, Point Beach Nuclear Plant

Westinghouse Electric Corporation (contacted by telephone)

Richard Miller, Principal Engineer, Equipment Design and Regulatory Engineering  
Nuclear Regulatory Commission

Jacob F. Ringwald, Senior Resident Inspector, Wolf Creek  
Carl F. Lyon, Senior Resident Inspector, Beaver Valley Unit 1  
Thierry M. Ross, Senior Resident Inspector, Farley Units 1 and 2

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None.

Closed

None.

Attachment: Figure 1



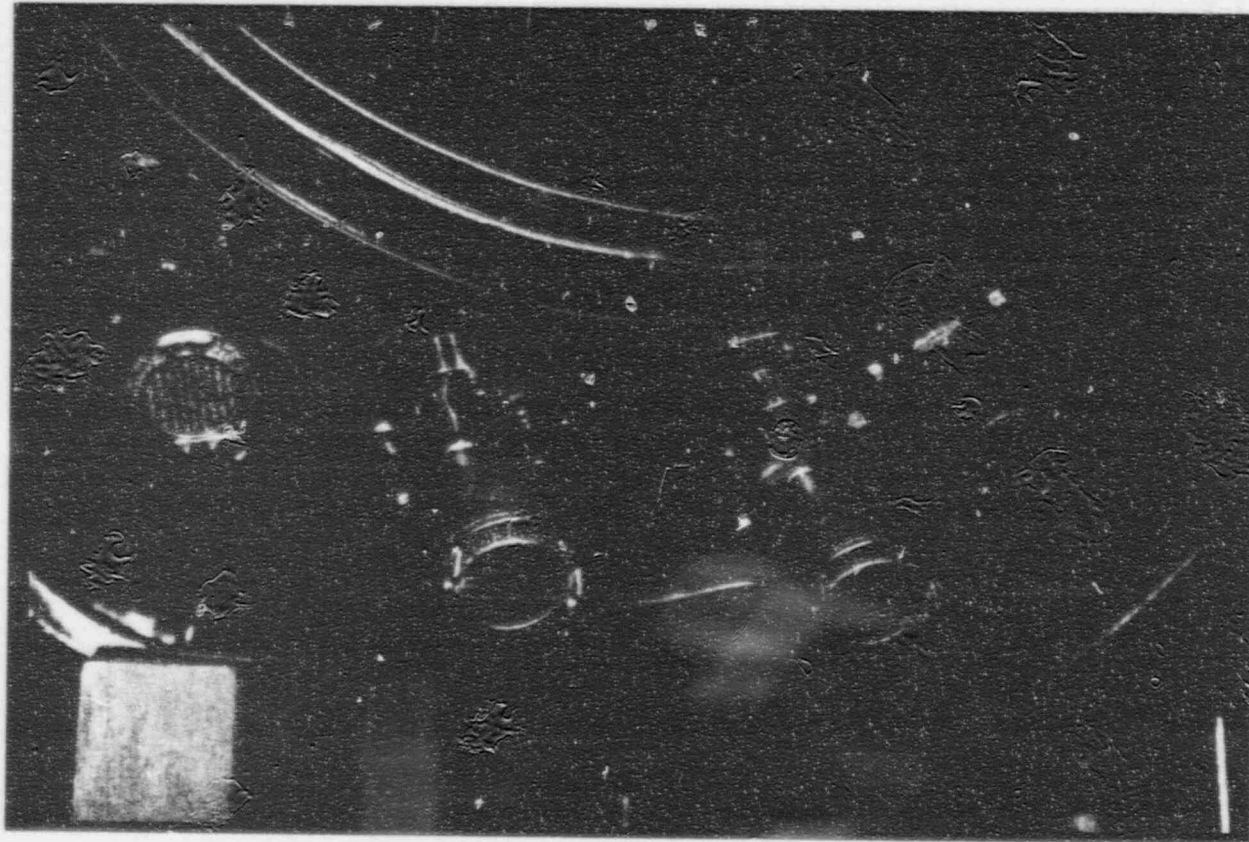


Figure 1

Transducers for the leading edge flow meter (LEFM) Model 601 or Model 8300 mounted on spool piece welded to feedwater pipe.