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IN 86-48

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

June 13, 1986

RECEIVED	
Bart D. Withers Vice President, Nuclear	
JUN 23 1986	
Route To:	<u>W. H. H. H.</u>

IE INFORMATION NOTICE NO. 86-48: INADEQUATE TESTING OF BORON SOLUTION CONCENTRATION IN THE STANDBY LIQUID CONTROL SYSTEM

Addressees:

All boiling water reactor (BWR) nuclear power facilities holding an operating license (OL) or a construction permit (CP).

Purpose:

This notice is to alert recipients to a potentially significant problem that has been observed with the sampling and testing of the sodium pentaborate solution concentration in the standby liquid control system (SLC) at several BWR nuclear power plants. It is expected that recipients will review the information for applicability to their facilities and consider action, if appropriate, to preclude a similar problem at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

Review of licensee event reports (LERs) over the past several years indicates continuing problems in maintaining volume and concentration of the solution within Technical Specification (TS) limits. Inspections have also revealed inadequate preoperational testing which failed to prevent operational problems with concentration. Several of the problems caused plants to initiate shut-downs as required by TS limits. Usually, the proper level and concentration was recovered in less than 8 hours but in one case recovery took twice that time. Values both lower and higher than the TS requirements were reported. Low boron concentration or low tank level reduces protection against an anticipated-transient-without-scrum (ATWS) event due to reduced negative reactivity worth of the boron solution. High boron concentration increases the risk of forming crystals of boron that could render the system inoperable. However, none of the LERs or inspections reported situations in which the SLC would be rendered inoperable by boron crystallization or not capable of shutting down the reactor as required.

Discussion:

Eight LERs reported boron solution concentration too low (ranging from 94 percent to 99 percent of the TS limit) while 6 reported concentration too high
Copies to: Withers, Yundt, Lentsch, Orser, Steele, E. Burton, E. Jordan, A. Holm, LIS, C. A. Olmstead, S. Hoag, S. Sautter, TNP:GOV REL F:NRC CHRONO, TNP:GOV REL F:NRC IE Information Notice 86-48

PGE OAR Action - M. H. Malmros

6-25-86

"No OAR to be issued - Applicable to BWR's only"

(ranging from 100.1 percent to 106 percent of the TS limit). The causes reported included incorrect tank levels, inadequate accounting for system leakage, inadequate accounting for the specific gravity of sodium pentaborate, inferred loss of boron, and increased water evaporation rate with increased solution temperature. The problems of tank level measurement and mixing and testing procedures are discussed below in more detail.

Storage Tank Level

At LaSalle 2, NRC inspection revealed that the operations group and the chemistry group used 3 different methods to measure the tank level and results were in frequent disagreement. In some instances, the disagreement was as large as 200 gallons (about 4 percent). The 3 methods involved level meter readings, sight glass readings, and readings of a measuring tape attached to a plumb bob. As a corrective measure, the licensee is specifying the use of the last method, because it is apparently the most reliable method.

At Susquehanna 2, level was reported to be 8 percent less than the TS requirement (about 17 percent error in volume). Level was measured using a steel tube from which air bubbles continuously exited near the bottom of the tank and tank level was inferred from the air pressure. This approach was rendered inaccurate by tube blockage built up by the alternate wetting and drying of the tip of the tube. The licensee modified this system for periodically cleaning the tube with a brush and is establishing an additional alternative method of level measurement using an ultrasonic device.

Mixing

Over the course of 3 inspections of preoperational testing of the SLC at LaSalle, Perry, and Clinton, the NRC has identified apparent noncompliance related to whether the SLC can generate a uniform solution. The involved licensees did not adequately meet their commitment to implement Regulatory Guide 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants." In particular, the air sparger subsystem was not tested properly. Also, the sampling methodology (dip samples were or might be taken from near the liquid surface at these plants) necessary to satisfy surveillance requirements of TS was not demonstrated to yield valid results.

Concerning preoperational testing of the SLC, Appendix A of Regulatory Guide 1.68 gives in part:

- (3) Standby Liquid Control System Tests. Demonstrate proper operation of the system with demineralized water. Verify proper mixing of solution and adequacy of sampling system. . . .
Verify operability of. . .air spargers. . . .

The testing observed consisted of filling the solution tank with demineralized water, commencing air flow through the sparger, and verifying that


the distribution of air bubbles was even. This procedure does not demonstrate uniform mixing of the solution and it does not determine what sparging time is required to ensure that dip samples represent the tank's contents.

The sodium pentaborate solution stratifies over time. Because TS surveillance tests are performed on a monthly basis, the solution may not be well mixed at the time of the test. If the solution is not adequately mixed, a sample will be unrepresentative of the tank's contents. This may lead to accepting the inferred concentration erroneously or diluting or strengthening the solution erroneously and thus allowing the concentration to be outside the TS requirement.

The licensees at LaSalle, Perry, and Clinton have found that an adequate way to verify proper mixing is to initially fill the tank to the concentration required by the facility's TS, allow a settling period equal to the maximum allowed time between surveillances, and apply air sparging of the solution at a given rate with periodic axial sampling until the difference in concentration between the axial samples is within a predetermined variance (e.g., twice the sampling accuracy). The cumulative sparging time that yields this variance then is the minimum sparging time to be used for all future surveillances for the specified sparging rate. Any decrease from the sparging rate used in the above test would necessitate retesting to determine an acceptable sparging time.

For those plants past the preoperational test phase, if the original testing performed on the SLC air sparger subsystem was inadequate, the TS surveillance tests may not be yielding valid results.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the Regional Administrator of the appropriate regional office or this office.


Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

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Attachment: List of Recently Issued IE Information Notices

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
86-47	Feedwater Transient With Partial Failure Of The Reactor Scram System	6/9/86	All BWRs and PWRs facilities holding an OL or CP
86-46	Improper Cleaning And Decontamination Of Respiratory Protection Equipment	6/12/86	All power reactor facilities holding an OL or CP and fuel fabrication facilities
86-45	Potential Falsification Of Test Reports On Flanges Manufactured By Golden Gate Forge And Flange, Inc.	6/10/86	All power reactor facilities holding an OL or CP and research and test facilities
86-44	Failure To Follow Procedures When Working In High Radiation Areas	6/10/86	All power reactor facilities holding an OL or CP and research and test reactors
86-43	Problems With Silver Zeolite Sampling Of Airborne Radioiodine	6/10/86	All power reactor facilities holding an OL or CP
86-42	Improper Maintenance Of Radiation Monitoring Systems	6/9/86	All power reactor facilities holding an OL or CP
86-41	Evaluation Of Questionable Exposure Readings Of Licensee Personnel Dosimeters	6/9/86	All byproduct material licensees
86-32 Sup. 1	Request For Collection Of Licensee Radioactivity Measurements Attributed To The Chernobyl Nuclear Plant Accident	6/6/86	All power reactor facilities holding an OL or CP

OL = Operating License
CP = Construction Permit