TOLEDO EDISON
A Centerior Energy Company

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TOLEDO, OHIO 43652-0001

AB-93-0003
NP-33-91-06, Revision 1

Docket No. 50-346

License No. NPF-3

February 5, 1993

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Gentlemen:

LER 91-006, Revision 1
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence - November 5, 1991

Enclosed please find Revision 1 to Licensee Event Report 91-006, which includes updated information on the occurrence. The changes are marked with a revision bar in the left margin. Please destroy or mark superseded any previous copies of this LER.

Yours truly,

Louis F. Storz
Plant Manager
Davis-Besse Nuclear Power Station

LFS/dlc

Enclosure

cc: Mr. A. Bert Davis
Regional Administrator
USNRC Region III

Mr. Stan Stasek
DB-1 NRC Sr. Resident Inspector

IE27 1/1

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

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.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Davis-Besse Unit No. 1	05000-346	1 OF 4

TITLE (4)
Analysis of Post Large Break LOCA Boron Concentration Was Potentially Non-Conservative

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	05	91	91	-- 006 --	01					05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	2
POWER LEVEL (10)	00

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	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)		50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iv)	X	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	TELEPHONE NUMBER (Include Area Code)
N. K. Peterson, Engineer - Licensing	(419) 321-8450

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

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	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 November 5, 1991, with the plant in Mode 2, Toledo Edison determined that analysis of boron concentration in the core after a large break LOCA of a cold leg was potentially non-conservative. A preliminary safety concern (PSC 2-91) was initially evaluated by Babcock and Wilcox Nuclear Services Company (NSSS vendor). The evaluation concluded that the boron dilution flow path through the reactor vessel vent valves would not carry two phase flow for the forty day period previously predicted. The NSSS vendor had not accounted for the effect of the plenum cylinder in the reactor vessel when modeling the boiling in the plenum region.

Subsequent analysis takes credit for flow through passive gaps which exist between the core support shield and the hot leg nozzles. This flow path, by itself, is adequate to prevent boron precipitation. Active boron dilution flow paths, while unnecessary from an analytical standpoint, provide added assurance. The preferred active boron dilution flow path will establish forward flow through the core via the decay heat drop line and will prevent boron precipitation even without credit for gap flow. A procedure change to the Davis-Besse operating procedures has been made which assures use of this flow path. A second active flow path, which induces reverse flow through the core using the pressurizer auxiliary spray line, also is available for long term use.

Description of Occurrence:

On November 5, 1991, following a Toledo Edison Engineering review of a preliminary safety concern (PSC 2-91) from Babcock and Wilcox (B&W) Nuclear Services Company, it was concluded that the existing large break LOCA analysis was potentially non-conservative.

The previous analysis described methods available for preventing boron concentration in the core following a large break LOCA of the cold leg. One of the methods thought to be available for an extended period of time was steam-liquid mixture flow through the reactor vessel vent valves (RVVVs). A recent B&W evaluation found that the effect of the plenum cylinder was not included in the computer modeling. Therefore, the flow through the RVVVs may not be effective for the conditions and time periods previously evaluated. The plant was in Mode 2 (Startup) at 0 percent reactor thermal power at the time of this finding.

Babcock & Wilcox notified the NRC of their preliminary safety concern via letter dated November 7, 1991.

The NRC was notified via the ENS at 1400 hours on November 5, 1991 under 10 CFR 50.72(b)(2)(i) since the condition questioned meeting the requirements of 10CFR 50.46, acceptance criteria for emergency core cooling systems.

This LER was originally submitted per 10CFR 50.73 (a)(2)(ii) as an unanalyzed condition that potentially compromised plant safety. Following further analysis by B&W (B&W Report Number 51-1206351-00, "Long Term Boron Dilution Following Large LOCA Accidents", January 1992) which credits flow of coolant through passive gaps in the reactor vessel internals, Toledo Edison has concluded that there is no impact on plant safety. Although the passive method noted above was described in original design documents, no credit was taken for it to mitigate the consequences of an accident in the Davis-Besse Updated Safety Analysis Report (USAR).

Apparent Cause of Occurrence:

The initial B&W flow model in the core and upper head region failed to recognize the effect that the plenum cylinder would have on core recirculation for the large break LOCA transient. The presence of the plenum cylinder between the core exit and the RVVV's may serve to separate the vapor and liquid phases, preventing carry-over of concentrated liquid through the RVVVs and out through the cold leg break. Recently, while B&W was developing a more

Apparent Cause of Occurrence: (cont)

contemporary thermal-hydraulic code model and reviewing methodology previously used, they confirmed a discrepancy in the analysis. The earlier model did not have the ability to account for two phase mixture separation due to the presence of the plenum cylinder.

Analysis of Occurrence:

Previously, a circulation path carrying two-phase flow through the RVVVs was predicted to exist for several days following a LOCA, at which time further mitigative actions were required to prevent boric acid concentration build-up. PSC 2-91 stated that this flow path may no longer be effective for long term cooling. However, independent of RVVVs, there are still three methods available to prevent post LOCA boron precipitation. They are:

- Passive leakage gaps in the RV internals.
- Forward hot leg flow through the decay heat drop line.
- Reverse hot leg flow through the pressurizer auxiliary spray line.

Leakage gap sizes are temperature dependent, with the largest gap size occurring early in the transient. B&W calculations have confirmed that the average of Davis-Besse post-LOCA leakage gaps in the RV internals is approximately 40 mils, with a total gap flow of over 70 gpm for times up to 27,000 seconds. The continuous flow through the leakage gaps between the RCS hot leg outlet nozzles and the core support shield is sufficient to provide adequate dilution flow, even without use of any active flow paths.

The active flow path via the decay heat drop line continues to provide a viable means to prevent post LOCA boron precipitation and provides an additional margin of safety. In addition, flow through the pressurizer auxiliary spray line is sufficient in itself when pre-reactor trip power levels are below 23 percent reactor power. It should be recognized that a certain single failure scenario (i.e., Loss of Offsite Power following the LOCA with failure of an Emergency Diesel Generator) could delay timely establishment of either active flow path. In this case, flow through the leakage gaps is sufficient for boron concentration control as described above.

Therefore, it is concluded that sufficient and redundant means are available to preclude post LOCA boron precipitation, and there is no safety significance to this event.

Corrective Actions:

Procedure change (TA91-3625) was issued to DB-OP-02000, Rev. 2 (SFAS, SFRCS, RPS Trip, or SG Tube Rupture) that provides administrative requirements to establish active boron dilution flowpaths following transfer of the Low Pressure Injection Pump suction to the emergency sump. This change was made to comply with guidance suggested by B&W.

In the 1980s B&W instituted a practice of providing Analytical Input Summaries (AIS) to clients prior to commencing analytical work. This allows clients to verify the completenesss/correctness of assumptions and inputs to analyses. In addition, new ECCS analyses is generally reviewed by the BWOG Analysis Committee for completeness as they are developed. No counterpart review existed in the 1970s. The additional oversight provides a wider perspective on emerging analyses.

Practices in place since the 1980s include an improved validation process (analysis, modeling), more internal/external review, and BWOG oversight. Therefore, no improvements to the present process is warranted.

In January 1992, the BWOG formally submitted the analysis of the leakage gap methodology to the NRC in B&W Report 51-1206351-00. Toledo Edison will make appropriate revisions to its USAR upon completion of the NRC review of the BWOG report.

Failure Data:

There have been no LERs in the previous five years that were the result of NSSS vendor analytical errors.

NP33-91-06, Rev. 1 PCAQR 91-0558