



A General Energy Company

EDISON PLAZA  
300 MADISON AVENUE  
TOLEDO, OHIO 43652-0001

AB-91-0033  
NP-33-91-006

DCD

Docket No. 50-346

License No. NPF-3

December 5, 1991

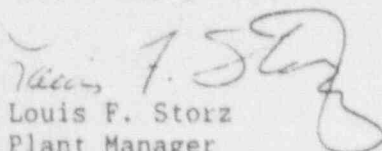
United States Nuclear Regulatory Commission  
Document Control Desk  
Washington, D. C. 20555

Gentlemen:

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

Enclosed please find Licensee Event Report 91-006, which is being submitted to provide 30 days written notification of the subject occurrence. This LER is being submitted in accordance with 10 CFR 50.73(a)(2)(ii).

Very truly yours,

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

LFS/ed

Enclosure

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

Mr. William Levis  
DB-1 NRC Sr. Resident Inspector

IEU

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555 AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503

FACILITY NAME (1): Davis-Besse Unit No. 1		DOCKET NUMBER (2): 0 5 0 0 0 3 4 1 6	PAGE (3): 1 OF 0 1 4
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TITLE (4):  
Analysis of Post Large Break LOCA Boron Concentration Was Potentially Non-Conservative

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 NAMES	DOCKET NUMBER(S)													
1	1	0	5	9	1	9	1	0	0	6	0	0	1	2	0	5	9	1	0	5	0	0	0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5 (Check one or more of the following) (11)

OPERATING MODE (9): 2	20.402(b)	20.406(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10): 01010	20.406(a)(1)(i)	50.38(a)(1)	50.73(a)(2)(v)	73.71(a)
	20.406(a)(1)(ii)	50.38(a)(2)	50.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.406(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(vii)(A)	
	20.406(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(vii)(B)	
	20.406(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12):

NAME: J. C. Stotz, Engineer - Nuclear Licensing	TELEPHONE NUMBER: 4 1 1 9 3 1 2 1 1 - 1 7 1 5 4 1 4
AREA CODE:	

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS

SUPPLEMENTAL REPORT EXPECTED (14):

YES (If yes, complete EXPECTED SUBMISSION DATE):  NO

EXPECTED SUBMISSION DATE (15):

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces - i.e., approximately fifteen single-space 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 to the evaluation, a procedure change to the Large LOCA section of DB-OP-02000 (SFAS, SFRCS, RPS Trip, or SG Tube Rupture), was issued. This change provides administrative requirements to establish a long term boron dilution flow path, via the decay heat drop line or the pressurizer auxiliary spray, at the earliest time possible following the transfer to the emergency sump, which will normally be within 2 hours. Recent analysis has confirmed the gap between the plenum and the hot leg nozzles provides an adequate flow path to prevent boron precipitation in the core until either the decay heat drop line or auxiliary spray flow can successfully provide adequate dilution flow.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET WASHINGTON, DC 20503

FACILITY NAME (1)  Davis-Besse Unit No. 1	DOCKET NUMBER (2)  0 5   0 0   0 3   4 6	LER NUMBER (5)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		91	006	00	02	OF 04

TEXT (if more space is required) - additional NRC Form 366A's (17)

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 is being submitted per 10CFR 50.73 (a)(2)(ii) as an unanalyzed condition that potentially compromised plant safety.

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 carryover of concentrated liquid through the RVVVs and out through the cold leg break. Recently, while B&W was developing a more contemporary thermo-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.

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FACILITY NAME (1)  Davis-Besse Unit No. 1	DOCKET NUMBER (2)  0 5 0 0 0 3 4 6 9 1	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
			0 0 6	0 0	0 3	OF 0 4

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

### Analysis of Occurrence:

The circulation path carrying two-phase flow through the RVVVs was predicted to exist for 40 days, at which time further mitigative actions were required to prevent boric acid concentration build-up. The recent B&W analysis found that this flow path is no longer effective for long term cooling. However, independent of RVVVs, there are still three methods available to prevent post LOCA boron precipitation. They are:

- 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. Recent B&W calculations have confirmed that the average of Davis-Besse post-LOCA leakage gaps in the RV internals is approximately 40 mils, with total gap flows of over 30 gpm for times up to 27,000 seconds. This 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 assumed flow via the RVVVs. At longer time, alternative means, in conjunction with the leakage gaps, provides adequate dilution flow. Therefore, the recent evaluation performed by B&W justified that existing passive leakage gaps provide a sufficient path to prevent post-LOCA boron precipitation.

In addition, the flow path via the decay heat drop line continues to provide a viable means to prevent post LOCA boron precipitation (with or without leakage gaps) and provides an additional margin of safety. Flow through the pressurizer auxiliary spray line is sufficient in itself when pre-reactor trip power levels are below 50 percent reactor power and, in conjunction with the leakage gaps, provides a redundant active boron concentration control system.

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:

Subsequent to the evaluation, and prior to completion of the gap calculation, a procedure change (TA91-3625) was issued to DB-OP-02000, rev. 2 (SFAS, SFRCS, RPS Trip, or SG Tube Rupture). This procedure change provides administrative requirements to establish boron dilution flowpaths at the earliest time possible following transfer to the emergency sump, which will normally be in less than 2 hours after a large break LOCA. This change was made to comply with guidance suggested by B&W.

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FACILITY NAME (1)  Davis-Besse Unit No. 1	DOCKET NUMBER (2)  0   5   0   0   0   3   4   6   9   1	LER NUMBER (8)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
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TEXT (if more space is required, use additional NRC Form 366A z) (17)

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

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

Failure Data:

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

NP33-91-06

PCAQR 91-0558