TOLEDO
EDISON
A Centerior Energy Company

EDISON PLAZA
300 MADISON AVENUE
TOLEDO, OHIO 43652-0001

AB-92-026
NP-33-92-004

Docket No. 50-346

License No. NPF-3

May 8, 1992

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

Gentlemen:

Voluntary LER 92-004
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence - April 27, 1992

Enclosed please find voluntary Licensee Event Report 92-004, which is being submitted to provide written notification of the subject occurrence. This voluntary LER is being submitted due to the potential for generic interest.

Very truly yours,

Louis F. Storz

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

IE22
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NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

TITLE (4): Voluntary Report of HELB Analysis Error

EVENT DATE (5) MONTH	DAY	YEAR	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	REPORT DATE (7) MONTH	DAY	YEAR	OTHER FACILITIES INVOLVED (8) FACILITY NAMES	DOCKET NUMBER(S)
0 4	2 7	9 2	9 2	– 0 0 4 –	0 0	0 5	0 8	9 2		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (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)	XX OTHER (Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
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)	Voluntary Report

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	
Mark A. Turkal, Engineer - Nuclear Licensing	4 1 9	3 2 1 - 7 3 7 7

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)

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)

On April 27, 1992 at 1900, with the plant in Mode 1 at 100% power, Potential Condition Adverse To Quality Report (PCAQR) 92-0195 was initiated to document potential environmental qualification problems resulting from errors identified in calculations of temperature profiles following postulated high energy line breaks (HELBs). In specific, the analyses performed to predict environmental conditions following a HELB outside containment associated with lines containing superheated steam, used non-conservative techniques regarding heat transfer coefficients. The HELB analyses affected by the modeling error include calculations for breaks in the following high energy lines located in the Auxiliary Building: (1) Main Steam to Auxiliary Feedwater Pump Turbines; (2) Main Feedwater; (3) Steam Generator Blowdown; and (4) Auxiliary Steam Supply.

A Justification for Continued Operation (JCO) was completed on May 1, 1992. This JCO concluded that, following postulated HELBs, it is reasonable to assume that equipment required to mitigate the consequences of the break will perform its intended safety function and continued operation of the plant is justified. Toledo Edison is discussing the potential of reporting this issue, in accordance with 10CFR21, with Impell Corporation who performed the original HELB analyses.

This situation is being reported as a voluntary Licensee Event Report.

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

Description of Occurrence:

On April 27, 1992 at 1900, with the plant in Mode 1 at 100% power, Potential Condition Adverse To Quality Report (PCAQR) 92-0195 was initiated to document potential environmental qualification problems resulting from errors identified in calculations of temperature profiles following postulated high energy line breaks (HELBs). In specific, the analyses performed to predict environmental conditions following a HELB outside containment associated with lines containing superheated steam, used non-conservative techniques regarding heat transfer coefficients. The HELB analyses affected by the modeling error include calculations for breaks in the following high energy lines located in the Auxiliary Building: (1) Main Steam to Auxiliary Feedwater Pump Turbines (AFPTs); (2) Main Feedwater; (3) Steam Generator Blowdown; and (4) Auxiliary Steam Supply.

Toledo Edison recently purchased PCFLUD, a personal computer based compartment modeling code developed by Bechtel Power Corporation. In the course of running test cases, very poor agreement between the results of the existing Impell analysis and the results obtained using PCFLUD were achieved. The apparent errors in the existing Impell analysis were discovered through investigations by Toledo Edison regarding the cause of the discrepancies.

A scoping analysis has shown that some rooms may have an increase in peak temperatures of approximately 0 to 140 degrees F above the existing analysis for HELBs involving superheated steam release.

This situation is being reported as a voluntary Licensee Event Report.

Apparent Cause of Occurrence:

The apparent cause is the use of non-conservative assumptions, by Impell Corporation, in the calculation of post-HELB environmental qualification profiles. These calculations were originally performed in 1981 and redone by Impell in 1985 as a result of reconfiguration of the Auxiliary Feedwater System. Prior to 1985, the Main Steam to AFPT lines were isolated under normal operation and, as such, not considered as a high energy line. In 1985, the configuration for normal operation was revised so that these lines were no longer isolated. The revised analyses were submitted to the NRC on November 16, 1985 (Serial 1208).

Environmental qualification of equipment for HELBs is based on compartment temperatures which were calculated by Impell Corporation. The RELAP4/MOD5 computer code which was used in the analysis did not have the capability to

NRC FORM 366A (6-89) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104
EXPIRES 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 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)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Apparent Cause of Occurrence (Continued):

directly account for condensing heat transfer, which is the dominant mechanism of heat transfer to compartment heat sinks (walls, ceilings, etc.). In order to credit condensing heat transfer, which would have had a heat transfer coefficient of approximately 40 times that of natural convection, Impell multiplied the actual surface area of the compartments by a factor of up to 40. However, the RELAP4 code treated this coefficient as if it was a convective rather than condensing heat transfer coefficient, multiplying the coefficient by an improper temperature difference in order to obtain the heat transfer rate. Therefore, the analysis greatly over-predicted heat transfer to heat sinks, resulting in non-conservative compartment ambient temperatures.

Analysis of Occurrence:

A Justification for Continued Operation (JCO) was completed on May 1, 1992. This JCO concluded that, following postulated HELBs, it is reasonable to assume that equipment required to mitigate the consequences of the break will perform its intended safety function and continued operation of the plant is justified. The JCO evaluates, on a room by room basis, the effects of postulated breaks in the following high energy lines located in the Auxiliary Building: (1) Main Steam to Auxiliary Feedwater Pump Turbines; (2) Main Feedwater; (3) Steam Generator Blowdown; and (4) Auxiliary Steam Supply. Some of the key aspects of the JCO are summarized below.

The HELB criteria given in Section 3.6.2.1 of the Updated Safety Analysis Report (USAR) requires that a double-ended rupture be postulated in piping operating above 275 psig and 200 degrees F. The pipe breaks are postulated in accordance with NRC Branch Technical position MEB-3-1 at the terminal ends and at the intermediate locations where the pipe stress exceeds 80 percent of the ASME code allowables. If the pipe stress did not exceed 80 percent of the ASME Code allowables, breaks are postulated at two arbitrary intermediate locations where the stresses are high.

In Generic Letter 87-11, the NRC provided a relaxation for arbitrary intermediate pipe rupture requirements. The Generic Letter specifically eliminates the requirement for postulation of arbitrary intermediate pipe breaks for pressure, temperature, humidity and flooding considerations. The guidance provided in Generic Letter 87-11 forms the basis for the breaks analyzed in the JCO.

For one room in the Auxiliary Building (room 124), the JCO takes credit for post-HELB temperature and pressure mitigation by the installed fire protection system. The maximum expected room temperature in room 124 exceeds the actuation

Analysis of Occurrence (Continued):

temperature rating of the fire protection sprinkler heads. The fire protection system design flowrates and drainage characteristics of the affected rooms were reviewed to ensure that sprinkler system actuation would not adversely affect any safety related equipment required to mitigate the HELB.

A risk evaluation, based on the preliminary Davis-Besse Probabilistic Risk Assessment (PRA), was also performed. Based on this evaluation, it was determined that a high energy line break of this piping would have a negligible impact (less that 0.1 percent) on the overall plant core damage frequency. Operations personnel are currently monitoring portions of the AFP Turbine Steam Supply lines twice per shift so that a leak in the pipe could be detected prior to a full break in the pipe.

The AFP Turbine Steam Supply lines are provided with instrumentation to detect and mitigate breaks. Pressure switches PSL-106A through D and PSL-107A through D alarm in the control room to alert the operators to initiate the appropriate abnormal procedure. Pressure switches PSL-5894A and B and PLS-5895A and B provide an isolation signal for the AFP Turbine Steam Supply line isolation valves. The JCO assumes that the pressure switches will detect breaks and perform their intended safety function. The analysis also assumes a limiting single failure of the isolation valve (MS106A or MS107A) to close.

As stated above, the JCO provides the basis for Toledo Edison's determination that equipment required to mitigate the consequences of a postulated HELB will perform its intended safety function and continued operation of the plant is justified.

Corrective Actions:

Toledo Edison has taken the following precautionary measures as a result of this issue.

A JCO was completed on May 1, 1992. This JCO concluded that, following postulated HELBs, it is reasonable to assume that equipment required to mitigate the consequences of the break will perform its intended safety function and continued operation of the plant is justified.

As an interim measure, credit is taken for fire protection sprinklers to mitigate the effects of a Main Steam to AFPT break in room 124. Per Standing Order 92-022 issued on May 4, 1992, the plant will be placed in Mode 4 (Hot Shutdown) if any of the sprinklers in room 124 are not capable of meeting their intended function for more than 72 hours. Also, Standing Order 92-022 requires Operations personnel to monitor portions of the AFP Turbine Steam Supply Lines (located in rooms 124, 235, 236, 237, 238, 304, 314, 404, 427, and 501) twice per shift.

Corrective Actions (Continued):

The local control stations in rooms 500 and 501 for steam inlet valves MS106, 107, 106A, and 107A were electrically disabled on May 1, 1992 to prevent inadvertent post-HELB operation. The automatic operation of these valves from the control room is not affected by this change.

Insulation of the two SFAS containment pressure transmitters in rooms 500 and 501 was completed on May 2, 1992 to ensure that environmental qualification is maintained.

Industry notification of this issue was made on May 1, 1992 via INPO Nuclear Network.

Toledo Edison is continuing to review existing Impell calculations to determine if additional errors exist.

Toledo Edison is discussing the potential of reporting this issue, in accordance with 10CFR21, with Impell Corporation who performed the original HELB analyses.

In addition to the above precautionary measures, a Task Force has been formed to determine long term actions necessary to resolve the issue and Independent Safety Engineering is performing an independent review of the issue.

Failure Data:

There have been no other reports in the previous two years which involved inaccurate environmental qualification profiles which resulted from non-conservative calculational assumptions.

Report No.: NP-33-92-04 PCAQ No.: 92-0195