FirstEnergy

Davis-Besse Nuclear Power Station
5501 North State Route 2
Oak Harbor, Ohio 43449-9760

NP-33-03-010-00

Docket No. 50-346

License No. NPF-3

October 27, 2003

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

Ladies and Gentlemen:

LER 2003-010-00
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence – August 28, 2003

Enclosed please find Licensee Event Report 2003-010-00, which is being submitted to provide written notification of potential inability of Decay Heat valve DH14B to function during design basis conditions. During valve disassembly following its unexpected behavior in a recent flow test, the two disc-to-shaft attachment pins were discovered to be missing. This condition is being reported pursuant to 10 CFR 50.73(a)(2)(i)(B), a condition prohibited by the plant's Technical Specifications. Commitments associated with this LER are listed in the Attachment.

Very truly yours,

M. B. Bezilla
Vice President

PSJ/s

Enclosures

cc: Regional Administrator, USNRC Region III
DB-1 Project Manager, USNRC
DB-1 NRC Senior Resident Inspector
Utility Radiological Safety Board

IE22

## COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station in this document. Any other actions discussed in the submittal represent intended or planned actions by Davis-Besse. They are described only as information and are not regulatory commitments. Please notify the Manager - Regulatory Affairs (419-321-8450) at Davis-Besse of any questions regarding this document or associated regulatory commitments.

| COMMITMENTS | DUE DATE |
|---|---|
| 1. Evaluate the potential effects of the missing pins on the Reactor fuel, Reactor Coolant System, and Steam Generators. | 1. Complete. |
| 2. Inspect the Reactor Vessel for missing pins. | 2. Next core offload. |
| 3. Inspect the Steam Generators for missing pins. | 3. Next opening of Steam Generators primary side manways. |
| 4. Stake the taper pins in DH13A and DH14A. | 4. Complete. |
| 5. Replace and stake ECCS Train 1 valve DH14B disc-to-stem pins. | 5. Complete. |
| 6. Stake the disc-to-stem pins in DH13B. | 6. Complete. |
| 7. Inspect spare Containment Vacuum Breaker Isolation Valve to determine if disc-to-stem pins are staked. | 7. Complete. |
| 8. Revise butterfly valve maintenance procedures to require staking or welding of disc-to-stem pins or keys. (DB-MM-09267, DB-MM-09316, DB-MM-09143) | 8. Complete. |

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

# LICENSEE EVENT REPORT (LER)

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

| 1. FACILITY NAME | 2. DOCKET NUMBER | 3. PAGE |
|---|---|---|
| Davis-Besse Unit Number 1 | 05000346 | 1 OF 5 |

**4. TITLE**

Potential Inoperability of Decay Heat/Low Pressure Injection System Due to Loss of Valve Disc Pins

| 5. EVENT DATE | | | 6. LER NUMBER | | | 7. REPORT DATE | | | 8. OTHER FACILITIES INVOLVED | |
|---|---|---|---|---|---|---|---|---|---|---|
| MO | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REV NO | MO | DAY | YEAR | FACILITY NAME | DOCKET NUMBER |
| 08 | 28 | 2003 | 2003 | – 010 – | 00 | 10 | 27 | 2003 | | 05000 |
| | | | | | | | | | FACILITY NAME | DOCKET NUMBER |
| | | | | | | | | | | 05000 |

| 9. OPERATING MODE | 5 |
|---|---|
| 10. POWER LEVEL | 000 |

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

| | | | |
|---|---|---|---|
| 20.2201(b) | 20.2203(a)(3)(ii) | 50.73(a)(2)(ii)(B) | 50.73(a)(2)(ix)(A) |
| 20.2201(d) | 20.2203(a)(4) | 50.73(a)(2)(iii) | 50.73(a)(2)(x) |
| 20.2203(a)(1) | 50.36(c)(1)(i)(A) | 50.73(a)(2)(iv)(A) | 73.71(a)(4) |
| 20.2203(a)(2)(i) | 50.36(c)(1)(ii)(A) | 50.73(a)(2)(v)(A) | 73.71(a)(5) |
| 20.2203(a)(2)(ii) | 50.36(c)(2) | 50.73(a)(2)(v)(B) | OTHER Specify in Abstract below or in NRC Form 366A |
| 20.2203(a)(2)(iii) | 50.46(a)(3)(ii) | 50.73(a)(2)(v)(C) | |
| 20.2203(a)(2)(iv) | 50.73(a)(2)(i)(A) | 50.73(a)(2)(v)(D) | |
| 20.2203(a)(2)(v) | X 50.73(a)(2)(i)(B) | 50.73(a)(2)(vii) | |
| 20.2203(a)(2)(vi) | 50.73(a)(2)(i)(C) | 50.73(a)(2)(viii)(A) | |
| 20.2203(a)(3)(i) | 50.73(a)(2)(ii)(A) | 50.73(a)(2)(viii)(B) | |

**12. LICENSEE CONTACT FOR THIS LER**

| NAME | TELEPHONE NUMBER (Include Area Code) |
|---|---|
| Peter S. Jordan – Regulatory Affairs | (419) 321-8260 |

**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

| CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX | | CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX |
|---|---|---|---|---|---|---|---|---|---|---|
| B | BP | FCV | V037 | N | | | | | | |

| 14. SUPPLEMENTAL REPORT EXPECTED | | | 15. EXPECTED SUBMISSION DATE | MONTH | DAY | YEAR |
|---|---|---|---|---|---|---|
| | YES (If yes, complete EXPECTED SUBMISSION DATE). | X NO | | | | |

**16. ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

During a High Pressure Injection comprehensive flow test conducted on April 29, 2003, DH14B, Train 1 Decay Heat Cooler outlet valve, was observed to operate erratically. On August 28, 2003, the valve was removed from the system, disassembled, and inspected. The two taper pins which provide an interference fit between the disc and the valve shaft were discovered to be missing. Based upon a detailed inspection, it was determined that the failure mechanism of the missing pins was a combination of incorrect (reverse) installation, flow conditions causing vibration, and the absence of pin staking. Valves DH13A and B and DH14A, which are of the same design, were inspected. These valves had the taper pins in place and correctly installed. Therefore, the condition of DH14B was determined to be an isolated case of incorrect pin installation. DH14B is open during normal plant operation and receives a confirmatory Safety Features Actuation System Level 3 signal to open. It was determined that DH14B may not have performed its safety function following a design basis accident. The taper pins have been replaced in DH14B, and the pins for this and butterfly valves DH13A/B and DH14A have been staked to back-up their interference fit. This condition is being reported pursuant to 10CFR50.73(a)(2)(i)(B) as a condition prohibited by the plant's Technical Specifications.

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| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| Davis-Besse Unit Number 1 | 05000346 | 2003 | -010- | 00 | 2 OF 5 |

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

DESCRIPTION OF OCCURRENCE:

DH14B is a 10-inch Valtek Valdisk butterfly valve located in the discharge piping of the Train 1 Decay Heat (DH) Cooler [BP-CLR] at the Davis Besse Nuclear Power Station (DBNPS). The function of this valve, when Train 1 of the DH System [BP] is in operation, is to control Reactor Coolant System (RCS) temperature during normal decay heat removal operations. During accident conditions, the valve is designed to fail open upon receipt of a Safety Features Actuation System (SFAS) [JE] Level 3 signal in order to provide Low Pressure Injection (LPI) flow to the RCS [AB]. The valve is designed to fail open upon loss of control air, receives a confirmatory Safety Features Actuation System Level 3 signal to open, and the handwheel is locked open during normal plant operation to prevent mispositioning. The valve has a double-acting pneumatic cylinder with a mechanical spring to stroke the valve to its fail safe position. The valve was installed in 1988. The valve design includes two disc-to-shaft taper pins which assure a positive connection between the valve disc and shaft. The taper pins are approximately 3/8-inch in diameter by 2.5-inches long. The pins are A564 Grade 630 material with a H1100 hardening condition designation.

During a High Pressure Injection (HPI) comprehensive flow test conducted on April 29, 2003, the valve was observed to operate erratically. In response, troubleshooting was performed on the valve which included diagnostic testing. This testing indicated a potential for a problem with the valve internals. On August 28, 2003, the valve was disassembled and inspected, and the two disc-to-stem taper pins were observed to be missing. The piping immediately upstream and downstream of the valve was inspected to the first elbow for foreign material, and none was found. Due to the dislocation of the taper pins in DH14B, DH Train #1 was declared inoperable on August 29, 2003.

Because DH14B is normally open to its set mechanical stop for post-accident flow conditions and is not required to be manipulated during post-accident conditions, it was likely capable of performing its post-accident function. However, since this function could not have been guaranteed during past operation of the plant, this condition conservatively rendered Emergency Core Cooling System (ECCS) [BP] Train #1 inoperable. This condition is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by plant Technical Specification 3.5.2 due to Low Pressure Injection Train #1 being declared inoperable.

APPARENT CAUSE OF OCCURRENCE:

Following valve disassembly, a detailed inspection was conducted. It was concluded from this inspection that the taper pins were driven in from the opposite side from that depicted in the vendor manual. Based on the approved vendor manual, the pins did not require any additional pin retention mechanism beyond being firmly pressed into the hole.

Follow-up communication with the valve vendor revealed that the pins are prone to work their way loose if driven in from the wrong side. Although not required by the vendor manual, the pins for DH13A and DH13B were not "staked"

APPARENT CAUSE OF OCCURRENCE (continued):

after installation (i.e., peened or tack welded adjacent to the head of the pin). The pins for DH14A were determined to be staked based upon inspection following valve disassembly. Staking is an enhanced pin retaining mechnanism that is intended to increase the stress of interference at this end of the hole as an added measure to prevent loosening of the pin.

Therefore, the cause of the loss of taper pins in DH14B was determined to be incorrect installation of the pins by the vendor (pins installed from the wrong side) coupled with vibration induced by the flow from the April 29, 2003, test, and a lack of enhanced pin retaining mechanism (staking). The root cause of the condition was a deficient vendor manual that did not contain complete guidance for valve assembly with respect to correct pin installation.

ANALYSIS OF OCCURRENCE:

Valves DH13A and B are 6-inch Valtek Valdisk butterfly valves which serve as Trains 2 and 1 DH Cooler bypass valves, respectively. Valve DH14A is the Train 2 DH Cooler discharge valve which like DH14B is a 10-inch Valtek Valdisk butterfly valve. Since DH13A and B and DH14A are similar in design to DH14B, these valves became suspect relative to correct installation of the taper pins. All four valves were installed in 1988 by Modification 87-1168. Maintenance records associated with this modification did not indicate the valves were disassembled or assembled. This suggests the valves were assembled by the manufacturer. Inspection or evaluation of operating characteristics of the other three valves following the discovery of the missing pins in DH14B revealed that the taper pins for the other three valves were installed correctly. Therefore, the incorrect installation of the pins in DH14B is considered an isolated valve assembly error by the vendor.

A review of AirCet data for DH14B indicated that the shaft to disc integrity was still maintained prior to the April 2003 flow test. It was concluded that the pins probably became dislodged during the performance of the April 29, 2003, flow test which subjected the valve to turbulent flow conditions.

The missing pins could not be located in the piping adjacent to the valve and are considered to be foreign material introduced into the system which may have been transported to the Reactor Vessel [RPV]. A DBNPS evaluation was performed comparing this debris condition to Framatome ANP 51-5017340-00 dated March 11, 2002, "Reactor Operation with Loose Parts at Davis Besse." The Framatome ANP evaluation compared the potential effects of specified DBNPS debris to the potential effects of several SG plugs in circulation. The present condition was determined to be bounded by the Framatome evaluation relative to the effect on fuel fretting. The DBNPS evaluation concluded there is a low likelihood the present debris, if transported to the reactor vessel, would cause fuel fretting, and public health and safety would not be affected by operation with the identified debris. The fuel vendor, Framatome ANP, reviewed the DBNPS evaluation and concurred with its conclusions. Based on the low likelihood of

ANALYSIS OF OCCURRENCE (continued):

the debris progressing past the reactor internals and the bounding analysis completed by Framatome ANP, the potential effects of the loose material on the RCS and SGs were considered to be minimal.

The DBNPS utilizes Valtek Valdisk butterfly valves as the DH Cooler Bypass, DH Cooler Outlet, and Containment Vacuum Breaker Isolation valves [BF-ISV]. As previously noted, the DH Cooler valves were inspected. In addition, a representative spare Containment Vacuum Breaker Isolation Valve was inspected, and its taper pins were verified to have been staked by the vendor.

DB-SP-04455, "LPI Flow Verification By RCS Recirculation," Revision 1, was performed for Low Pressure Injection/Decay Heat Train #1 on May 31, 2003. During the performance of the test, the measured injection flow was 3750 gallons per minute with DH14B open at the mechanical stop. This is the position the valve would be in during a large loss of coolant accident (LOCA). Calculation C-NSA-049.02-033, Revision 1, established that the measured flow was sufficient to meet the Technical Requirements Manual 4.5.2.h surveillance requirement. DH14B is not required to reposition during the injection or recirculation phases of the large LOCA. Therefore, based on testing performed after the taper pins were believed to have been dislodged, it appears that the difficulty positioning the valve during the Comprehensive Flow test performed in April 2003 would not have affected the post-LOCA performance of DH14B. Consequently, any risk significance of this event is negligible.

CORRECTIVE ACTIONS:

The immediate corrective action was to replace the taper pins in DH14B in the correct direction and stake the pins in place. In addition, the taper pins in DH13A and B and DH14A have been staked in place. A spare Containment Vacuum Breaker Isolation Valve, provided by the same manufacturer, was verified to have the taper pins staked.

With respect to location of the missing pins, the potential effects during plant operation of this debris on the fuel, the reactor vessel, and the SGs were evaluated and determined to be bounded by an existing analysis performed by Framatome ANP, and, therefore, this event has minimal safety significance from a loose parts perspective. However, videotapes of reactor vessel cleaning performed in February 2003 will be reviewed to determine if either of the missing pins were removed during this activity. The reactor vessel will be inspected for the missing pins after the next core offload. The SGs will be inspected for the missing pins when the primary side manways are next opened.

Staking or welding of taper pins that maintain the disc to shaft connection provides added assurance that this disc-to-shaft connection will be retained while in service. To prevent recurrence of the dislodged taper pins or similar condition, maintenance procedures for the various butterfly valves installed

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

CORRECTIVE ACTIONS (continued):

at the DBNPS have been revised to ensure that the taper pins or keys are staked or welded. In addition, the vendor stated that the pins are now staked during valve assembly prior to shipment.

FAILURE DATA: No plant experience directly relating to loose or missing taper pins has been identified. No examples at DBNPS of loose or missing taper pins have previously been experienced with the butterfly valves of interest.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

NP-33-03-010-00

CR 03-03385
CR 03-07037
CR 03-07049
CR 03-07065
CR 03-07177