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NP-33-02-008-01

Docket No. 50-346

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May 6, 2003

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

Ladies and Gentlemen:

LER 2002-008-01
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence – March 8, 2002

Enclosed please find Revision 1 to voluntary Licensee Event Report (LER) 2002-008, which is being submitted to provide additional information regarding degraded conditions identified on the Containment Air Coolers. The changes are marked with a revision bar in the margin. This revised LER is being submitted in accordance with the guidance of Sections 2.7 and 5.1.5 of NUREG-1022, Event Reporting Guidelines.

Very truly yours,

Lew W. Myers

PSJ/s

Enclosures

cc: Mr. J. E. Dyer, Regional Administrator, USNRC Region III
Mr. C. S. Thomas, 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
None	None

NRC FORM 366 (1-2001) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	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. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), 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. If an 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.

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TITLE (4)
Containment Air Coolers Collective Significance of Degraded Conditions

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 NAME	DOCKET NUMBER 05000
03	08	2002	2002	-- 008 --	01	5	6	2003	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	D	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)							
POWER LEVEL (10)	000		20.2201(b)		20.2203(a)(3)(i)		50.73(a)(2)(i)(C)		50.73(a)(2)(vii)
			20.2201(d)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(A)
			20.2203(a)(1)		20.2203(a)(4)		50.73(a)(2)(ii)(B)		50.73(a)(2)(viii)(B)
			20.2203(a)(2)(i)		50.36(c)(1)(i)(A)		50.73(a)(2)(iii)		50.73(a)(2)(ix)(A)
			20.2203(a)(2)(ii)		50.36(c)(1)(ii)(A)		50.73(a)(2)(iv)(A)		50.73(a)(2)(x)
			20.2203(a)(2)(iii)		50.36(c)(2)		50.73(a)(2)(v)(A)		73.71(a)(4)
			20.2203(a)(2)(iv)		50.46(a)(3)(ii)		50.73(a)(2)(v)(B)		73.71(a)(5)
			20.2203(a)(2)(v)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(C)	X	OTHER
			20.2203(a)(2)(vi)		50.73(a)(2)(i)(B)		50.73(a)(2)(v)(D)		Specify in Abstract below or in NRC Form 366A

LICENSEE CONTACT FOR THIS LER (12)

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

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

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)

Following unit shutdown for refueling on February 16, 2002, various degraded conditions were identified associated with the Containment Air Coolers (CACs). A review was performed of the collective significance of these degraded conditions adverse to quality. An engineering evaluation of structural integrity issues has been performed which concluded that corrosion and pitting that resulted from boric acid deposition was not sufficient to render the CACs structurally inoperable during or following a safe shutdown earthquake. An engineering evaluation has been performed of non-conservatisms utilized in piping stress analysis for the Service Water (SW) System that feeds the CACs. This evaluation concluded that the SW piping and CAC cooling coils would remain functional following postulated accidents. Notifications made to the licensee under Part 21 did not render the CACs inoperable. Fouling conditions have been identified for both air and water sides of the cooling coils. An engineering evaluation of thermal performance issues concluded that with the containment emergency sump available, the CACs, in conjunction with Containment Spray (CS), would perform their intended function. Conditions that may render the sump unavailable and consequences on operation of the CS are discussed in LER 2002-005-01. This information is being provided to the NRC on a voluntary basis.

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

DESCRIPTION OF OCCURRENCE:

Davis Besse Nuclear Power Station (DBNPS) was designed with three Containment Air Cooling (CAC) units [BK]. During normal plant operation, two of three CAC units operate to provide cooling of the containment atmosphere and maintain containment air temperature within limits. The third unit is maintained in standby. Following a postulated accident, the operating CAC units receive a safety features actuation signal (SFAS) [JE] to shift the operating CAC units from high to low speed fan operation. The CAC units, in conjunction with the Containment Spray System (CS)[BE], are designed to ensure adequate containment heat removal capacity is available during post-loss of coolant accident (LOCA) conditions and to promote long term containment cooling. Service Water (SW) [BI] is provided to the CAC cooling coils [BK-CCL] to provide the heat transport mechanism. The heat removal capability of one CAC unit in conjunction with one operating CS train has been analyzed to adequately mitigate post-accident conditions. Each CS train includes a CS pump, spray headers, nozzles, valves, and piping. On February 16, 2002, DBNPS commenced the Thirteenth Refueling Outage (13RFO). The plant entered Mode 6 on February 22, 2002, to perform refueling activities.

Following unit shutdown on February 16, 2002, various degraded conditions were identified associated with the CACs which were documented in condition reports (CRs). The issues were related to structural integrity (seismic adequacy, boric acid corrosion, and post accident thermal stress); maintenance, test, and configuration control; thermal performance; and 10 CFR 21 reports.

The CAC units are currently being thoroughly refurbished/replaced because of their degraded condition.

A decision was made to collectively review these degraded conditions to assess past operability of the CAC units. CRs written since the beginning of 13RFO through mid-November 2002 were reviewed to identify those Condition Reports (CRs) which documented conditions adverse to quality from previous operation of the CAC units. One additional CR was identified in early 2003 which potentially affected CAC operation (SW blockage). This CR was also included in the review.

This information is being provided on a voluntary basis since no condition of CAC degradation alone has been identified which would have rendered the CACs inoperable during periods of plant operation.

APPARENT CAUSE OF OCCURRENCE:

A number of the conditions adverse to quality related to corrosion, pitting, and rusting of the CAC unit components and SW piping resulted from boric acid deposition. These conditions could have challenged the seismic integrity of the CAC units. The boric acid deposition was the result of leaking reactor coolant, the causes of which have been documented in the Root Cause Analysis Reports on Failure to Identify Reactor Vessel Head Degradation provided to the NRC on

APPARENT CAUSE OF OCCURRENCE (continued):

April 18, 2002, and August 21, 2002. In addition, microbiological influenced corrosion (MIC) was identified on SW return flow manifold flanges following disassembly of the flanges. No evidence of prior leakage was observed.

Concerns identified relative to thermal stress and seismic design were the result of apparent non-conservative original design modeling assumptions. No basis or reference for these assumptions could be located.

Several issues were identified which related to maintenance, test, and/or configuration control activities or conditions. These conditions were either administrative in nature or did not affect the ability of the CACs to perform their design function during previous operation.

A limited number of conditions which could result in degraded thermal performance were identified. Water-side fouling of one cooling coil from CAC #3 was identified. It consisted of limited hard blockage of cooling coil tubes and accumulation of zebra mussel shells. Since the service conditions for CACs #1 and #2 are similar to CAC #3, the degraded conditions on CAC #3 are considered to be representative of the other cooling coils. The presence of microbiological organisms was attributed to lack of effective biocide treatment on the SW System prior to and during 13RFO. Air-side (cooling fin) fouling was identified as the result of boric acid deposition. The cause of this condition is described above. While conducting inspection and cleaning of CAC #2 SW piping, a piece of plywood measuring approximately 5 inches by 7 inches was discovered in the 8-inch diameter supply line upstream of the transition to two 6-inch pipes, each of which supplies SW to one of two independent cooling coil manifolds. There are no intervening pipe fittings or valves between the as-found location of the foreign material and the two 6-inch transitions. This condition is believed to be an isolated condition that occurred during 12RFO.

ANALYSIS OF OCCURRENCE:

The Containment Cooling System consists of CACs and the CS System. Technical Specification 3.6.2.2 requires that at least two CAC units must be operable during Modes 1, 2, and 3. The basis for this CAC operability requirement is to ensure 1) the containment air temperature will be maintained within limits during normal operation and 2) adequate heat removal capacity is available when one CAC is operated in conjunction with one train of CS during post-LOCA conditions. In order to mitigate postulated accident conditions, each CAC unit and each train of CS is designed to remove 75E6 British Thermal Units (BTU) per hour. The total design heat removal capability is 150E6 BTU per hour. However, accident analyses incorporate degraded conditions for CAC operation to conservatively determine CAC performance. The design heat removal capability can be met by operation of one CAC unit in conjunction with one CS train. A seismic event concurrent with a loss of coolant accident (LOCA) is not assumed.

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ANALYSIS OF OCCURRENCE (continued):

However, loss of direct connection of the SW System to Lake Erie is assumed.

As previously noted, a number of CRs documented various deficiencies associated with the CAC units. These were broken down into four general categories, as follows:

Structural Integrity

Maintenance, Test, and Configuration Control

Thermal Performance

10 CFR 21

Structural Integrity:

Structural integrity issues encompassed corrosion, pitting, and rust resulting from boric acid deposition on CAC components and associated SW piping and their effect on seismic adequacy and post-accident thermal stresses.

A number of CRs were written to document degraded conditions on the CAC units and their associated SW piping resulting from boric acid deposition. These conditions could result in diminished capability of the CAC units to perform their intended function following a LOCA or seismic event. An engineering evaluation, included with DBNPS CR 02-02943, was conducted of the potential impact of the collective conditions to determine if the CAC units would have been structurally adequate. This evaluation concluded that the corrosion and pitting that resulted from boric acid deposition was not sufficient to render the CACs structurally inoperable during or following a LOCA or safe shutdown earthquake (SSE).

As part of the effort to determine the extent of condition related to leaks of boric acid, the CACs were inspected in May and June 2002. Moderate to severe corrosion was observed. The inspection was performed by a certified Seismic Capability Engineer. The assessment included the CAC structural frames, the cooling coils and their support frames, the fan motors, and motor supports. Based on the assessment of observed conditions, the CACs were determined to have been structurally adequate. While corrosion and pitting was observed, it has been concluded that the "as-found" condition would not have been sufficiently degraded to prevent the CACs from performing as designed during and following an SSE in combination with other imposed design loads. Therefore, the CACs are considered to have been degraded but operable relative to the collective conditions of corrosion, rusting, and pitting that resulted from boric acid deposition.

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ANALYSIS OF OCCURRENCE (continued):

Apparent non-conservatisms were identified in the stress analysis methodology that was applied to the SW piping supply and return lines for the CACs. The conditions involved lack of inclusion of stress intensification factors, consideration of water hammer loads, application of post-accident thermal loads versus SW piping nozzle flexibility, and seismic loading. An engineering evaluation of these issues, included with DBNPS CR 02-05563, was performed, and it was concluded that although the issues result in a degraded condition, the CACs were not rendered inoperable based on these non-conservatisms.

Thermal Performance:

Inspections of the CACs revealed cooling coil fouling conditions both on the air (cooling fin) side and the water side. Water side degradation apparently resulted from an accumulation of zebra mussel shells, rust fragments, and silting. Four of 28 tubes on one coil from CAC #3 were discovered to be plugged with hard deposits and another three tubes were partially obstructed. Since the service conditions for CACs #1 and #2 are similar to CAC #3, the degraded conditions on CAC #3 were considered to be representative of the other CAC cooling coils.

In addition, a piece of plywood was discovered in the 8-inch SW supply pipe (SW tree) to CAC #2. This is believed to be an isolated condition that occurred during the previous refueling outage (12RFO). An extent of condition inspection was conducted of the CAC SW supply and return piping in containment and the annulus, and no other foreign material was found. This condition is believed to have no generic implications relative to the Foreign Material Exclusion Program.

Air side degradation consisted of boric acid residue and dirt which may impede the heat transfer characteristic of the cooling fins.

An engineering evaluation of thermal performance of degraded CAC operation was performed which utilized conservative assumptions. It concluded the effects of the degraded conditions on heat transfer capability of the CACs, when operating in conjunction with the CS System, would not have rendered the CACs inoperable with respect to the long term post-accident heat removal capability for containment pressure reduction, increased sump temperature effect on ECCS pump net positive suction head (NPSH), ECCS Pump Room heatup, equipment environmental qualification, and radiological release. This engineering evaluation of thermal performance is included with DBNPS CR 03-00120.

Conditions associated with potential post-accident unavailability of the containment emergency sump and consequential effects on CS System operation are discussed in LER 2002-005-01.

ANALYSIS OF OCCURRENCE (continued):

10 CFR 21:

By letter dated April 1, 2002, Fischer Controls notified DBNPS of a deviation in their vendor manual regarding valve stem to plug torque requirements for certain specified valves with 1-1/4 inch diameter valve stems. This Part 21 notification was entered into the DBNPS Corrective Action Program as CR 02-02239. DBNPS concluded that it did not have a vendor manual for the referenced valve assemblies. A review of the DBNPS Asset Database indicated no safety-related assets fit the applicability criteria. However, since DBNPS did have similar Fischer valve assemblies, procedure DB-MM-09334, "Fischer Controls Type EWD and EWS Valve Maintenance," was reviewed and validated to identify torque values for the plug to stem connection for all stem sizes.

By letter dated May 20, 2002, Howden Buffalo notified DBNPS that the Reliance motors provided as part of the CAC fan assemblies had a deficiency with the stator winding which resulted from a vendor engineering error. The deficiency could result in winding failure during motor startup or speed changes. Operation of the CAC units at DBNPS is directly into high fan speed for normal operation. No winding failures or anomalies were experienced during fan startup. At the time of receipt of the Part 21 notification, the plant was in Mode 6 (shutdown) and the CAC motors were being refurbished as part of the overall CAC refurbishment. There was no past operability issue.

CORRECTIVE ACTIONS:

The overall corrective action to resolve the physical degradation of the CAC units is the refurbishment/replacement of the units prior to plant restart. This activity will be supported by appropriate engineering design documentation to ensure the design and installation of the new CAC units is consistent with their design basis.

FAILURE DATA:

There have been no LERs in the previous two years involving inoperability of the CAC units.

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

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LICENSEE EVENT REPORT (LER)
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Structural Integrity

CR 02-01139	CR 02-02172	CR 02-02943	CR 02-04361
CR 02-01191	CR 02-02179	CR 02-03273	CR 02-04364
CR 02-01363	CR 02-02194	CR 02-03670	CR 02-04414
CR 02-01378	CR 02-02269	CR 02-03703	CR 02-04587
CR 02-01642	CR 02-02294	CR 02-03765	CR 02-04906
CR 02-01730	CR 02-02318	CR 02-03848	CR 02-04969
CR 02-01748	CR 02-02330	CR 02-04036	CR 02-04980
CR 02-01841	CR 02-02394	CR 02-04350	CR 02-05235
CR 02-02108	CR 02-02409	CR 02-04351	CR 02-05373
CR 02-02165	CR 02-02414	CR 02-04358	CR 02-05563
	CR 02-02864		CR 02-09595

Maintenance, Test, and Configuration

CR 02-01178	CR 02-04363	CR 02-05981	CR 02-08235
CR 02-01450	CR 02-04930	CR 02-06091	CR 02-08389
CR 02-01783	CR 02-04985	CR 02-06093	CR 02-08398
CR 02-02236	CR 02-05109	CR 02-06595	CR 02-08452
CR 02-02767	CR 02-05448	CR 02-07075	CR 02-08671
CR 02-03245	CR 02-05459	CR 02-07130	CR 02-08780
CR 02-03849	CR 02-05712	CR 02-07723	CR 02-08810
CR 02-04345	CR 02-05779	CR 02-07758	CR 02-09404
CR 02-04354	CR 02-05885	CR 02-07781	

Thermal Performance

CR 02-03337	CR 02-03963	CR 02-05516	CR 03-00120
CR 02-03960	CR 02-04419	CR 02-07516	CR 03-00418

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CR 02-02191	CR 02-02239