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419-321-7676
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Docket Number 50-346

NP-33-06-004-02
10 CFR 50.73

License Number NPF-3

August 29, 2007

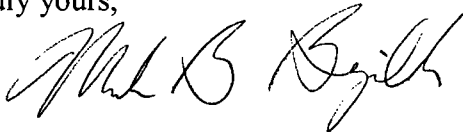
United States Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Licensee Event Report 2006-004-02
Potential Damage to Ventilation Dampers due to Design-Basis Tornado Differential Pressures
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence – December 14, 2006

Ladies and Gentlemen:

Enclosed is Revision 02 to Licensee Event Report (LER) 2006-004. This LER was originally submitted to provide written notification of the discovery that some safety-related ventilation dampers could have been damaged due to design-basis tornado differential pressures. This issue is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as operation or condition prohibited by the Technical Specifications, and 10 CFR 50.73(a)(2)(vii) as a single cause that caused at least one independent train to become inoperable in multiple systems. In accordance with the guidance of NUREG-1022, revision bars have been added to the right margin to denote changes from the previous submittal of LER 2006-004 dated May 9, 2007. This revision provides an update to the LER and commitments made with respect to this issue, which were modified based on evaluations performed following determination of the safety significance of this issue. Commitments associated with this LER are listed in the Attachment, and replace previous commitments made under this LER in their entirety.

Very truly yours,



GMW

Attachment
Enclosure

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

JE22

NRR

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 Compliance (419-321-8000) at Davis-Besse of any questions regarding this document or associated regulatory commitments.

<u>COMMITMENTS</u>	<u>DUE DATE</u>
1. Update the DBNPS Design Criteria Manual to add a statement that safety-related ventilation systems and their components must be designed for applicable design basis tornado differential pressures.	1. Completed May 11, 2007
2. Update the Design Interface Review Checklist to ensure personnel performing design interface evaluations properly address tornado differential pressure loads that may affect safety-related ventilation systems.	2. Completed May 14, 2007
3. Submit supplemental information regarding the safety significance of this occurrence.	3. Completed May 9, 2007, with submittal of Revision 01 of this LER.

NRC FORM 366 (6-2004)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB NO. 3150-0104		EXPIRES 6/30/2007																																																	
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)																																																								
<p>On December 14 and 15, 2006, with the plant at approximately 100 percent power, evaluations of ventilation systems required for safe shutdown in the event of a tornado revealed that dampers for the Low Voltage Switchgear Rooms (LVSGR) and the Component Cooling Water (CCW) Room could be overstressed during the depressurization experienced due to a design basis tornado. The overstressed dampers, which are normally closed, could be damaged to the point where they would not be able to open to allow proper functioning of the associated ventilation systems. Compensatory actions were taken to ensure the dampers were opened upon issuance of a Tornado Watch, which would allow the subject rooms to depressurize during a tornado and prevent damage to the dampers. While these actions were initially incorporated into site procedures, further evaluation determined these actions were not necessary based on resultant room temperatures with the dampers failed closed.</p> <p>This issue, which is due to inadequate design input for the ventilation dampers during initial plant construction, is being reported in accordance with 10CFR50.73(a)(2)(i)(B) as operation or condition prohibited by the Technical Specifications, and 10CFR50.73(a)(2)(vii) as a single cause that caused at least one independent train to become inoperable in multiple systems or two independent trains to become inoperable in a single system.</p>																																																								

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Davis-Besse Unit Number 1	05000346	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 6
		2006	-- 004 --	02	

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

DESCRIPTION OF OCCURRENCE:

System Descriptions:

Emergency Diesel Generators and Room Ventilation

The onsite electric power system [EB] at the Davis-Besse Nuclear Power Station (DBNPS) is powered by two separate and independent Emergency Diesel Generators (EDGs) [EK-DG]. These EDGs provide onsite standby electrical power sources to supply their respective 4160 Volt A.C. Essential Buses [EB-BU]. The EDG Room Ventilation System [VJ] consists of two 50% capacity supply air fans [VJ-FAN] and associated dampers in each EDG room. These ventilation systems are sized to provide adequate outside air cooling to maintain each operating diesel generator room between 60 and 125 degrees F. The fans are started automatically when the respective diesel generator is started, and the normally-closed supply and exhaust dampers [VJ-CDMP] modulate along with the return air damper to maintain desired room temperature. DBNPS Technical Specification (TS) Limiting Condition for Operation (LCO) 3.8.1.1.b requires two separate and independent EDGs to be Operable while the plant is operating in Modes 1, 2, 3, and 4. With one EDG inoperable, the inoperable EDG must be restored to Operable status within 7 days or a plant shutdown initiated.

Low Voltage Electrical System and Room Ventilation

The essential electrical distribution system [EB, ED] at the DBNPS is designed to provide reliable power to components and systems essential to plant safety, and is designed to perform its functions when subjected to any design basis event. This system also distributes power to loads vital to safe operation, shutdown, and accident mitigation of the plant. The low voltage portion of this system includes the 480 Volt A.C. system and associated transformers [ED-XFMR] that feed the unit substations; the 120 Volt Instrument A.C. system [EF] and associated inverters [EF-INVT]; and the 125/250 Volt D.C. systems [EJ] and associated station batteries [EJ-BTRY] and battery chargers [EJ-BYC]. DBNPS TS LCO 3.8.2.1 requires the 480 Volt A.C. Essential Busses and the 120 Volt A.C. Vital Buses to be Operable while the plant is operating in Modes 1, 2, 3, and 4. With less than the full complement of A.C. busses operable, the inoperable bus must be restored to Operable status within 8 hours or a plant shutdown initiated. DBNPS TS LCO 3.8.2.3 requires the 125/250 Volt D.C. trains be energized and Operable while the plant is operating in Modes 1, 2, 3, and 4. With less than the full complement of D.C. busses, batteries, or battery chargers Operable, the inoperable equipment must be restored to Operable status within 2 hours or a plant shutdown initiated.

The key equipment for the low voltage electrical systems is contained in the two redundant Low Voltage Switchgear Rooms (LVSGR). Normal ventilation for the LVSGR is provided by the Non-Radwaste Area Supply and Return Fans [VF-FAN] and associated ductwork and dampers [VF-CDMP]. The Non-Radwaste Fans operate continuously, with dampers modulating to maintain the average temperature in the non-radwaste areas of the plant between 60 and 104 degrees F. Two safety-related 100 percent capacity LVSGR Ventilation Fans [VF-FAN] are provided to ensure adequate cooling of the LVSGR following a loss of offsite power, postulated accident, or failure of the non safety-related Non-Radwaste Ventilation system. Each LVSGR Ventilation Fan is started at a predetermined temperature, which simultaneously opens the outside air supply and exhaust air dampers [VF-BDMP]. Each LVSGR Ventilation train is also designed to maintain the average LVSGR temperature between 60 and 104 degrees F during all modes of operation, including post accident conditions.

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

DESCRIPTION OF OCCURRENCE: (continued)

Component Cooling Water and Room Ventilation

The Component Cooling Water (CCW) System [CC] circulates water through two closed cooling loops to provide cooling water to safety-related equipment and reactor auxiliary equipment, transferring the heat through the CCW Heat Exchangers [CC-HX] to the Service Water (SW) System [BI]. During normal operation, one of the two CCW loops will supply cooling water with the other loop in a standby capacity. During a design-bases accident, the non-essential portion of the system is automatically isolated from both loops. The two CCW pumps [CC-P] and associated heat exchangers (along with a spare pump and heat exchanger that can be aligned to either loop) are located in a common CCW Pump Room. The CCW Pump Room ventilation [VF] consists of two 100 percent capacity fans [VF-FAN] and associated dampers, and is designed to maintain the CCW Pump Room temperatures between 60 and 140 degrees F year round. A non-safety-related Turbine Building Roof Exhaust Fan [VK-FAN] normally operates to exhaust air from the CCW Pump Room, with supply air being drawn from the Turbine Building through a transfer grill in the Elevator Machinery Room. Upon reaching a predetermined temperature setpoint in the CCW Room, a temperature switch will start one of the CCW Room ventilation fans, and open the motor-operated outside air louvers [VF-LV]. The exhaust and recirculation dampers will modulate to maintain the CCW Room temperature between 60 and 140 degrees F. DBNPS TS LCO 3.7.3.1 requires two independent CCW loops be Operable while the plant is operating in Modes 1, 2, 3 and 4. With one CCW loop inoperable, the inoperable loop must be restored to Operable status within 72 hours or a plant shutdown initiated.

Event Description:

On December 11, 2006, with the DBNPS in Mode 1 operating at approximately 100 percent power, an evaluation of ventilation systems required for safe shutdown in the event of a tornado revealed that the dampers for the Emergency Diesel Generator (EDG) Rooms could be structurally overstressed for a design basis tornado depressurization. Because the EDG Room intake and exhaust dampers are normally in a closed position, in the event a design basis tornado strikes the facility, a potential three (3.0) pounds per square inch (psi) differential pressure would be applied to the closed dampers. This pressure could cause the dampers to bend and potentially be damaged to the point where they would no longer open, which could prevent the EDG Room ventilation system from maintaining the room temperatures within acceptable limits.

Further evaluation of the EDG inlet and outlet ventilation dampers determined that the maximum differential pressure experienced in the EDG rooms as a result of a design basis tornado was approximately 0.6 psi, not 3.0 psi as previously assumed. This is the result of the EDG room doors leading to the outside failing at lower than 3.0 psi differential pressure, allowing the room to vent more rapidly in the event of a design basis tornado, and thus reducing the differential pressures experienced by the ventilation dampers. The dampers were determined to be capable of withstanding this lower differential pressure of approximately 0.6 psi; therefore, the EDG ventilation system remained capable of performing all required functions.

This issue with the EDG Room ventilation dampers was discovered during an engineering self-assessment in preparation for an upcoming NRC Component Design Basis Inspection. Other safe shutdown ventilation systems were subsequently reviewed with respect to this issue, and it was determined on December 14, 2006, that the Low Voltage Switchgear Room (LVSGR) ventilation supply

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

DESCRIPTION OF OCCURRENCE: (continued)

and exhaust dampers could be similarly overstressed during the design basis tornado depressurization. Because the normal ventilation for the LVSGR is provided by the Non-Radwaste Ventilation System, the safety-related LVSGR supply and exhaust dampers are normally closed, subjecting them to a potential differential pressure of 3.0 psi in the event of a design basis tornado. This pressure could cause the dampers to bend and potentially be damaged to the point where they would no longer open, which could prevent the LVSGR ventilation system from maintaining the room temperatures within acceptable limits.

Further reviews on December 15, 2006, determined that the Component Cooling Water (CCW) Room ventilation outside air intake louvers could be overstressed during the design basis tornado depressurization. With ventilation normally supplied via a non-safety-related Turbine Building Roof Exhaust Fan, these louvers along with the room exhaust dampers are normally closed. In the event a design basis tornado strikes the facility, a potential 3.0 psi differential pressure could be applied to these louvers and dampers. While the room exhaust dampers were determined to be structurally adequate for a design basis tornado event, the outside air inlet louvers were determined to not be structurally adequate. The design basis tornado depressurization of 3.0 psi differential pressure could overstress the aluminum alloy blades of the normally closed louvers, possibly bending and deforming the louver blades to the point where they would not be able to open to allow outside air to enter the CCW Room to cool the equipment contained within.

The inability of the LVSGR and CCW Room ventilation systems to withstand the design basis tornado depressurization has apparently existed since initial construction of the DBNPS. Because the ventilation equipment, and therefore the supported equipment, was inoperable for longer than permitted by the DBNPS TS, the plant was operated in a condition prohibited by the Technical Specifications, which is reportable in accordance with 10 CFR 50.73(a)(2)(i)(B). Furthermore, because a single cause (tornado differential pressure) resulted in more than one independent train to be inoperable in different systems, or two independent trains to become inoperable in a single system, this issue is also reportable in accordance with 10 CFR 50.73(a)(2)(vii).

APPARENT CAUSE OF OCCURRENCE:

The probable cause of the LVSGR and CCW Room ventilation dampers/louvers not being able to withstand design basis tornado induced differential pressures is a less than adequate initial design in that the ventilation dampers were never considered as being subject to tornado differential pressure loading, and therefore were under-designed. Evaluation of this issue found no information that addressed tornado differential pressure for dampers, ductwork, or the ventilation systems. The focus on protecting the plant from natural phenomenon appeared to have been placed only on the plant's structures. The construction design specification, issued in 1972, did not address tornado differential pressures. Due to the age of this specification, no information was obtained on how the specification was developed.

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ANALYSIS OF OCCURRENCE:

This issue involves only the ventilation systems of the LVSGR and CCW Rooms. An evaluation of the 24 hour time period following a tornado that damages the LVSGR ventilation supply and exhaust dampers determined that the temperature in the LVSG rooms would stabilize within acceptable limits. Specifically, the main equipment rooms would stabilize below the 120 degrees F limit of the station battery chargers, and the electrical isolation rooms would remain below 131 degrees F, which is the short-term limit (24 hours) for the remainder of the equipment in this area. A similar evaluation of the 24 hour time period following a tornado that damages the CCW Room outside air intake louvers determined that the CCW Room temperature will stabilize at approximately 150 degrees F in approximately 1.2 hours, which is below the maximum ambient temperature limit of the CCW Pump Motors (185 degrees F). Based on these evaluations, the equipment within these rooms necessary for the system's safety functions will be able to operate for the 24 hours following a tornado event before room temperatures may affect continued equipment operation. This should be sufficient time for a high temperature condition to be diagnosed and corrected using existing and/or portable ventilation equipment following the tornado event. Therefore, this issue had minimal safety significance.

CORRECTIVE ACTIONS:

Under an Operability Evaluation, it was determined that the LVSGR dampers would remain operable in the event of a tornado provided the room intake dampers, and the exhaust damper for LVSGR 2, were open prior to a tornado. A Standing Order was issued to start the LVSGR Fans and ensure these dampers were opened and then open the supply breakers for the dampers upon issuance of a Tornado Watch to keep the dampers in the open position. Similar measures were incorporated into revision 06 of procedure RA-EP-02810, "Tornado," on January 26, 2007.

Under another Operability Evaluation, it was determined that the CCW Room inlet louvers would remain operable in the event of a tornado provided the louvers were open prior to a tornado. A Standing Order was issued to open the louver supply breakers, thereby failing open the louvers to maintain them in the open position, upon issuance of a Tornado Watch. These compensatory measures were incorporated into revision 06 of procedure RA-EP-02810, "Tornado," on January 26, 2007.

Based on the evaluations performed to determine the safety significance of this issue as described above in the Analysis of Occurrence Section, it was determined there was a reasonable expectation that the equipment in the LVSG rooms and CCW Room would remain capable of performing their designated safety function(s) in the event the room ventilation dampers/louvers were damaged. Because the resulting room temperatures would not challenge the operational readiness of the equipment, the procedural provisions to open the dampers/louvers upon issuance of a Tornado Watch were removed from RA-EP-02810 by issuance of revision 07 on June 1, 2007.

The DBNPS Design Criteria Manual has been updated to add a statement that safety-related ventilation systems and their components must be designed for applicable design basis tornado differential pressures. Also, the Design Interface Review Checklist has been updated to ensure that personnel performing design interface evaluations as part of engineering activities properly address tornado differential pressure loads that may affect safety-related ventilation systems.

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FAILURE DATA:

There have been no Licensee Event Reports at the DBNPS involving the effects of tornado differential pressures in the past three years. A recent question regarding the effects of tornado depressurizations, raised as a result of a NRC Inspection of Evaluation of Changes, Tests, of Experiments and Permanent Plant Modifications completed in March 2006, was the basis for including the effects of tornado differential pressure in the engineering self-assessment to prepare for the upcoming NRC Component Design Basis Inspection.

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

NP-33-06-004-02

CRs 2006-11269, 2006-11421, 2006-11483, 2006-11740