



**INDIANA  
MICHIGAN  
POWER**

A unit of American Electric Power

Indiana Michigan Power  
Cook Nuclear Plant  
One Cook Place  
Bridgman, MI 49106  
AEP.com

May 19, 2006

AEP:NRC:2573-30  
10 CFR 50.73

Docket No. 50-316

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Mail Stop O-P1-17  
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Unit 2  
LICENSEE EVENT REPORT 316/2006-002-00  
MULTIPLE MAIN STEAM SAFETY VALVE TEST FAILURES

In accordance with the criteria established by 10 CFR 50.73 entitled Licensee Event Report System, the following report is being submitted:

LER 316/2006-002-00: "Multiple Main Steam Safety Valve Test Failures"

There are no commitments contained in this submittal.

Should you have any questions, please contact Mr. Michael K. Scarpello, Regulatory Affairs Supervisor, at (269) 466-2649.

Sincerely,

Lawrence J. Weber  
Plant Manager

RAM/jen

Attachment

JE22

c: J. L. Caldwell, NRC Region III  
K. D. Curry – AEP Ft. Wayne, w/o attachment  
J. T. King, MPSC – w/o attachment  
MDEQ – WHMD/RPMWS – w/o attachment  
NRC Resident Inspector  
P. S. Tam, NRC Washington DC

**LICENSEE EVENT REPORT (LER)**

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

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to infocollects@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 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.

<b>1. FACILITY NAME</b> Donald C. Cook Nuclear Plant Unit 2	<b>2. DOCKET NUMBER</b> 05000316	<b>3. PAGE</b> 1 of 4
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**4. TITLE**  
Multiple Main Steam Safety Valve Test Failures

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	23	2006	2006	-- 002	-- 00	05	19	2006		

<b>9. OPERATING MODE</b> 1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> (Check all that apply) <table border="0"> <tr> <td><input type="checkbox"/> 20.2201(b)</td> <td><input type="checkbox"/> 20.2203(a)(3)(i)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(C)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(vii)</td> </tr> <tr> <td><input type="checkbox"/> 20.2201(d)</td> <td><input type="checkbox"/> 20.2203(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(1)</td> <td><input type="checkbox"/> 20.2203(a)(4)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(B)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(i)</td> <td><input type="checkbox"/> 50.36(c)(1)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ix)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(ii)</td> <td><input type="checkbox"/> 50.36(c)(1)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iv)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(x)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iii)</td> <td><input type="checkbox"/> 50.36(c)(2)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(A)</td> <td><input type="checkbox"/> 73.71(a)(4)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iv)</td> <td><input type="checkbox"/> 50.46(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(B)</td> <td><input type="checkbox"/> 73.71(a)(5)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(v)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(C)</td> <td><input type="checkbox"/> OTHER</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(vi)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(D)</td> <td>Specify in Abstract below or in NRC Form 366A</td> </tr> </table>	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input checked="" type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A
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<b>10. POWER LEVEL</b> 100%																																					

**12. LICENSEE CONTACT FOR THIS LER**

<b>FACILITY NAME</b> Michael Scarpello, Regulatory Affairs	<b>TELEPHONE NUMBER (Include Area Code)</b> (269) 466-2649
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	SB	RV	Dresser	N					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b>				<b>15. EXPECTED SUBMISSION DATE</b>			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)

Testing of Donald C. Cook Nuclear Plant Unit 2 main steam safety valves revealed a total of 5 out of 20 unsatisfactory as-found lift pressure tests (high). All of the unsatisfactory as-found lift pressures were above the acceptance band.

Technical Specification (TS) Limiting Condition For Operation 3.7.1 requires a minimum of 20 (5 per steam generator) to be operable in Modes 1, 2, and 3. Since a similar cause was determined for the multiple unsatisfactory as-found lift pressures, this condition may not have arisen over a period of time, and there is a likelihood that the affected main steam safety valves may not have been operable during plant operation. Therefore, this occurrence is considered reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by the plant's TS and 10 CFR 50.73(a)(2)(vii) as a common cause of inoperability.

The apparent cause of the occurrence is nozzle disc bonding. Immediate corrective action was that all affected safety valves were adjusted to within TS limits and satisfactorily retested. I&M will continue to work with its vendors and industry peers to ensure it fully understands and addresses this condition, with expanded testing and adjustments to be performed as appropriate.

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

**Conditions Prior to Event**

Unit 2 at 100% power.

**Description of Event**

On March 23 and 24, 2006, Indiana Michigan Power Company (I&M) performed Trevi testing of the main steam safety valves (MSSV) [SB-RV] for Donald C. Cook Nuclear Plant (CNP) Unit 2 in accordance with procedure 12-EHP-4030-051-256, Main Steam Safety Valve Setpoint Verification With Lift Assist Device. During this testing, 5 of the 20 safety valves failed to meet technical specification (TS) required lift setpoints specified in TS Surveillance Requirement 3.7.1.1, Table 3.7.1-2. Operations department personnel entered the applicable TS action statements until each valve was adjusted and tested satisfactorily. The following table summarizes the as-found conditions for the five safety valve failures:

Valve Number	Setpoint (psig)	As Found (psig)	% Deviation	Last Tested
2-SV-1A-3	1065	1098.43	3.14	05/14/03
2-SV-2A-1	1075	1112.68	3.51	05/13/03
2-SV-1B-1	1065	1103.88	3.65	05/13/03
2-SV-1B-4	1065	1111.08	4.33	05/14/03
2-SV-2A-4	1075	1110.18	3.27	05/14/03

Since a similar cause was determined for the multiple unsatisfactory as-found lift pressures, this condition may have arisen over a period of time, and there is a likelihood that the affected main steam safety valves may not have been operable for a time period greater than the TS limiting condition for operation time limits while the unit was at 100% power. Therefore, this occurrence is considered reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by the plant's TS and 10 CFR 50.73(a)(2)(vii) as a common cause of inoperability.

**Cause of Event**

The apparent cause of the occurrence is nozzle disc bonding.

The Electric Power Research Institute (EPRI), in conjunction with plant owners, has investigated the previous occurrences of high lift setpoints with the Dresser 3700 valves and concluded the probable cause was a condition referred to as disc bonding. During power operations an aqueous, somewhat alkaline, condition exists between the disc seating surface and the nozzle. This environmental condition promotes buildup of oxide films which over time grow together and form a mechanical bond known as "oxide locking or disc bonding." As a result of this, it was determined the use of pre-oxidized Inconel x-750 discs can mitigate the severity of this disc bonding condition. The oxide layer that forms on the surface of the Inconel material has a lower tendency to interlock with or adhere to the oxide layer of the nozzle material due to widely different chemical composition and crystalline structure of the two oxides.

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I&M has installed the X-750 discs on all MSSVs for both units, as well as the spare MSSVs. Subsequent to the installation of the X-750 discs, the industry identified that X-750 discs also have the potential for disc bonding. It takes an extended operational run for the X-750 discs to develop a bond sufficient to cause a lift outside the 3% acceptance criteria. The five Unit 2 MSSVs that failed the Trevi testing during the Spring 2006 refueling outage were last tested in May 2003. This run time is of sufficient duration for oxide re-growth to have occurred. I&M is aware of this phenomenon and continues to work with its vendors and industry peers to ensure it fully understands and addresses this condition. All 20 of the Unit 2 MSSVs were tested during the Spring 2006 refueling outage.

During the CNP Unit 1 Spring 2005 Cycle 20 refueling outage, all of the Unit 1 MSSVs were tested with a single failure attributable to disc bonding, thus providing an opportunity to break any disc bonding that may have started to occur.

**Analysis of Event**

The primary purpose of the MSSVs is to provide overpressure protection for the secondary system. These valves also provide protection against over-pressurizing the reactor coolant pressure boundary by providing a heat sink for the removal of energy from the reactor coolant if the preferred heat sink that is provided by the condenser [COND] is not available.

The operability of the MSSVs ensures that the secondary system pressure will be limited to within 110% of its design pressure of 1085 psig during the most severe anticipated system operational transient. A review of the existing accident analyses for CNP Unit 2 demonstrated that the MSSV capacity is more than is needed to cope with the limiting challenge to steam relief capacity, even when the analyses are performed at conservative power levels that are higher than the licensed power level for CNP Unit 2. Thus, there is reasonable assurance that the valves were capable of performing their primary safety function as well as maintaining an adequate heat sink for the primary side. Therefore, this event is not considered safety significant since the valves in question would have performed their function.

**Corrective Actions**

- 1) All affected safety valves were adjusted to within TS limits and satisfactorily retested.
- 2) I&M will continue to work with its vendors and industry peers to ensure it fully understands and addresses this condition, with expanded testing and adjustments to be performed as appropriate.

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**Previous Similar Events**

As noted in the analysis of event section of this Licensee Event Report, numerous MSSV high lift setpoint test failures throughout the industry were identified in a study completed through a tailored collaboration effort between EPRI, Altran, South Texas Project, and several other plants experiencing similar test failures that may be attributed to disc bonding. The study further concluded that the use of X-750 discs is an effective way to reduce the sticking problem. However, some surface bonding of the X-750 discs as a result of extended inservice periods may occur. I&M is aware of this phenomenon and continues to work with its vendors and industry peers to ensure it fully understands and addresses this condition. The following is a list of the recent similar events at CNP for the time period of January 1, 2004, through May 8, 2006.

Condition Report 05085048, Unit 1 Steam Generator OME-3-3 Safety Valve 1B failed the as-found set point test at the valve (high).