



Entergy Nuclear Operations, Inc.  
Palisades Nuclear Plant  
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December 22, 2008

10 CFR 50.73

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Palisades Nuclear Plant  
Docket 50-255  
License No. DPR-20

Licensee Event Report 08-007, Potential Loss of a Safety Function due to  
Non-Conservative Auxiliary Feedwater Trip Setpoints

Dear Sir or Madam:

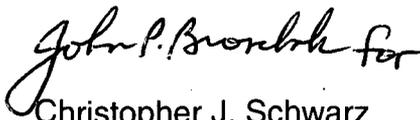
Licensee Event Report (LER) 08-007 is enclosed. The LER describes a condition that could have prevented fulfillment of a safety function due to non-conservative setpoints for the low suction pressure trip of the auxiliary feedwater pumps. The condition was first identified in the first quarter of 2006 as a potential issue. Subsequent evaluations and reviews were required to define the condition. The need to report this condition was not identified until the evaluations and reviews were completed.

This LER is being submitted in accordance with 10 CFR 50.73(a)(2)(v)(B).

Summary of Commitments

This letter contains one new commitment and no revisions to existing commitments.

ENO will provide a supplement containing an assessment of safety consequences by January 21, 2009.



Christopher J. Schwarz  
Site Vice President  
Palisades Nuclear Plant

Enclosure (1)

CC Administrator, Region III, USNRC  
Project Manager, Palisades, USNRC  
Resident Inspector, Palisades, USNRC

JED2  
NRR

**ENCLOSURE 1**

**LER 08-007**

**POTENTIAL LOSS OF A SAFETY FUNCTION DUE TO NON-CONSERVATIVE  
AUXILIARY FEEDWATER TRIP SETPOINTS**

4 Pages Follow

**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: 80 hours. 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.

<b>1. FACILITY NAME</b> PALISADES NUCLEAR PLANT	<b>2. DOCKET NUMBER</b> 05000255	<b>3. PAGE</b> 1 OF 4
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**4. TITLE**  
Potential Loss of a Safety Function due to Non-Conservative Auxiliary Feedwater Trip Setpoints

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	14	2008	2008	007	00	12	22	2008	FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b>  1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> (Check all that apply)											
	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input 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)
<b>10. POWER LEVEL</b>  100	<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 type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

**12. LICENSEE CONTACT FOR THIS LER**

FACILITY NAME Laurie Lahti	TELEPHONE NUMBER (Include Area Code) (269) 764-2788
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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
A	BA	TK	N/A	N					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO	<b>15. EXPECTED SUBMISSION DATE</b>	MONTH 01	DAY 21	YEAR 2009
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**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On October 14, 2008, after completing reviews of evaluations performed by Entergy Nuclear Operations, Inc. (ENO) engineering, the Nuclear Regulatory Commission (NRC) closed an unresolved issue related to potentially non-conservative setpoints for the low suction pressure trip (LSPT) of the auxiliary feedwater (AFW) pumps. The potentially non-conservative setpoints, which were first identified on February 13, 2006, could have existed at certain Condensate Storage Tank (CST) levels and AFW pump flow rates.

The CST is the normal suction source of the AFW pumps. In the extreme unlikelihood of a tornado (probability of 6.51 E-8 events per year), a tornado-generated missile could have caused a rupture near the bottom of the CST. The rupture may have allowed rapid draining of the CST, without completely emptying the tank. Subsequent automatic operation of the AFW pumps after a plant trip could have caused the onset of vortexing within the CST, leading to air entrainment in the auxiliary feedwater suction piping and pumps. This entrained air could have rendered the AFW pumps inoperable. Consequently, the AFW system may not have been capable of supplying the steam generators with Lake Michigan water, as outlined in the Palisades Nuclear Plant design basis.

This condition is being reported in accordance with 10 CFR 50.73(a)(2)(v)(D) as a condition that could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
PALISADES NUCLEAR PLANT	05000255	2008	- 007	- 00	2	OF 4

### EVENT DESCRIPTION

On October 14, 2008, after completing reviews of evaluations performed by Entergy Nuclear Operations, Inc. (ENO) engineering, the Nuclear Regulatory Commission (NRC) closed an unresolved issue related to potentially non-conservative setpoints for the low suction pressure trip (LSPT) of the auxiliary feedwater (AFW) pumps [P; BA]. The potentially non-conservative setpoints, which were first identified on February 13, 2006, could have existed at certain Condensate Storage Tank (CST) [TK] levels and AFW pump flow rates.

The CST is the normal suction source of the AFW pumps. In the extreme unlikelihood of a tornado (probability of 6.51 E-8 events per year), a tornado-generated missile could have caused a rupture near the bottom of the CST. The rupture may have allowed rapid draining of the CST, without completely emptying the tank. Subsequent automatic operation of the AFW pumps after a plant trip could have caused the onset of vortexing within the CST, leading to air entrainment in the auxiliary feedwater suction piping and pumps. This entrained air could have rendered the AFW pumps inoperable. Consequently, the AFW system may not have been capable of supplying the steam generators with Lake Michigan water, as outlined in the Palisades Nuclear Plant design basis.

This condition is being reported in accordance with 10 CFR 50.73(a)(2)(v)(D) as a condition that could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident.

### CAUSE OF THE EVENT

The CST provides the primary source of water to the AFW pumps. The AFW system is designed to provide a supply of feedwater to the steam generators during start-up operations and to remove primary system sensible heat during initial stages of shutdown operations.

In the original plant design, the CST and the AFW system were not intended to have a safety function. Therefore, the CST was not designed with barriers to protect it from tornado-generated missiles. However, in the early 1980's, the AFW system was upgraded from non-safety-related system to a safety-related system as a result of lessons learned from the accident at Three Mile Island.

After the upgrade, Palisades still did not rely on the CST to provide a safety-related source of water for the AFW pumps. Instead, Palisades credited the two alternate sources of water, the fire water system, and the service water system. Both sources draw water from Lake Michigan. Plant operators can manually align these sources of safety-related water to the suction piping of the AFW pumps.

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In 1982, the NRC reviewed the capability of the plant structures at Palisades to withstand tornado wind loads and tornado missile strikes per the Systematic Evaluation Program (SEP). In this evaluation, the NRC concluded that the CST and several other plant structures were not designed to resist tornado wind loads and were vulnerable to tornado missile strikes. However, the NRC concluded in the integrated SEP assessment that any damage to the CST would not adversely affect the shutdown capability of the plant due to the availability of backup water supplies. The AFW pumps were adequately protected against the loss of the CST and the loss of net positive suction head by LSPT devices. These devices protect the AFW pumps from a loss of net positive suction head.

In February 2006, ENO identified a potential error in the calculation used to ensure the AFW pumps are removed from service by the LSPT. In a scenario where a tornado missile strikes the CST near the bottom and causes a loss of inventory, the CST is postulated to drain down to a point just below the level of vortex formation. Assuming the tornado also causes a plant trip, the AFW pumps would sequentially start on a low steam generator level signal.

When an AFW pump starts, the level at which the LSPT actuates is down in the CST discharge piping. As the AFW pump speeds up, the LSPT actuation level travels upward toward the CST due to the increase in friction head loss as flow velocity increases. A vortex could form in the CST before the LSPT level reaches the CST level. The three AFW pumps could fail due to vortex-induced air entrainment before they are tripped by the LSPT.

The setpoints for the AFW LSPT were determined in a calculation that subtracted the friction head loss from the CST level static head. Although this was an appropriate formula, the flow rates used to determine friction head loss were based on a design basis AFW flow rate and may not be bounding under other circumstances in which AFW flow could be less than the design basis flow rate. This resulted in a calculated LSPT setpoint that was lower than that needed to protect the AFW pumps in a postulated tornado missile scenario.

In addition, follow-up reviews of other AFW evaluations were performed in March 2006. An evaluation to validate that an adequate water volume exists in the AFW suction piping, to ensure an air slug does not enter the pump before it has stopped after the LSPT, had a potential non-conservative assumption. The coastdown time was assumed to be 3.5 seconds for all three AFW pumps. However, the turbine-driven AFW pump takes 23 seconds to coast down, which means that more water would be pumped than assumed and the air slug could reach the AFW pump. As a result, in March 2006, a compensatory measure was established to ensure at least one AFW pump would remain available if the scenario described above occurred.

On October 14, 2008, after completing reviews of evaluations performed by ENO, the NRC closed the unresolved issue related to potentially non-conservative setpoints for the low suction pressure trip of the AFW pumps, which was first identified on February 13, 2006. On October 21, 2008, ENO determined that this represented a reportable condition.

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### CORRECTIVE ACTIONS

To address the issue, in March 2006, ENO implemented a compensatory measure to disable the automatic start of one, 100-percent capacity, AFW pump (P-8C) in the event of a tornado watch, warning, or sighting. Guidance for performing the compensatory measure was established in Off-Normal Procedure (ONP), ONP-12, "Acts of Nature." This is physically accomplished by placing the pump handswitch in the "off" position. With manual control of the AFW pump, plant operators can respond to a loss of the CST inventory by manually aligning service water from Lake Michigan to the suction of the AFW pump P-8C. This ensures that at least one AFW pump would remain available to supply water to the steam generators.

On December 9, 2008, as a final corrective action, construction of a tornado missile wall / barrier was completed on the west side of the CST. This barrier, together with other surrounding structures, provides a level of protection for the CST from certain tornado missiles. The compensatory measure was suspended at that time because it was no longer needed.

### ASSESSMENT OF SAFETY CONSEQUENCES

Assessment of safety consequences is not yet complete. ENO will provide a supplement containing an assessment of safety consequences by January 21, 2009.

### PREVIOUS SIMILAR EVENTS

None