



Kewaunee Nuclear Power Plant
Operated by Nuclear Management Company, LLC

May 25, 2005

NRC-05-067
10 CFR 50.73

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

Kewaunee Nuclear Power Plant
Docket 50-305
License No. DPR-43

Reportable Occurrence 2005-006-00

In accordance with the requirements of 10 CFR 50.73, "Licensee Event Report System", the enclosed Licensee Event Report (LER) for reportable occurrence 2005-006-00 is being submitted.

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

1. NMC will correct this design error, associated with the Auxiliary Feedwater Pump packing, before exceeding 350°F.

Michael G. Gaffney for

Michael G. Gaffney
Site Vice President, Kewaunee Nuclear Power Plant
Nuclear Management Company, LLC

Enclosure (1)

cc: Administrator, Region III, USNRC
Project Manager, Kewaunee, USNRC
Resident Inspector, Kewaunee, USNRC
INPO Records Center

JE22

ENCLOSURE 1
LICENSEE EVENT REPORT (LER)
2005-006-00

3 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 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, (3150-0066), 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.

FACILITY NAME (1) Kewaunee Nuclear Power Plant	DOCKET NUMBER (2) 05000305	PAGE (3) 1 of 3
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TITLE (4)
Auxiliary Feedwater Pumps Postulated to Fail due to Air Ingestion Through Pump Packing

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	26	2005	2005	-- 006 --	00	05	25	2005	FACILITY NAME	DOCKET NUMBER
OPERATING MODE (9)		N		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)(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)	x	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)		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)		

LICENSEE CONTACT FOR THIS LER (12)

NAME Gerald Riste	TELEPHONE NUMBER (Include Area Code) (920) 388-8424
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT

On March 26, 2005, while the Kewaunee Nuclear Power Plant (KNPP) was in the refueling shutdown mode, Nuclear Management Company, LLC, (NMC) personnel determined a potential may exist for damage to the Auxiliary Feedwater (AFW) pumps due to air ingestion through the pumps' packing glands. A conservative calculation has shown that during certain main steam line break post-accident conditions the pressure in the pump's inlet chamber can be sub-atmospheric for short periods. During those postulated short sub-atmospheric periods cooling and lubrication of the pump's packing would stop, air may flow through the packing and into the inlet chamber, potentially causing damage to the pump due to air entrainment. Communication with the pump's vendor indicates, "...the pump can handle up to 5% gas by volume without distress. At 20% gas by volume there is a good chance that the pump will lose prime and run gas bound. Seizure of the rotor would then occur almost immediately." Therefore, the potential existed that during certain post-accident conditions the inlet chamber pressure may become sub-atmospheric, which may cause sufficient damage to the pump's packing to allow air ingestion in to the pump, which may reach 20% where there is a good chance for the pump to lose prime and be damaged.

This event report does not constitute a safety system functional failure as this failure was found during the evaluation of the failure documented in KNPP LER 2005-002-00.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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

Event Description:

On March 26, 2005, while the Kewaunee Nuclear Power Plant (KNPP) was in the refueling shutdown mode, Nuclear Management Company, LLC, (NMC) personnel determined a potential existed for damage to the Auxiliary Feedwater (AFW) [AB] pumps [P] due to air ingestion through the pump's packing gland. A conservative calculation has shown that during certain main steam line break (MSLB) post-accident conditions the pressure in the pump's inlet chamber can be sub-atmospheric for short periods. During those short sub-atmospheric periods cooling and lubrication of the pump's packing would stop, air could flow through the packing and into the inlet chamber, causing damage to the pump due to air entrainment. Communication with the pump's vendor indicates, "...the pump can handle up to 5% gas by volume without distress. At 20% gas by volume there is a good chance that the pump will lose prime and run gas bound. Seizure of the rotor would then occur almost immediately."

The AFW pump shafts are sealed with mechanical packing and require a small amount of leak-off water to cool the packing and seal the pump. When the leak-off cooling water is lost, the packing can become damaged due to overheating. Damaged packing can cause an increase in the clearance between the packing and the shaft. If the inlet chamber conditions are sub-atmospheric, air could be drawn into the pump. In the case of KNPP's AFW pumps, air ingestion will potentially air bind then damage the pump. During operation of the AFW pumps under certain accident conditions, the pressure at the pump suction could go below atmospheric pressure. Consequently, the KNPP system design is potentially vulnerable to the AFW pumps ingesting air. As stated above, the AFW pump can handle up to 5% gas by volume without distress and at 20% gas by volume there is a good chance that the pump will lose prime and run gas bound. It is not currently known or easily calculated if the gap formed when the packing erodes will restrict air ingestion enough to keep the pump below 20% gas by volume during the period this condition is postulated to exist.

Event Analysis:

This event is being reported under § 50.73(a)(2)(v)(B) "Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to: (B) Remove residual heat." The plant had already been placed in a shutdown condition where AFW system was not required to be operable at the time of discovery. Therefore, no 10 CFR 50.72 event notification was made.

This condition was postulated to occur during conditions of high flow rates through the AFW pumps. A conservative calculation was performed to determine if the AFW pump suction pressure could drop below atmospheric pressure during postulated accidents. The limiting accident assumed was a main steam line break (MSLB) where the faulted steam generator (SG) immediately depressurized. The analysis assumed the AFW pumps could be operated as directed by the Integrated Plant Emergency Operating Procedures (IPEOP's) and during multiple single failure events. This analysis determined that the worst-case scenario assumed a MSLB in either SG with all pumps operating. The result of the worst-case scenario shows that the AFW pump suction pressure is sub-atmospheric for 7 minutes. The limiting AFW pumps suction pressure starts at 0.26 psig and decreases to 0.0 psig in 2.2 minutes. Subsequently the suction pressure decreases to a minimum pressure of -0.81 psig where the turbine driven (TD) AFW pump is stopped, as directed by the IPEOP's, and suction pressure increases to greater than atmospheric.

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

There is a very low safety significance associated with this event. The risk significance is very low (less than 1E-7/year core damage frequency), because it only applies to a steam line break with initial condensate storage tank level of 68% or less. Historical data has shown that Kewaunee operates with CST levels below 68% less than 0.2% of the time.

Cause:

The cause of the event was a previously undetected original system design error. Had the sub-atmospheric inlet chamber pressure condition been postulated during original construction the design of the AFW system components could have been modified to account for the sub-atmospheric condition.

Corrective Actions:

NMC will correct this design error, associated with the Auxiliary Feedwater pump packing, before exceeding 350 degree F.

Similar Events:

LER 2005-002, Auxiliary Feedwater Pumps Assumed to Fail from Postulated Loss of Primary Water Source – Safe Shutdown and Accident Analysis Assumptions Not Assured – Inadequate Design of Pump Protective Equipment