Consumers Energy

A CMS Energy Company

Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

March 23, 2000

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

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT
LICENSEE EVENT REPORT 99-003-01, REDUCTION IN SERVICE WATER FLOW THROUGH CONTAINMENT AIR COOLERS VHX-1 AND VHX-2

Supplemental Licensee Event Report (LER) 99-003-01 is attached. This event was reported to the NRC on November 30, 1999, in accordance with 10CFR50.73 (a)(2)(i)(B), as a condition prohibited by Technical Specifications. At the time the LER was submitted, an analysis of the event considering the impact of reduced flow through two Containment Air Coolers was in progress. The results of the analysis were to be provided in a supplemental LER. The enclosed supplemental LER reflects the results of the evaluation.

SUMMARY OF COMMITMENTS

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

Douglas E. Cooper
Plant General Manager

CC Administrator, Region III, USNRC
Project Manager, NRR, USNRC
NRC Resident Inspector - Palisades

Attachment

IE22

NRC FORM 366 (6-1998) 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

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TITLE (4)
REDUCTION IN SERVICE WATER FLOW THROUGH CONTAINMENT AIR COOLERS VHX-1 AND VHX-2

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
10	31	1999	1999 --	003 --	01	03	23	2000	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	000		20.2201(b)		20.2203(a)(2)(v)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)
			20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
			20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
			20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Kenneth E. Marbaugh, Licensing Engineer	(616) 764-2195

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
X	BI	V	A391 V085	Y					

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)**

On October 31, 1999, with the plant in Refueling Shutdown, the Containment Air Cooler (CAC) service water discharge check valves associated with CACs VHX-1, VHX-2 and VHX-3 were discovered to have incurred severe damage to their internal components, including detachment of the check valve disc from the disc arm. For CACs VHX-1 and VHX-2, the disc itself was found in both cases to be wedged in the respective check valve outlet port in an orientation which was largely obstructing the outlet. For CAC VHX-3, the disc was found in the bottom of the valve, and did not restrict flow or affect operability of this CAC. As a result of the associated reduction in service water flow, CACs VHX-1 and VHX-2 may have been inoperable for a period of time in excess of the Technical Specification allowed outage time for this equipment. In accordance with this assumption, this occurrence is reportable pursuant to 10CFR50.73 (a)(2)(i)(B), as a condition prohibited by Technical Specifications. The excessive wear of the check valve internals was caused by disc fluttering as a consequence of the relatively low service water flow through the check valves which is experienced during normal plant operation. Each of the check valves has been refurbished and enhancements have been incorporated to provide a high degree of confidence that the check valves will remain intact for the duration of the forthcoming operating cycle. An operating change has been implemented to increase service water flow through the check valves to minimize fluttering of the internals and reduce the potential for excess wear.

EVENT DESCRIPTION

On October 31, 1999, with the plant in Refueling Shutdown, visual examination of Containment Air Cooler (CAC) [CLR] service water [BI] discharge check valves [V] (CK-SW407, CK-SW408, CK-SW409 and CK-SW410) was performed. This examination revealed significant damage to three of the four check valves' internal components, including detachment of the check valve disc from the disc arm in these check valves. Two of the detached discs were found wedged in their respective check valve outlet ports, largely blocking the valve outlets in the service water flow path associated with CACs VHX-1 and VHX-2. The other detached disc was found in the bottom of its valve body, in a non-obstructing orientation that did not adversely affect flow for CAC VHX-3. The fourth check valve, associated with non-safety related CAC VHX-4, was intact. CK-SW407 (VHX-1) is an Anchor-Darling, 8 inch, 150 psi, bonnet hung swing check valve; CK-SW408 (VHX-2) is an Anchor-Darling, 8 inch, 150 psi, swing check valve with lever arm; CK-SW-409 (VHX-3) is a Velan Valve, 8 inch, 150 psi, swing check valve, model number 00114B-02TS.

Technical Specification 3.4.1 (a) requires that the reactor shall not be made critical unless CACs V-1A (VHX-1), V-2A (VHX-2) and V-3A (VHX-3) are operable. Technical Specification 3.4.3 allows two CACs to be simultaneously inoperable for no more than 24 hours. Based upon the as-found condition of the check valves, CACs VHX-1 and VHX-2 may have been inoperable for a period of time in excess of the allowed outage time. In accordance with the above assumption, this occurrence is reportable pursuant to 10CFR50.73 (a)(2)(i)(B), as a condition prohibited by Technical Specifications.

ANALYSIS OF EVENT

On September 15, 1999, a sudden unexplained drop of approximately 400 gpm was indicated on containment service water flow instrumentation. This reduction in indicated flow was regarded at the time as most likely the result of variance in the indication. Further evaluation concluded that normal system changes, ongoing testing, and declining lake water temperature could have accounted for the indicated flow variation. This resulted in Operators considering the indication valid and reasonably deciding no additional actions were required at that time. It now appears likely that this was the time of occurrence of the failure of either CK-SW407 (VHX-1) or CK-SW408 (VHX-2). Prior to September 15, 1999, overall service water flow indication to containment had remained at expected values even though it can now be presumed that one of the two check valves had already failed prior to September 15, 1999.

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

Evaluation of this event also noted that CK-SW407 had been replaced in 1990 and 1995, CK-SW408 had been replaced in 1990 and 1996, and CK-SW409 had been replaced in 1990; in each case for conditions similar to those found in 1999. These represented missed opportunities to identify and fully resolve the root cause as it is now understood.

The safety function of each check valve is to remain open in order to pass a minimum of 1600 gpm of service water flow through its respective CAC to limit post accident containment pressure and temperature. Despite the as-found condition of CK-SW407 and CK-SW408, they were observed during non-intrusive check valve testing on October 29, 1999, to be capable of passing significant flow. Indicated flow in this non-accident service water alignment through VHX-1 and VHX-2 was observed at 1450 gpm and 700 gpm, respectively. These flow observations suggest that CACs VHX-1 and VHX-2 may have retained a substantial portion of their required capability, even if unable to be regarded as operable with a verifiable flow rate in excess of 1600 gpm to each under accident service water flow conditions.

SAFETY SIGNIFICANCE

There was minimal safety significance associated with this occurrence.

The limiting analyzed scenario with respect to adverse containment parameters is the response to a postulated Main Steam Line Break (MSLB) event. The Basis for Technical Specification 3.4 credits either 1) a train consisting of a single containment spray pump and three CACs, or 2) a train consisting of two containment spray pumps, as providing adequate containment cooling for a MSLB. The conditions described in this LER did not affect operability of any containment spray pumps. Thus, at worst, only one of the two trains of containment cooling was affected.

Based on as-found check valve conditions, heat removal capacities of the two restricted-flow CACs were estimated to have been reduced to 75% (VHX-1) and 50% (VHX-2) of normal. Combined with the remaining operable CAC, it may have been possible that the equivalent of about two CACs' heat removal capacity was available. However, it can be postulated that the reduced service water flows, coupled with high containment atmosphere temperatures early in the MSLB, could have resulted in service water reaching or exceeding saturation in the two CACs or downstream piping. The effect of steam voiding on heat removal capability in this configuration has not been analyzed.

Conservatively assuming that the second train of two spray pumps would be inoperable, a sensitivity study was performed to determine the effect on peak containment pressure of having the heat removal capacity of the first train with zero, one, two and three CACs available (with the remaining containment spray pump). The study resulted in a maximum containment pressure of 56.6 psig for the zero cooler case. The case with one CAC available resulted in a maximum containment pressure of 55.6 psig, two CACs in 54.6 psig, and three CACs in 53.6 psig. Containment design pressure is 55 psig. Although the zero and one CAC cases resulted in conservatively calculated peak pressures that slightly exceed design, a 1991 analysis determined the compound lower bound ultimate pressure capacity of the containment structure to be 112 psig. In addition, following closure of the steam generator replacement opening in 1991, the containment was proof tested to 115% of the 55 psig design pressure (63.25 psig) with no observable detrimental effects. Thus, even assuming no CACs available to mitigate MSLB effects, it is reasonable to conclude that the resulting peak containment pressure would be well within the structure's ultimate capacity. In addition, except for brief periods during required quarterly testing, the second train of MSLB mitigation equipment (two spray pumps) would have been available.

ROOT CAUSE

The excessive wear of the check valve internals was caused by disc fluttering as a consequence of the relatively low service water flow through the check valves which is experienced during normal plant operation. The normal flow rate through a CAC with its accident condition high capacity outlet valve closed is only approximately 1000 gpm. The flow rate needed to maintain the check valves in the full open position has been calculated to be approximately 1300 gpm.

CORRECTIVE ACTIONS TAKEN

Each of the check valves has been refurbished and enhancements have been incorporated to provide a high degree of confidence that the check valves will remain intact for the duration of the forthcoming operating cycle.

An operating change has been implemented to increase service water flow through the check valves to minimize fluttering of the internals and reduce the potential for excess wear.