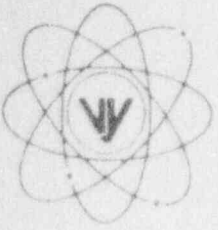


VERMONT YANKEE NUCLEAR POWER CORPORATION



P.O. Box 157, Governor Hunt Road
Vernon, Vermont 05354-0157
(802) 257-7711

January 7, 1994

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

REFERENCE: Operating License DPR-28
Docket No. 50-271
Reportable Occurrence No. LER 93-015, Supplement 1

Dear Sirs:

As defined by 10 CFR 50.73, we are reporting the attached Reportable Occurrence as LER 93-015, Supplement 1.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Robert J. Wanczyk
Plant Manager

cc: Regional Administrator
USNRC
Region I
475 Allendale Road
King of Prussia, PA 19406

190041

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REPORT: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-350), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20603.

FACILITY NAME (1) VERMONT YANKEE NUCLEAR POWER STATION										DOCKET NO. (2) 0 5 0 0 0 2 7 1				PAGE (3) 0 1 OF 0 5															
TITLE (4) LOW PRESSURE CORE SPRAY SUCTION STRAINERS FOUND TO BE OF DIFFERENT SIZE THAN PREVIOUSLY ASSUMED																													
EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)																			
MONTH	DAY	YEAR	YEAR	SEQ #	REV #	MONTH	DAY	YEAR	FACILITY NAMES		DOCKET NO. (S)																		
1	0	0	8	9	3	9	3	-	0	1	5	-	0	1	0	1	0	7	9	4			0	5	0	0	0		
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO REQ'MTS OF 10 CFR §: CHECK ONE OR MORE (11)																											
POWER LEVEL (10)		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)																					
0 0 0		20.405(a)(1)(i)		50.36(c)(1)		X 50.73(a)(2)(v)		73.71(c)																					
		20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER:																					
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		20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)																							
		20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)																							
LICENSEE CONTACT FOR THIS LER (12)																													
NAME ROBERT J. WANCZYK, PLANT MANAGER										TELEPHONE NO. AREA CODE 8 0 2 2 5 7 - 7 7 1 1																			
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																													
CAUSE	SYST	COMPONENT	MFR	REPORTABLE TO NPRDS	CAUSE	SYST	COMPONENT	MFR	REPORTABLE TO NPRDS	CAUSE	SYST	COMPONENT	MFR	REPORTABLE TO NPRDS												
NA					NA					NA																
NA					NA					NA																
SUPPLEMENTAL REPORT EXPECTED (14)										EXPECTED SUBMISSION DATE (15)		MO	DAY	YR															
<input type="checkbox"/> YES (if yes, complete EXPECTED SUBMISSION DATE)										<input checked="" type="checkbox"/> NO																			

ABSTRACT (Limit to 1400 spaces, i.e., approx. fifteen single-space typewritten lines) (16)

During the 1993 Refueling Outage, inspections of the Low Pressure Core Spray (ELIS=BM) suction strainers were performed to respond to a BWR Owners Group request for information. On 10/08/93, it was identified that the size of the strainers was smaller than that assumed in the calculations of record.

The Low Pressure Core Spray Systems were not required to be operable at the time of the discovery. The suction strainers were replaced with larger strainers on 10/13/93 and 10/14/93, prior to returning the Low Pressure Core Spray Systems to operation.

The root cause for this event has been determined to be the use of unverified information on the size of the suction strainers in an NPSH analysis performed in 1986. This resulted in an incorrect conclusion that the strainers were of adequate size such that sufficient pump net positive suction head (NPSH) existed when post Loss of Coolant Accident (LOCA) debris loading was considered.

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TEXT CONTINUATION

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		YEAR		SEQ #		REV #									
VERMONT YANKEE NUCLEAR POWER CORPORATION	05000271	9	3	-	0	1	5	-	0	1	0	2	OF	0	5

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

DESCRIPTION OF EVENT

During the 1985 and 1986 Recirculation Piping Replacement Outage, the mirror insulation on the Recirculation (EIS=AD) and Residual Heat Removal (RHR)(EIS=BO) system piping was replaced with Owens-Corning NUKON insulation. This material is a low density fiberglass wool with a cover of woven fiberglass. A postulated concern with fiberglass insulation is that fibrous debris formed during a LOCA may possibly migrate to the intakes of the Emergency Core Cooling System (ECCS) pumps. Should the fibrous debris build up on the suction strainers, NPSH could be reduced to the point where pump cavitation results, thereby impairing the cooling ability of the ECCS Systems.

Due to this concern, analyses were performed in 1986 to determine the effect of the change to NUKON insulation at Vermont Yankee. The analyses were performed in accordance with the procedures outlined in Regulatory Guide 1.82, Rev. 1, and NUREG 0897, Rev. 1. Calculations were made of the volume of debris generated, the short and long term transport of debris to the Torus, the head loss through a layer of debris on the ECCS suction strainers, and the resulting reduction in pump NPSH from "clean screen" conditions. The analyses, performed by General Electric, concluded that the RHR suction strainers were undersized and required replacement, but that the Low Pressure Core Spray (LPCS)(EIS=BM) suction strainers were adequately sized. The RHR suction strainers were replaced during the Recirculation Piping Replacement Outage.

The General Electric analysis report stated that the conclusions regarding both the RHR and LPCS suction strainers were based on estimated strainer sizes. This is because no detailed prints were found for either the existing RHR or LPCS suction strainers. The sizes were scaled from other drawings and sources of information available at the time. The General Electric analysis report identified the LPCS suction strainers as having an estimated surface area of 9.8 square feet, with 9.0 square feet required for the postulated debris loading.

The use of estimates by General Electric was identified by engineering personnel and the need to obtain "as-built" information was identified in internal engineering memos prepared in 1986. However, this need was not clearly communicated to the installation department. The information that was requested of the installation department was for interference data for the newly proposed RHR suction strainers and configuration data for both the RHR and LPCS suction penetrations. The interference data was requested to ensure that the new larger RHR suction strainers would fit in the Torus as designed. The configuration data was taken for both the RHR and the LPCS penetrations to update Torus structural calculations.

Although information on the size of the LPCS suction strainers was not requested, cryptic information was provided on the penetration configuration data sheets. This information consisted of notes and sketches which incorrectly identified the LPCS suction strainers as being of two different sizes. No indication of an independent review of this data has been found.

The information provided on the penetration configuration data sheets was used to update the Torus structural calculations in 1986. During preparation of the calculations, it was identified that two different sizes were provided for the LPCS suction strainers. To provide conservative results for the structural calculations, the larger of the two sizes was used. The calculations contained a calculational sketch of the LPCS penetration configuration, but showed only the larger size suction strainers. The fact that two different sizes may exist was identified in the calculations, but only as a note rather than an assumption.

Verification to ensure that the surface area of the LPCS suction strainers allowed for sufficient pump NPSH under the postulated debris loading were not performed in 1986. This was due to the previously mentioned failure to formally communicate the need to obtain "as-built" information to verify the General Electric estimates. As part of an analysis of the potential impact of paint chips on the suction strainers in 1989, NPSH calculations were performed.

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

DESCRIPTION OF EVENT (Continued)

However, the 1989 calculations used the calculation drawing of the LPCS penetration configuration provided in the 1986 Torus structural calculations as input. This led to a failure to identify that two different sizes may exist and the non-conservative use of the larger size. The use of non-conservative input data resulted in the conclusion that the surface area for each LPCS penetration was 10.75 square feet, greater than the 9.0 square feet minimum required by the 1986 General Electric analyses.

On 10/01/93 and 10/07/93, during the 1993 Refueling Outage, inspections of the LPCS suction strainers were performed to respond to a BWR Owners Group request for information. On 10/08/93, it was identified that the size of the strainers was smaller than that assumed in the 1986 and the 1989 calculations. These inspections identified the surface area for each LPCS penetration as 7.8 square feet. This surface area allows for sufficient pump NPSH under "clean screen" conditions, but is less than the 9.0 square feet minimum required for the postulated debris loading.

CAUSE OF EVENT

The root cause of this event was the failure to properly verify and document the design of the LPCS suction strainers in 1986. Proper data sheets were not prepared or used to record the strainer dimensions. Nor was the apparently contradictory information that was gathered properly resolved.

A contributing cause was the failure to clearly note on the strainer calculational sketch how it was produced from the available data.

ANALYSIS OF EVENT

In the unlikely event that a large break LOCA occurred in the primary containment, and if fibrous debris built up on the LPCS suction strainers to the amount calculated using the procedures outlined in Regulatory Guide 1.82, Rev. 1, and NUREG 0897, Rev. 1, then pump NPSH may have been reduced to the point where pump cavitation resulted. This would have impaired the core cooling capability of the LPCS Systems.

To evaluate the safety significance of this event a review of the design analysis was conducted. This review revealed that there are several significant conservatisms in the analysis:

1. Post accident primary containment pressure is assumed as 0 psig for the purposes of the analysis. Review of the LPCS pump NPSH requirements indicates that 1 1/2 to 2 psig of containment overpressure would provide the necessary NPSH. Post accident pressures are an order of magnitude higher than this required value.

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ANALYSIS OF EVENT (Continued)

- The insulation destruction zones assumed are based on PWR pressures, which are approximately twice the pressure of a BWR. Therefore, for a BWR, the extreme end of the destruction zone would be closer to the break and a smaller volume of destroyed insulation debris would be realized.
- The analysis takes credit for only a small amount of insulation captured in the drywell. The path from the area of destruction, through the densely packed drywell, around the missile barriers, and through the torus distribution header provides enough direction changes to capture a larger amount of the insulation.

Given the significant conservatisms in the design analysis it is very likely that the LPCS system would have performed its design basis function in the event a design basis accident occurred.

CORRECTIVE ACTIONS

Immediate:

- The LPCS suction strainers were replaced with larger strainers on 10/13/93 and 10/14/93, prior to returning the LPCS systems to operation. The replacement strainers have a surface area of 24.4 square feet for each penetration providing adequate NPSH under severe debris loading. The applicable calculations and analysis were updated and engineering drawings of the new strainers were produced.
- As-built measurements were taken for the RHR, High Pressure Coolant Injection (EIS=BJ) and Reactor Core Isolation Cooling (EIS=BN) suction strainers. These strainers were verified to be correctly sized to meet design requirements.
- Visual inspections were performed on the above mentioned strainers and of the torus bottom. The strainers were in good condition with no visible debris loading and no debris was found on the torus bottom.

Subsequent:

- A revision to the procedures for preparation of engineering calculations and analyses will be performed to provide specific instructions on obtaining input data. Input data should be obtained directly from verified or QA sources. Where unverified data is used, it will be specifically noted with follow up action assigned as appropriate. These actions are expected to be completed on or before May 1994.
- Training on the lessons learned from this event relative to use of informally gathered data and differences in what would be conservative assumptions for different calculations was provided to engineering personnel.
- A sample of selected calculations was reviewed to determine if similar problems existed elsewhere. No similar problems were found. A review of calculations from the time period of this event was included.
- A review of industry and other Vermont Yankee events was performed. No similar events were identified.
- The applicable design calculations and analyses were updated to include the proper "as-built" information.

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ADDITIONAL INFORMATION

No similar events have been reported to the Commission in the last five years.