

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) VERMONT YANKEE NUCLEAR POWER STATION	DOCKET NUMBER (2) 0 5 0 0 0 2 7 1	PAGE (3) 1 OF 0 1 3
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TITLE (4)
Qualification Failure of Hydrogen/Oxygen Analyzer Parts

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 NAMES		DOCKET NUMBER(S)
0 1	2 8	8 6	8 6	0 0 2	0 0 0	2 2	7 8	8 6	None		0 5 0 0 0
									None		0 5 0 0 0

OPERATING MODE (9) _____

POWER LEVEL (10) 0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	20.406(a)	80.73(a)(2)(iv)	73.71(b)
20.406(a)(1)(i)	80.38(a)(1)	<input checked="" type="checkbox"/> 80.73(a)(2)(v)	73.71(a)
20.406(a)(1)(ii)	80.38(a)(2)	80.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 388A)
20.406(a)(1)(iii)	80.73(a)(2)(i)	80.73(a)(2)(vii)(A)	
20.406(a)(1)(iv)	80.73(a)(2)(ii)	80.73(a)(2)(vii)(B)	
20.406(a)(1)(v)	80.73(a)(2)(iii)	80.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME James P. Pelletier, Plant Manager	TELEPHONE NUMBER	
	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	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS
				N					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If you complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

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

During an engineering review of radiation exposure calculations affecting the containment hydrogen/oxygen analyzer internal parts, an error was discovered in the original calculations which underpredicted the postulated radiation exposure.

Subsequent evaluation revealed that the Viton and Teflon components within the analyzer could not survive the design basis loss of coolant accident radiation exposure for environmental qualification. Vermont Yankee and Yankee Nuclear Services Division are currently preparing appropriate design documents to replace the Viton and Teflon with qualified material.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (if more space is required, use additional NRC Form 366A's) (17)

DESCRIPTION OF EVENT

The hydrogen/oxygen analyzer at Vermont Yankee is used to monitor primary containment hydrogen and oxygen concentrations following a loss of coolant accident. This analyzer is required to be qualified in accordance with Regulatory Guide 1.97 and Vermont Yankee's Environmental Qualification Program. Vermont Yankee's present Environmental Qualification Program requires this to be qualified for one year post loss of coolant accident (LOCA).

During a review of the exposure calculations for the hydrogen/oxygen analyzer at Rowe Yankee, it became apparent that the method used by Yankee Nuclear Services Division to calculate the exposure (the same method as was used for Vermont Yankee) was incorrect. The initial method used was to calculate the exposure based on a planar source model. This method was subsequently judged not to be conservative. Additionally, a mathematical error was made.

A different method, using a hemispherical source to calculate the exposure was used to correct the calculation and to ensure its conservatism. Also the mathematical error was corrected. The integrated exposure at 30 days, using the new method and correcting the calculation error, is 1.3×10^7 Rads for the pump diaphragms and 1.7×10^7 Rads for the regulator diaphragms. This proved to be greater than the original exposure. This error was identified on 1/28/86 in a memo received from Yankee Nuclear Services Division.

CAUSE

As stated previously, Yankee Nuclear Services Division made an invalid assumption in using a planar source to calculate the exposure to the affected parts and also made a mathematical error regarding the amount of fuel inventory in the core. These mistakes resulted in a projected exposure that initially showed that no adverse effects from radiation would impact the analyzer parts. Subsequent review and correction of the calculation resulted in an exposure level that exceeded the limit for using Viton and Teflon materials.

ANALYSIS

If a loss of coolant accident had occurred, the analyzer pump diaphragms would have been subjected to an exposure of 1.3×10^7 Rads and the regulator diaphragms would have been subjected to an exposure of 1.7×10^7 Rads in thirty days. Had this occurred, the analyzer may have failed within the 30 day period (Viton cannot be used in dynamic applications above 1×10^7 Rads). This might have resulted in both analyzers failing and no hydrogen or oxygen concentration readouts being available to the operators, from installed instrumentation. In accordance with a General Electric Report Nuclear Energy Division Operations (NEDO) 22155, the containment atmospheric mixture would be stable after approximately 12 hours during which time the operators could use the information to add nitrogen to the containment to prevent the hydrogen/oxygen mixture from reaching the explosive or flammable range.

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TEXT (If more space is required, use additional NRC Form 388A's) (17)

Additionally, in accordance with Vermont Yankee Operating Procedures if the hydrogen/oxygen analyzers become inoperable, the operators are instructed by procedure to have a grab sample taken from remote piping outside the Reactor Building, and analyzed to determine the hydrogen and oxygen concentration. Based on the results, the operators could take the necessary action to prevent the containment hydrogen/oxygen atmosphere from reaching the explosive or flammable range.

Considering these facts, failure of the analyzers would not have prevented the operators from taking the appropriate actions to prevent a flammable or explosive hydrogen/oxygen atmosphere inside the containment with potential subsequent release of radioactive materials. Therefore there were no adverse consequences to public health and safety.

CORRECTIVE ACTION

Using the revised results and the one year post-LOCA operability assumption, it was determined that the Viton material used for the pump and regulator diaphragms would receive an exposure in excess of the qualification limits. As Viton is not acceptable for use in dynamic applications above 1×10^7 Rads, it was determined that these items would be replaced with diaphragms manufactured of Nordel/Nomex material and gaskets manufactured of Lexide material; both are qualified to 2×10^8 Rads. Additionally, the adjusting vanes in the alarm units are manufactured of Teflon which is not acceptable for use above an exposure of 1×10^5 Rads. These alarm units will be replaced with alarm units that have stainless steel adjusting vanes. The 30 day dose for these new materials is 1.3×10^7 Rads for the pump diaphragms and 1.7×10^7 Rads for the regulator diaphragms which is below the dose this material is qualified for.

Following the discovery and subsequent correction of the calculations, it was determined that the hydrogen/oxygen analyzer need only to function 30 days post loss of coolant accident instead of the original assumption of one year. This is based on a General Electric report Nuclear Energy Division Operations (NEDO) 22155 that states that approximately 12 hours after an accident the containment will have a stable atmospheric mixture and therefore the need to have an installed monitor for 30 days is a conservative approach.

As previously stated, Vermont Yankee will order the qualified replacement parts from the vendor. When these parts are received, they will be installed in the analyzer and analyzer spare parts. This replacement of parts will take place prior to the startup from the 1985/86 outage.

A review by Yankee Nuclear Services Division of other similar Yankee Nuclear Services Division calculations has been performed which shows that this error is an isolated case.

No previous similar occurrences have been reported in the past five years.



VERMONT YANKEE NUCLEAR POWER CORPORATION

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February 27, 1986

VYV #86-050

U.S. Nuclear Regulatory Commission
Document No. 50-271
Washington, D.C. 20555

REFERENCE: Operating License DPR-28
Docket No. 50-271
Reportable Occurrence No. LER 86-02

Dear Sirs:

As defined by 10CFR50.73, we are reporting the attached Reportable Occurrence as LER 86-02.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

James P. Pelletier
Plant Manager

HMM/drc

cc: Regional Administrator
USNRC Office of Inspection and Enforcement
Region I
631 Park Avenue
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