VERMONT YANKEE
NUCLEAR POWER CORPORATION

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Feb. 27, 1998
BVY 98-029

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

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
Reportable Occurrence No. LER 98-02, Rev. 0

As defined by 10CFR50.73, we are reporting the attached Reportable Occurrence as LER 98-02, Rev. 0.

Sincerely,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Gregory A. Maret
Plant Manager

cc: USNRC Region I Administrator
USNRC Resident Inspector - VYNPS
USNRC Project Manager - VYNPS
VT Department of Public Service

IE22

NRC Form 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION LICENSEE EVENT REPORT (LER)	APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98 ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND 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.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
VERMONT YANKEE NUCLEAR POWER STATION	05000271	01 OF 4

TITLE (4) Lack of Specificity in Licensing Basis Documents Results in Operating Procedures Which Do Not Adequately Address Pump Minimum Flow Requirements as Described in IEB 88-04 Due to Instrument Inaccuracies.

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 NO.(S) 05000
02	05	98	98	-- 002 --	00	02	27	98	N/A	

OPERATING MODE (9)	N
POWER LEVEL (10)	94

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: CHECK ONE OR MORE (11)

	20.2201(b)		20.2203(a)(2)(v)		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)	X	50.73(a)(2)(v)		
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NO. (Include Area Code)
GREGORY A. MARET, PLANT MANAGER	802-257-7711

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
NA					NA				
NA					NA				

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MO	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 02/05/98, Vermont Yankee, while evaluating concerns noted during an NRC architect engineer inspection of the facility, concluded that the 1988 disposition of questions raised regarding Emergency Core Cooling System pump minimum flow requirements was inadequate. In the disposition of IEB 88-04, Vermont Yankee had credited operator action for providing minimum flow requirements and added a precaution in the affected procedures - citing the need to promptly achieve the flowrate prescribed by the vendor. Crediting operator control of some safety systems in the performance of their safety functions (after the first 10 minutes of the onset of an event) is consistent with the general assumptions documented in the VY Final Safety Analysis Report. However, the flowrate prescribed within the procedure had been taken directly from the vendor recommendation without considering the indication instrument loop accuracy. Due to the failure to prescribe an indicated flow in the procedure which would have assured that actual flows established met vendor recommendations, the operability of the Core Spray and RHR Systems during extended minimum flow conditions was called into question.The failure to consider instrument loop accuracies in the procedure was caused by the ambiguity of VY's current licensing basis documentation in its treatment of instrument accuracy considerations. Subsequent evaluations assessing industry operating experience in combination with system "as-built conditions," and those configurations allowed by plant Operating, and Emergency Operating Procedures have demonstrated that the as-built minimum flow protection is adequate to ensure the fulfillment of the pertinent safety function. Therefore this event is not considered to have increased the risk to public health or safety.

DESCRIPTION OF EVENT

On 02/05/98, Vermont Yankee, while evaluating concerns noted during an NRC architect engineer inspection of the facility, concluded that the 1988 disposition of questions raised regarding Emergency Core Cooling System pump minimum flow requirements was inadequate. The Vermont Yankee plant was operating at 94% of rated thermal power. In the disposition of IEB 88-04, Vermont Yankee had credited operator action for providing minimum flow requirements and added a precaution in the affected procedures - citing the need to promptly achieve the flowrate prescribed by the vendor. Crediting operator control of some safety systems in the performance of their safety functions (after the first 10 minutes of the onset of an event) is consistent with the general assumptions documented in the VY Final Safety Analysis Report. However, the flowrate prescribed within the procedure had been taken directly from the vendor recommendation without considering the indication instrument loop accuracy. Due to the failure to prescribe an indicated flow in the procedure which would have assured that actual flows established met vendor recommendations, the operability of the Core Spray and Residual Heat Removal Systems during extended minimum flow conditions was called into question.

CAUSES OF EVENT

The apparent cause for this event is the ambiguity of VY's current licensing basis documentation in its treatment of instrument accuracy considerations.

ANALYSIS OF EVENT

The Safety Objectives of the Residual Heat Removal System (RHRS, EIIS=BO) as described in the VY FSAR are:

1. To restore and maintain the coolant inventory in the reactor vessel so that the core is adequately cooled after a loss-of-coolant accident.

2. To provide cooling for the suppression pool so that condensation of the steam resulting from the blowdown due to the design basis loss-of-coolant accident is ensured.

3. To extend the redundancy of the Core Standby Cooling Systems (CSCS) by provision of containment cooling.

The following Safety Design Bases are listed in the VY FSAR in support of the aforementioned safety objectives for the RHRS:

1. The RHRS shall act automatically, in combination with other CSCS, to restore and maintain the coolant inventory in the reactor vessel such that the core is adequately cooled to limit fuel cladding damage following a design basis loss-of-coolant accident.

2. The RHRS shall be capable of providing flow from the suppression pool to spray headers in the drywell and torus when required to maintain pressures and temperatures within design limits.

The Safety Objectives of the Core Spray system (as a portion of the CSCS, EIIS=BM) as described in the VY FSAR is as follows: the objective of the CSCS, in conjunction with the primary and secondary containments, is to limit the release of radioactive materials to the environs following a loss-of-coolant accident; so that resulting radiation exposures are kept to a practical minimum and are within the guideline values given in 10CFR100; and to meet the requirements of 10CFR50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors."

The following Safety Design Bases are those listed in the VY FSAR in support of the aforementioned safety objectives for the CSCS, some portion of which is met by the Core Spray (CS) and RHR systems. Some CSCS safety design bases have not been

included, as they are not potentially affected by pump minimum flow protection.

1. To provide adequate cooling of the reactor core under abnormal and accident conditions, various cooling systems shall be provided of such number, diversity, reliability, and redundancy that only a highly improbable combination of events could result in inadequate cooling of the core.

2. In the event of a loss-of-coolant accident, the CSCS shall remove the residual stored heat and heat from radioactive decay from the reactor core at such a rate that the requirements of 10CFR50.46 are met.

3. The CSCS shall provide for continuity of core cooling over the complete range of postulated break sizes in the nuclear system process barrier.

4. Operation of the CSCS shall be initiated regardless of the availability of off-site power supplies and the normal generating system of the station.

A review of IEB 88-04 and technical documentation reveals that the issues of concern in the IEB are two-fold. Firstly, the issue of inadequate pump heat removal, and the resulting rapid failure was a concern for plant configurations where two pumps recirculated via a common minimum flow line. The concern being that the pump with the higher discharge head may provide all of the flow through the recirculation line while the other pump produces essentially no flow and rapidly overheats and fails. The disposition of that portion of the IEB has not been challenged.

A second issue relating to pump minimum flow was also identified in the cited IEB. That issue involves operation of centrifugal pumps at flowrates significantly lower than their Best Efficiency Point (BEP). Testing had shown that pumps operated at flowrates less than 30-50% of their BEP had shown higher failure frequencies (higher unavailability). While experts seem to disagree about the primary mechanism involved there appears to be consensus that flowrates beneath 30-50% of BEP would result in shortened bearing and seal life as well as accelerating other operation-induced failures. The common link in the varying theories postulated regarding the mechanism was that each attempted to explain the vibration profiles of centrifugal pumps operating from a shut-off head condition to points approaching run-out. It is the increased vibration which accelerates various forms of failure, thus reducing pump availability. Unlike the loss of pump heat removal capability, the failure to meet minimum flow requirements relating to these elevated vibration levels is not expected to result in rapid failure of the pump. Rather it is expected to manifest itself as increased pump-related outage times due to accelerated wear. A review of the INPO Safety System Performance Indicators shows that the VY RHR systems have historically operated reliably. The CS system has also been historically reliable.

Evaluations assessing industry operating experience in combination with system "as-built conditions," and those configurations allowed by plant Operating, and Emergency Operating Procedures have demonstrated that the as-built minimum flow protection is adequate to ensure the fulfillment of the pertinent safety functions and design bases. The current VY Basis for Maintaining Operation documents that assessment. Recent communication with the pump vendor regarding pump test data has supported previous VY engineering judgements. Therefore this event is not considered to have increased the risk to public health or safety.

CORRECTIVE ACTIONS

Immediate Actions:

1. An internal VY Event Report was issued to determine the cause for the failure to adequately disposition IEB 88-04. This action is complete.

2. A Basis for Maintaining Operation was written and approved to document the basis for continued safe operation of the plant pending final resolution of the issue. This action is complete.

3. Plant procedures were revised to remove specific reference to the vendor recommended flows for minimum flows needed to prevent accelerated wear. These values were considered to be potentially misleading. The procedure was restored to its pre-1988 condition identifying that "pump operation in the minimum flow mode should be minimized." This action is complete.

4. The particulars of this event were discussed with Operations Department Personnel to reinforce the long-standing practice of minimizing time in the minimum flow mode. This action is complete.

Long Term Corrective Actions:

1. The RHR and CS system flow instrumentation is being modified to improve accuracy. This modification is expected to be installed by 06/30/98.

2. The specific issue of instrument uncertainty was the subject of a previous event investigation. That investigation is complete. The investigation cited the VY Setpoint Control Program as a viable corrective action to prevent occurrence of similar events.

   VY is developing a Setpoint Control Program which will ensure that safety significant instrument loop uncertainties are given proper consideration when performing maintenance, testing and design functions potentially affected by or affecting instrument loop uncertainties. This action is expected to be completed by 06/30/98.

   Much of the benefit to be gained from the implementation of the Setpoint Control Program currently under development has already been realized through the many setpoint control process improvements which have been made in support of the Setpoint Control Program development and implementation.

ADDITIONAL INFORMATION:

The following similar events have been reported during the past five years.

96-10	04/11/96	Inadequate design/single failure evaluation during a design results in potential loss of RHR pump minimum flow protection.
96-12	06/06/97	RHR Heat Removal Service Water Flow Could Be Lower Than Required By Technical Specifications Due to Instrument Inaccuracy.