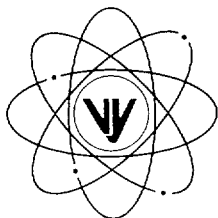


# VERMONT YANKEE NUCLEAR POWER CORPORATION



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

October 18, 2001  
BVY 01-77

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

**Subject: Vermont Yankee Nuclear Power Station  
License No. DPR-28 (Docket No. 50-271)  
Reportable Occurrence No. LER 2001-004, Rev. 0**

As defined by 10CFR50.73, we are reporting the attached Reportable Occurrence as LER 2001-004, Rev. 0.

Sincerely,

VERMONT YANKEE NUCLEAR POWER CORPORATION

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Kevin H. Bronson  
Plant Manager

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

IE22

Estimated burden per response to comply with this mandatory information 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 Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bis1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104) Office of Management and Budget, Washington, DC 20503. If a means used to impose 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.

**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

<b>1. FACILITY NAME</b> VERMONT YANKEE NUCLEAR POWER STATION (VY)	<b>2. DOCKET NUMBER</b> 05000271	<b>3. PAGE</b> 1 of 3
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**4. TITLE**  
Exceeded Core Thermal Power Limit Due to Feedwater Flow Nozzle Fouling

<b>5. EVENT DATE</b>			<b>6. LER NUMBER</b>			<b>7. REPORT DATE</b>			<b>8. OTHER FACILITIES INVOLVED</b>	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
08	21	2001	2001	004	00	10	19	2001	N/A	05000 -
									FACILITY NAME	DOCKET NUMBER
									N/A	05000 -

<b>9. OPERATING MODE</b>	N	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>										
		<input type="checkbox"/>	20.2201(b)	<input type="checkbox"/>	20.2203(a)(3)(ii)	<input type="checkbox"/>	50.73(a)(ii)(B)	<input type="checkbox"/>	50.73(a)(2)(ix)(A)			
<b>10. POWER LEVEL</b>	100	<input type="checkbox"/>	20.2203(d)	<input type="checkbox"/>	20.2203(a)(4)	<input type="checkbox"/>	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(x)			
		<input type="checkbox"/>	20.2203(a)(1)	<input type="checkbox"/>	50.36(c)(1)(i)(A)	<input type="checkbox"/>	50.73(a)(2)(iv)(A)	<input type="checkbox"/>	73.71(a)(4)			
		<input type="checkbox"/>	20.2203(a)(2)(i)	<input type="checkbox"/>	50.36(c)(1)(ii)(A)	<input type="checkbox"/>	50.73(a)(2)(v)(A)	<input type="checkbox"/>	73.71(a)(5)			
		<input type="checkbox"/>	20.2203(a)(2)(ii)	<input type="checkbox"/>	50.36(c)(2)	<input type="checkbox"/>	50.73(a)(2)(v)(B)	<input type="checkbox"/>	OTHER Specify in Abstract below or in NRC Form 366A			
		<input type="checkbox"/>	20.2203(a)(2)(iii)	<input type="checkbox"/>	50.36(c)(3)(ii)	<input type="checkbox"/>	50.73(a)(2)(v)(C)					
		<input type="checkbox"/>	20.2203(a)(2)(iv)	<input type="checkbox"/>	50.46(a)(2)(i)(A)	<input type="checkbox"/>	50.73(a)(2)(v)(D)					
		<input type="checkbox"/>	20.2203(a)(2)(v)	<input checked="" type="checkbox"/>	50.73(a)(2)(i)(B)	<input type="checkbox"/>	50.73(a)(2)(vii)					
		<input type="checkbox"/>	20.2203(a)(2)(vi)	<input type="checkbox"/>	50.73(a)(2)(i)(C)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)					
<input type="checkbox"/>	20.2203(a)(3)(i)	<input type="checkbox"/>	50.73(a)(2)(ii)(A)	<input type="checkbox"/>	50.73(a)(2)(viii)(B)							

**12. LICENSEE CONTACT FOR THIS LER**

<b>NAME</b> Kevin Bronson, Plant Manager	<b>TELEPHONE NUMBER (Include Area Code)</b> (802)257-7711
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
N/A					N/A				

<b>14. SUPPLEMENTAL REPORT EXPECTED</b>					<b>15. EXPECTED SUBMISSION DATE</b>					
<input type="checkbox"/>	YES (If yes, complete EXPECTED SUBMISSION DATE)				<input checked="" type="checkbox"/>	NO		MONTH	DAY	YEAR

**16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)**

During the period of August 17-21, 2001 Core Thermal Power (CTP) was exceeded by 3.5 Megawatts Thermal (MWTh). This was discovered on August 21, 2001 while performing a calibration of the feedwater nozzles after the control rod pattern exchange down power on August 16-17, 2001 to 65%, using the Crossflow Ultrasonic Flow Meter. Nozzles FE-6-11A&B were found to be out of calibration, indicating 0.22% lower than actual flow. This caused the calorimetric calculation to indicate 0.22% lower than actual. Reactor power as adjusted by plant operators was higher than the licensed power level of 1593 and calculated power of 1592.56 by 3.5 MWTh. Following this discovery, reactor power was decreased by 4 MWTh. New calibration numbers for the nozzles were calculated which allowed for the return to 100% CTP. Before the down power, the nozzles were reading within calibration. The root cause for this measured flow discrepancy was due to changes to fouling on the feed water nozzles during the down power to 65% CTP. A contributing cause is the first application of noble metal chemistry during RFO-22. Prior history indicates that nozzle fouling was stable for any percentage down power that did not take the unit off-line. The maximum power level achieved during this event (100.22%) was fully bounded by plant analysis. Therefore, this event has no effect on public health and safety.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
VERMONT YANKEE NUCLEAR POWER STATION (VY)	05000271	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 3
		2001	-- 004	-- 00	

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

**DESCRIPTION:**

On 08/21/01, with the reactor at 100% power, it was discovered by System Engineering that during the period of 08/17-08/21/01, Core Thermal Power (CTP) as calculated by the process computer, was non-conservatively low by 3.5 Megawatts Thermal (MWth). This calculation (used to determine reactor power), allowed Vermont Yankee to unknowingly exceed its licensed limit of 1593 MWth by a maximum of 3.5 MWth. This event is reportable under 10CFR50.73(a)(2)(i)(B) as a condition prohibited by Vermont Yankee's Technical Specifications. Although the maximum power level is stated in the Operating License, this has typically been interpreted to include both the License and the Technical Specifications by the industry.

A calibration of the feedwater nozzles was performed on 08/21/01 using the Crossflow Ultrasonic Flow Meter, after the control rod pattern exchange down power of 08/16-08/17/01 to 65%. The feedwater nozzles, FE-6-11A&B were found out of calibration, indicating a 0.22% lower than actual flow. This signal is used as an input to the Process Plant Computer (PPC) CTP calculation, which caused the calorimetric calculation to indicate 0.22% lower than actual. Therefore, reactor power as adjusted by plant operators, was higher than the licensed power level of 1593 MWth and calculated power of 1592.56 MWth by 3.5 MWth.

Following the discovery of the error in the CTP calculation on 08/21/01 at 11:30 AM, reactor power was decreased by 4 MWth at 11:50 AM. New calibration numbers for the nozzles were calculated by the guidance provided within OP2001 by System Engineering and placed in the computer by Reactor Engineering allowing the return to 100% CTP by 12:33 PM.

**BACKGROUND:**

Corrosion product fouling of the feedwater flow-measuring element has been recognized as an industry problem since the 1970's. The fouling preferentially occurs on the necked (narrowed) down part of the flow nozzle. The additional constriction has the effect of indicating higher than actual feedwater flow and hence a calculated CTP that is lower than indicated.

Vermont Yankee installed a Crossflow Ultrasonic Flow Meter in May 1999 to manage the fouling effects by allowing online calibration of the installed flow meter. Evaluations performed during Crossflow testing and Cycle 22 operation, indicated that the correction is valid for all routine power maneuvers, such as control rod pattern exchanges. Past practice has been to perform the calibration monthly and supply Reactor Engineering the results to input into the reactor heat balance.

Prior to Crossflow, the cycle based transmitter calibration was based on flow data obtained from nozzle testing at Alden labs in 1970.

**CAUSE OF THE EVENT:**

The cause of this event is mainly attributed to fouling on the feedwater nozzles which changed during a plant down power to 65% CTP. Contributing factors include the first application of noble metal chemistry during RFO22 (May 2001) which could have altered the oxide layer inside the feedwater nozzles. In addition, previous operational history indicates that nozzle fouling was stable for any percentage down power that did not take the unit off line.

**LICENSEE EVENT REPORT (LER)**

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VERMONT YANKEE NUCLEAR POWER STATION (VY)	05000271	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 3
		2001	-- 004	-- 00	

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

**ANALYSIS OF THE EVENT:**

Prior to the control rod pattern exchange down power, the feedwater nozzles were reading within calibration, based upon a review of the data performed by System Engineering. Power ascension from the 08/16-08/17/01 down power and previous down power maneuvers relied on the calculated CTP to be accurate. Alternate power indications are not as precise an indicator of CTP. Additionally, interviews with plant and peer plant personnel indicate changes in chemistry, noble metals, zinc, oxygen and hydrogen can alter feedwater-fouling characteristics, thereby affecting flow nozzle measurements.

A review of the Monthly Core Performance Log indicates the highest thermal limits achieved during this event were 0.883 for MFLCPR, 0.960 for MFLPD and 0.890 for MAPRAT. For small power changes, a change in power will cause a similar percentage change in thermal limits. A 0.22% rated error in the calculation of core thermal power could not have caused thermal limits to exceed 1.000. The 100.22% power level achieved during this event was fully bounded by plant analyses (Fuel Reload and Transient Analyses). The Fuel Reload Analysis assumes a CTP level in excess of 102% for all FSAR accident analysis and feedwater flow uncertainty of 1.8% for Transient Analysis. The plant's safety significant protection systems were unaffected and the limiting condition achieved during this event was fully bounded by plant analyses and accident analyses.

**CORRECTIVE ACTIONS:**

1. The operating crew reduced reactor power by 4 MWth and the nozzle calibration was implemented (08/21/01).
2. Daily calibration checks of feedwater nozzles with Crossflow were implemented for two weeks following the event to ensure that no other issues or equipment were contributing factors to this event.
3. The Crossflow Calibration check frequency was increased to weekly.
4. Interim Guidance for power ascension was provided to operators.
5. Procedures and interim guidance will be revised to address improved flow determination capability resulting from Crossflow Calibration and the impact of chemical addition upon plant systems.

**ADDITIONAL INFORMATION:**

In the past ten years, similar events have been reported as follows:

LER No.	Date	Title
97-12	10/02/97	Excess Core Thermal Power
94-12	10/24/94	Operated Above License Limit for Core Thermal Power