James A. FitzPatrick
Nuclear Power Plant
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New York Power Authority

Michael J. Colomb
Site Executive Officer

January 10, 2000
JAFP-00-0005

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

Subject: **Docket No. 50-333**
LICENSEE EVENT REPORT: LER-99-014 (DER-99-02908)

Non-Conservative APRM-Flow Referenced Neutron Flux Scram Line

Dear Sir:

This report is submitted in accordance with 10 CFR 50.73(a) (2) (ii), "a condition outside the design basis of the plant."

There are no commitments contained in this report.

Questions concerning this report may be addressed to Mr. Abramski at (315) 349-6305.

Very truly yours,

MICHAEL J. COLOMB

MJC:MA:las
Enclosure

cc: USNRC, Region 1
USNRC, Project Directorate
USNRC Resident Inspector
INPO Records Center

IE22

NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

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 collection.

LICENSEE EVENT REPORT (LER)

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

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TITLE (4)

Non-Conservative APRM-Flow Referenced Neutron Flux Scram Line

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
									N/A	05000
12	09	99	99	014	00	01	10	00	FACILITY NAME: N/A	DOCKET NUMBER: 05000

OPERATING MODE (9)	N
POWER LEVEL (10)	100

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)	X	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)
Mr. Mark Abramski, Sr. Licensing Engineer	315-349-6305

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X	YES (If yes, complete EXPECTED SUBMISSION DATE).	NO		04	06	00

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

Reactor power before, during and after this event was 100%. On 12/9/99, through one engineering analysis it was determined that the actual slope of the Average Power Range Monitor (APRM) flow referenced scram line was non-conservative relative to the functional relationship established in the Core Operating Limits Report (COLR). The Technical Specifications state that the APRM Flow Referenced Neutron Flux Scram setting shall be less than or equal to the limit specified in the COLR. The Average Power Range Monitor (APRM) Flow Referenced Neutron Flux Trip Function of the Reactor Protection System (RPS) was declared inoperable at 2230 on 12/9/99. The discrepancy between the actual slope of the APRM flow referenced scram line and the functional relationship established in the COLR was caused by an apparent reduction in the core to drive flow ratio. At 2315 the APRM gains were adjusted to bring the APRM flow referenced neutron flux scram line into agreement with the functional relationship established in the COLR. The APRM Flow Referenced Neutron Flux Trip Function of the RPS was then declared operable. Corrective actions include an investigation into the cause of the apparent reduction in the core to drive flow ratio, and the cause of the breakdown in the administrative control processes used for verifying compliance with assumptions in the COLR and evaluation of how the APRM Flow Reference Neutron Flux Scram was credited in the operating limit MCPR.

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

EIIS Codes in [ ]

Event Description

Reactor power before, during and after this event was 100 percent. On December 9, 1999, engineering analysis determined that the actual slope of the APRM flow referenced neutron flux scram line was non-conservative relative to the functional relationship established in the Core Operating Limits Report (COLR). The Technical Specifications state that the APRM Flow Referenced Neutron Flux Scram setting shall be less than or equal to the limit specified in the COLR.

The Technical Specifications require that, if this Limiting Condition for Operation (LCO) cannot be satisfied:

1. All operable control rods be inserted within four hours or,

2. Reactor power level be reduced to the Intermediate Range Monitor (IRM) range and the Mode Switch placed in the Startup position within eight hours.

The Average Power Range Monitor (APRM) Flow Referenced Neutron Flux Trip Function of the Reactor Protection System (RPS) [AA] was declared inoperable at 2230. This condition was reported under 10CFR50.72(b)(1)(i)(A), The initiation of a nuclear plant shutdown required by the plant's Technical Specifications and 10CFR50.72(b)(1)(ii)(B), In a condition that is outside the design basis of the plant.

At 2315 the APRM gains were adjusted to bring the APRM flow referenced neutron flux scram line into agreement with the functional relationship established in the COLR and the APRM Flow Referenced Neutron Flux Trip Function of the RPS was declared operable.

Cause

The COLR develops a functional relationship between Reactor Power and Reactor Water Recirculation (RWR) [AD] mass flow rate (expressed in percent of rated drive flow) for the APRM flow referenced neutron flux scram line.

Scram ≤ % Rated Drive Flow (0.66) + 54%

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Cause (cont'd.)

In-situ plant data indicates that core flow to drive flow ratio has decreased relative to previous cycles and perhaps relative to the beginning of the current fuel cycle. The cause for this apparent reduction in the core to drive flow ratio is under investigation.

This investigation is considering the effects of Core Power Distribution, Fuel Design changes and Noble Metals Chemical Addition and jet pump performance.

The discrepancy between the actual slope of the APRM flow referenced scram line and the functional relationship established in the COLR was caused by this apparent reduction in the core to drive flow ratio.

The value of Drive Flow that results in Rated Core Flow varies with fuel design, the thermo-hydraulic conditions in the Reactor Core and performance of the Reactor Jet Pumps. Figure 1 illustrates how a change in the Core Flow to Drive Flow relationship results in new value for 100 percent drive flow ($W_{D(100\%)}$). Points A and A' represent two arbitrary operating points. Over time, the Core Flow to Drive Flow relationship changes based on the factors identified above. These changes manifest themselves in a different slope for the correction factor as well as different operating points. In both cases, a value for $W_{D(100\%)}$ is developed based on an operating point and a correction factor (both of which are based on measured values) which are used to extrapolate $W_{D(100\%)}$ for 100 percent Rated Core Flow ($W_{T(Rated)}$). Note that, in practice, the slope of the correction factor line is relatively constant and therefore, the value for $W_{D(100\%)}$ is predominately a function of the operating point (W_T and W_T' are approximately equal).

Figure 2 illustrates how the gradual transition from Operating Point A to A' changes the slope of the Flow Referenced APRM Scram Line required to maintain the functional relationship between Reactor Power and percent rated Drive Flow established in the COLR. $W_{D(100\%)}$ moves to $W_D'_{(100\%)}$ and the required slope is reduced accordingly. This change in operating point had an analogous effect on the APRM Control Rod Block Trip Setting as well.

Since the change in operating point results in a lower required slope, instrument gains must be adjusted to ensure a conservative actual slope.

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Cause (cont'd.)

Reactor Analyst Procedure (RAP) 7.3.30, "Cycle Startup Physics Test Report" directs the performance of RAP 7.3.7, "Core Flow Evaluation and Indication Calibration" and RAP 7.3.29, "Determination of Rated Recirculation Flow." RAP 7.3.7 establishes values for $W_{D(Measured)}$ and $W_{T(Measured)}$. RAP 7.3.29 determines the value of $W_{D(100\%)}$ based on the results of RAP 7.3.7.

No procedural guidance was in place to review the new value for rated drive flow ($W_{D'(100\%)}$) against the value used to develop APRM/RWR system gains which maintain compliance with the COLR. This lack of guidance constitutes a breakdown in the administrative control processes used for verifying the assumptions in the COLR (Cause Code E). The extent of condition due to this deficiency is under investigation.

Analysis

The reduction in the slope of the Flow Referenced APRM Scram Line required to maintain the functional relationship between Reactor Power and percent rated Drive Flow established in the COLR resulted in a non-conservative APRM Flow Referenced Neutron Flux input to the RPS.

The Bases for JAF Technical Specifications (Bases Section 2.1.A.1.c, APRM Flux Scram Trip Setting [Run Mode]) states that the flow-referenced trip will result in a significantly earlier scram during slow thermal transients such as the loss of 80 degrees F feedwater heating event, than would result from the 120 percent fixed high neutron flux scram.

This bases section also states that the lower flow referenced-scram setpoint therefore decreases the severity (in terms of change in Critical Power Ratio) of a slow thermal transient and allows lower Minimum Critical Power Ratio (MCPR) Operating Limits if such a transient is the limiting abnormal operational transient during a certain exposure interval in the cycle. The flow-referenced trip also provides protection for power oscillations, which may result from reactor thermal hydraulic instability.

The analysis of limiting plant transients, pressurization events, does not consider the flow-biased APRM Rod Block and Scram functions. These events credit the fixed APRM Scram which is unaffected by the change in core flow characteristics.

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Analysis (cont'd.)

The JAF COLR specifies that, for Core Flows less than 59.863 percent of rated, the Operating Limit MCPR shall be increased by a factor inversely proportional to the percent of rated Core Flow. An evaluation is underway to determine if the APRM Flow Referenced Neutron Flux scram was credited in developing these limits.

This condition does not constitute a Safety System Functional Failure as defined by NEI 99-02 (Draft Rev. D) because it alone would not have prevented a reactor scram. Rather, this condition would have resulted in a higher Neutron flux scram setpoint for certain combinations of drive flow and reactor power.

Corrective Actions

1. The APRM/RWR system gains have been adjusted to bring the APRM Flow-Referenced Neutron Flux Scram Trip setting in agreement with the COLR. **(Complete)**

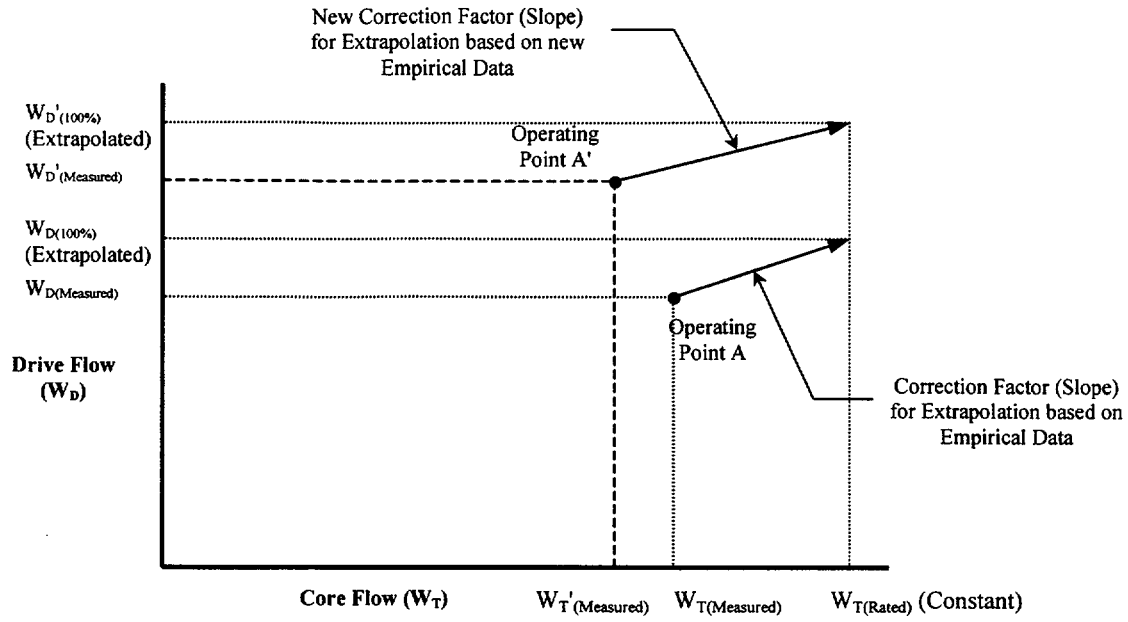
2. The cause of the apparent, change in Core Flow/Drive Flow is under investigation and will be submitted in a supplemental report. **(Scheduled Completion Date: 3/3/00)**

3. A root cause analysis is underway to determine the cause of the breakdown in the administrative control processes used for verifying the assumptions in the COLR. The results of this investigation will be submitted in a supplemental report. **(Scheduled Completion Date: 2/18/00)**

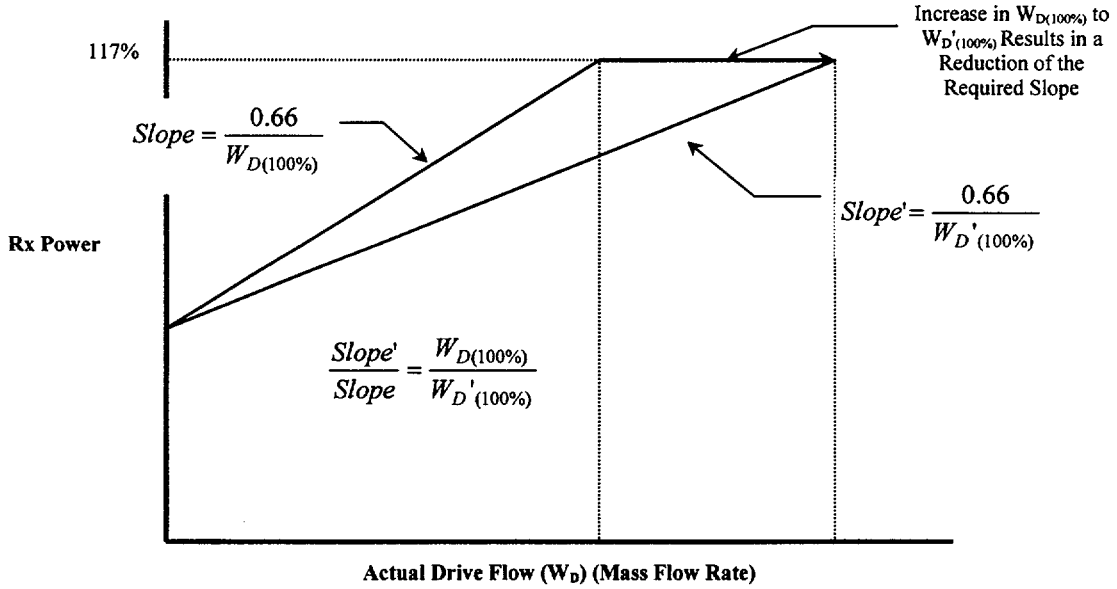
4. An evaluation is underway to determine if the APRM Flow Referenced Neutron Flux scram was credited in developing the Operating Limit MCPR. The results of this evaluation will be submitted in a supplemental report. **(Scheduled Completion Date: 04/17/00)**

Additional Information

Previous Similar Events: None



LER 99-014 Figure 1
Extrapolation of 100% Drive Flow



LER 99-014 Figure 2
Change in APRM Flow Referenced SCRAM Line Slope
Required to Maintain $S \leq .66(\frac{W_D}{W_{D(100\%)}}) + 54\%$