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Energy to Serve Your World™

NL-03-2339

November 19, 2003

Docket Nos.: 50-321
50-366

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Edwin I. Hatch Nuclear Plant – Units 1 and 2
Potentially Non-Conservative Setpoints Result in Inoperable
Oscillating Power Range Monitor System

Ladies and Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(i)(B), Southern Nuclear Operating Company is submitting the enclosed Licensee Event Report concerning potentially non-conservative setpoints in the Oscillating Power Range Monitor System.

This letter contains no NRC commitments.

If you have any questions, please advise.

Sincerely,


H. L. Sumner, Jr.

HLS/OCV/daj

Enclosure: LER 50-321/2003-002

cc: Southern Nuclear Operating Company
Mr. J. D. Woodard, Executive Vice President
Mr. G. R. Frederick, General Manager – Plant Hatch
Document Services RTYPE: CHA02.004

U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator
Mr. S. D. Bloom, NRR Project Manager – Hatch
Mr. D. S. Simpkins, Senior Resident Inspector – Hatch

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JE22

LICENSEE EVENT REPORT (LER)

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

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. 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 bjs1@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,

1. FACILITY NAME

Edwin I. Hatch Nuclear Plant - Unit 1

2. DOCKET NUMBER

05000-321

3. PAGE

1 OF 5

4. TITLE

Potentially Non-Conservative Setpoints Result in Inoperable Oscillating Power Range Monitor System

5. EVENT DATE

MONTH	DAY	YEAR
10	03	2003

6. LER NUMBER

YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
2003	002	0

7. REPORT DATE

MONTH	DAY	YEAR
12	02	03

8. OTHER FACILITIES INVOLVED

FACILITY NAME
Plant Hatch Unit 2DOCKET NUMBER(S)
05000-366

FACILITY NAME

DOCKET NUMBER(S)
050009. OPERATING
MODE (9)

1

10. POWER
LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § : (Check all that apply)

20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)
20.2203(a)(1)	50.36(c)(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)
20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
20.2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	OTHER
20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	
20.2203(a)(2)(v)	50.73(a)(2)(ii)(B)	50.73(a)(2)(vii)	
20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)	
20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

NAME

Steven B. Tipps, Nuclear Safety and Compliance Manager, Hatch

TELEPHONE NUMBER (Include Area Code)

(912) 537-5880

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

14. SUPPLEMENTAL REPORT EXPECTED

YES
(If yes, complete EXPECTED SUBMISSION DATE)NO
X15. EXPECTED
SUBMISSION
DATE

MONTH	DAY	YEAR

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

On October 3, 2003, with Hatch Units 1 and 2 operating in the Run mode at 100% of rated thermal power, the Oscillating Power Range Monitor (OPRM) system for each Hatch unit was declared inoperable. The declaration was made based on the anticipated issuance of a 10 CFR Part 21 communication by General Electric (GE) concerning the adequacy of the OPRM period tolerance and cut-off frequency setpoints.

The cause of the event was review of data from a recent industry instability event at Nine Mile Point - Unit 2. This review found that the OPRM period tolerance and cut-off frequency setpoints were set such that too many valid oscillation counts were reset during the event. Consequently, GE provided new recommendations for these setpoints. Since the Plant Hatch setpoints were not within the recommended ranges, the Unit 1 and 2 OPRMs were declared inoperable.

The corrective actions consisted of: 1) implementing the alternate method of detection and suppression of thermal hydraulic instabilities and 2) resetting the setpoints to the values recommended by GE and subsequently declaring the Units 1 and 2 OPRM systems operable.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL YEAR	REVISION NUMBER	
Edwin I. Hatch Nuclear Plant - Unit 1	05000-321	2003	-- 002	-- 00	2 OF 5

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

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor
Energy Industry Identification System codes appear in the text as (EIIS Code XX).

DESCRIPTION OF EVENT

On 10/3/2003, at 1200 EDT, with Hatch Units 1 and 2 operating in the Run mode at 100 % of rated thermal power, the Oscillating Power Range Monitor (OPRM, EIIS Code IG) system for each Hatch unit was declared inoperable due to the anticipated issuance of a 10 CFR Part 21 communication by General Electric (GE). That report was ultimately issued on October 4, 2003. The Part 21 communication stated that, as a result of the investigation of a recent instability event at the Nine Mile Point-2 (NMP-2) Nuclear Station which occurred on July 24, 2003 GE could not conclude that the performance of the OPRM with settings other than a period tolerance of 100 msec or higher and cutoff frequency of 1.0 Hz will not contribute to exceeding the Safety Limit Minimum Critical Power Ratio (SLMCPR) for all anticipated instability events. At the time, the corresponding Plant Hatch setpoints were 50 msec for the period tolerance and 3.0 Hz for the cutoff frequency. Consequently, the Hatch OPRMs were declared inoperable. The OPRMs, however, remained engaged to the system, capable of providing OPRM trips if necessary.

Upon declaring the OPRMs inoperable, Hatch Technical Specifications Required Action Statement (RAS) 3.3.1.1.I was entered. This requires initiating the alternate method of detecting and suppressing thermal hydraulic instabilities. At Hatch, the alternate method is contained in plant procedures and consists of monitoring the Local Power Range Monitors (LPRM, EIIS Code IG) and the Average Power Range Monitors (APRM, EIIS Code IG) for abnormal oscillations and taking appropriate action if they indicate the presence of a thermal-hydraulic instability. The RAS allows operation in this mode for 120 days. If the OPRM system remains inoperable at the end of the 120 days, reactor shutdown is required. Accordingly, the alternate method of detection and suppression was initiated for a brief period. The setpoints were reset to 100 msec for the period tolerance and 1.0 Hz for the cut-off frequency at 1806 and 1842 on 10/3/2003 for Unit 2 and Unit 1 respectively. At that time, the OPRM systems were declared operable. These setpoints were based on recommendations provided by GE, which were later included in their Part 21 communication.

CAUSE OF EVENT

This event occurred because the instability event at NMP-2 revealed weaknesses in the OPRM system. Specifically, the period tolerance and cut-off frequency setpoints were set in such a manner that too many valid oscillation counts were reset during the event. Based on their review of the event, GE provided new recommendations for these setpoints. Since Plant Hatch's period tolerance and cut-off frequency setpoints were outside the recommended range, the Unit 1 and 2 OPRMs were declared inoperable.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL YEAR	REVISION NUMBER	
Edwin I. Hatch Nuclear Plant - Unit 1	05000-321	2003	-- 002	-- 00	3 OF 5

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

In NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," August, 1996, a range of values was given for these setpoints; they were 100 to 300 msec for the period tolerance and 1.0 to 2.5 Hz for the cut-off frequency. During the initial 6 month monitoring period for the Hatch OPRM system, data evaluation showed a more sensitive response than anticipated. Consequently, Hatch petitioned the NRC, in a June 20, 1997 submittal, for more lenient period tolerance and cut-off frequency setpoints of 50 msec and 3.0 Hz, respectively. Approval from NRC for these setpoints was subsequently received.

At the time the OPRM system was designed, the only instability data available consisted of single LPRM readings from a few events, such as the 1988 LaSalle instability. The recent NMP-2 event provides the industry an opportunity to learn more on the nature of instability events and how best to configure the mitigating systems, such as OPRM.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This report is required by 10 CFR 50.73(a)(2)(i)(B) because the OPRM period tolerance and cutoff frequency setpoints were potentially non-conservative and thus potentially incapable of providing protection against violating the SLMCPR during a design-basis thermal hydraulic instability event, a condition prohibited by the Technical Specifications.

The SLMCPR is intended to protect the fuel rods from experiencing boiling transition, a condition characterized by a steam film blanketing the fuel cladding, thus severely restricting the heat transfer from the cladding to the coolant. This weakens the cladding, which could lead to structural damage and an eventual release of radioactive material to the primary system. The SLMCPR is calculated each operating cycle such that 99.9% of fuel rods in the core are expected to avoid transition boiling during normal operation and during a design-basis anticipated operational occurrence (AOO). This is a conservative limit because no fuel failures are expected to occur even if fuel rods do experience transition boiling for a short period of time.

To prevent violation of the SLMCPR, the most limiting AOOs are re-analyzed each operating cycle to determine the largest reduction in the critical power ratio (CPR). The operating limit (OL) MCPR is then calculated to be a value such that the CPR does not decrease below the SLMCPR at any time during this worst case scenario. An instability event is one of the potentially limiting MCPR events evaluated each cycle. This analysis is characterized by the following sequence of events: 1) the plant is operating at or near rated power, and at or near the lowest flow licensed for that power condition, 2) both recirculation pumps trip resulting in a core flow reduction down to natural circulation, and 3) the reactor begins to experience a thermal hydraulic instability. If the magnitude of the oscillations becomes large enough, the OPRM system is designed to detect the corresponding local power oscillations and initiate a Reactor Protection System (RPS, EIIS Code JC) scram when the OPRM

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL YEAR	REVISION NUMBER	
Edwin I. Hatch Nuclear Plant - Unit 1	05000-321	2003	-- 002 --	00	4 OF 5

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

confirmation count and amplitude setpoints are exceeded. This action is sufficient to prevent a violation of the SLMCPR during the instability. However, if the OPRM setpoints are inadequate, the scram could occur too late, or not at all, and the SLMCPR might not be protected.

One parameter used by the period based detection algorithm (PBDA) of the OPRM system to confirm an instability event is the periodicity of the oscillations. Oscillations that are indicative of a thermal-hydraulic instability have a base frequency somewhere in the 0.3 to 0.7 Hz range, and vary only slightly during the event. A legitimate oscillation is confirmed when successive peaks and valleys of an OPRM's cell signal repeatedly match the base frequency plus or minus the period tolerance. Confirmation continues (and the confirmation count is incremented) until the period of the signal no longer falls within the period tolerance. In this case the confirmation count is reset to zero. The period tolerance setpoint is set to avoid unnecessary trips, but to provide adequate protection against instability events. If the tolerance is set too low, the system may reset too many oscillation counts and an actual instability may be bypassed. If the tolerance is set too high, the possibility exists that the system will be too sensitive and cause unnecessary trips.

Also affecting the count confirmation is the conditioning filter cut-off frequency. The system will falsely reset the oscillation counts if the cell signal contains peaks and valleys from high frequency noise. The purpose of the conditioning filter is to remove as much of this noise as possible. If the cut-off frequency is set too high, there may be an excessive number of resets on noise in the channel.

Analysis of the instability event at NMP-2 determined that there were an excessive number of confirmation count resets on period tolerance due to small variations in the oscillation period. With respect to the cut-off frequency, the 3.0 Hz value did not adequately filter out high frequency noise. This also resulted in an excessive number of valid oscillation counts being reset.

Despite these excessive resets, the NMP-2 OPRM system was robust enough to provide an RPS trip, and it is therefore possible that the Hatch system, with the same 50 msec and 3.0 Hz setpoints, could provide adequate protection for the SLMCPR. However, as General Electric stated in the Part 21 communication, they cannot currently confirm that anything but the 100 msec or higher trip for the period tolerance, and a cutoff frequency of 1.0 Hz is adequate to provide SLMCPR protection.

CORRECTIVE ACTIONS

The Unit 1 and 2 OPRMs were declared inoperable and the alternate method of detection and suppression was initiated.

The Unit 1 and 2 OPRM period tolerance and cut-off frequency setpoints were reset to 100 msec and 1.0 Hz, respectively. Subsequently, the OPRMs were declared operable.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL YEAR	REVISION NUMBER	
Edwin I. Hatch Nuclear Plant - Unit 1	05000-321	2003	-- 002 --	00	5 OF 5

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

ADDITIONAL INFORMATION

This issue affects other domestic boiling water reactors. GE has issued a Part 21 notification detailing the results of their evaluation of the NMP-2 instability event of July 24, 2003. That notification was issued on October 4, 2003.

No systems other than those identified in this report were involved in the event.

No failed components caused this event.

On August 23, 2001 Plant Hatch submitted an LER (1-2001-003) on the OPRM system. That LER was based on another GE Part 21 report issued on June 29, 2001. That report dealt with errors in a generic industry analysis that resulted in non-conservative OPRM upscale setpoints. The event described in this LER also deals with the OPRM system and is also the result of a Part 21 notification. However, the current Part 21 does not involve the OPRM upscale setpoints, but rather the period tolerance and the cut-off frequency setpoints. The current event is the direct result of evaluation of empirical data received from an actual instability event at a domestic, similarly designed, boiling water reactor. This new data serves to enhance the industry's understanding on the mitigation of instability events. Consequently, the corrective actions of LER 1-2001-003 could not have prevented this event.