NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

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.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Millstone Nuclear Power Station Unit 1	05000245	1 of 4

TITLE (4)

Flow-Biased High Flux Scram Is Not Single Failure Proof

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
01	31	97	97	007	00	03	03	97	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	000	20.2201(b)	20.2203(a)(2)(v)	[X] 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)
Robert W. Walpole, MP1 Nuclear Licensing Manager	(860)440-2191

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

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION	MONTH	DAY	YEAR
[X] YES (If yes, complete EXPECTED SUBMISSION DATE).	[ ] NO		03	31	97

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

On January 31, 1997, at 0930, with the plant in COLD SHUTDOWN, it was discovered that the Average Power Range Monitor (APRM) Flow-Biased High Flux Reactor Scram is credited in establishing the initial conditions for limiting plant transients but is not redundant and not single failure proof. This event was immediately reported on January 31, 1997 pursuant to 10CFR50.72(b)(1)(ii)(B) as a condition that is outside the design basis of the plant. There were no automatic or manually initiated safety system responses as a result of this event.

The cause of this event is under investigation and will be provided in a supplement to this report. The safety significance of this event is that a single failure which disables the APRM Flow-Biased High Flux Reactor Scram results in the fuel thermal limits being exceeded during the transient. However, there were no safety consequences as a result of this event.

This report will be supplemented with required corrective actions.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)					PAGE (3)
		YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	
Millstone Nuclear Power Station Unit 1	05000245	97	--	007	--	00	2 of 4

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

I. Description of Event

On January 31, 1997, at 0930, with the plant in COLD SHUTDOWN, it was discovered that the Average Power Range Monitor (APRM) Flow-Biased High Flux Reactor Scram is credited in establishing the initial conditions for limiting plant transients but is not redundant nor single failure proof. The Cycle 16 reload analysis credits the APRM Flow-Biased High Flux Reactor Scram to establish the initial conditions of the limiting transient. However, a single flow converter provides a common flow reference signal to the redundant APRM channels in each Reactor Protection System (RPS) trip system; so, a single failure of one flow converter could cause the flow referenced high flux scram trip setting to become inoperable in redundant channels.

The APRM Flow-Biased High Flux Reactor Scram provides protection against transients where thermal power increases slowly, such as the loss of feedwater heating event. The limiting loss of feedwater heating event for Millstone Unit 1 is the Generator Loss of Stator Cooling (GLSC). The APRM Flow-Biased High Flux Reactor Scram was credited to establish the initial power and flow conditions for this transient necessary to ensure the Minimum Critical Power Ratio (MCPR) and Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) fuel thermal limits are maintained.

This event was immediately reported on January 31, 1997 pursuant to 10CFR50.72(b)(1)(ii)(B) as a condition that is outside the design basis of the plant. There were no automatic or manually initiated safety system responses as a result of this event.

II. Cause of Event

The cause of this event is still under investigation. The cause of the event will be provided in a supplement to this report.

III. Analysis of Event

Transient and accident analyses are performed for limiting transients. The APRM Flow-Biased High Flux Reactor Scram has been used by General Electric to determine the initial conditions for the limiting transients. The APRM Flow-Biased High Flux Reactor Scram would normally be expected to function for several UFSAR Chapter 15 events when initiated from a less than rated core flow condition. These include events such as Loss of Feedwater Heating, Feedwater Controller Failure, Recirculation Pump Trip or an Idle Recirculation Pump Start. Generally, the APRM Flow-Biased High Flux Reactor Scram is not explicitly credited because either the event is more limiting at rated flow conditions, where this scram would coincide with the high flux scram, or the plant safety limits are not impacted when this scram is conservatively ignored.

The GLSC transient was identified in LER 93-010-01 as causing a feedwater temperature reduction that exceeded the temperature change that is generically applied by General Electric for loss of feedwater heating events. The APRM Flow-Biased High Flux Reactor Scram was used to limit the conditions for analysis of the GLSC transient to show that loss of stator cooling initiated below rated core flow was a non-limiting event. Without credit for the APRM Flow-Biased High Flux Reactor Scram, this conclusion would not necessarily be valid.

The APRM Flow-Biased High Flux Reactor Scram provides protection against transients where thermal power increases slowly, such as the loss of feedwater heating event. The limiting loss of feedwater heating event for Millstone Unit 1 is the loss of turbine-generator loss of stator cooling (GLSC). In the event of a loss of stator cooling, a series of turbine load limit reductions are automatically initiated by sending a demand to the turbine

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)					PAGE (3)
		YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	
Millstone Nuclear Power Station Unit 1	05000245	97	--	007	--	00	3 of 4

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

control valves. Since Millstone 1 has 100% bypass capability, the turbine bypass valves will open, rejecting steam to the main condenser without significantly affecting the reactor. Since the reduction in turbine load takes place relatively slowly, the fast load reject logic (and related features such as the select rod insert) would not be initiated. As a result of the steam bypass, the feedwater temperature would begin to decrease causing reactor thermal power to increase if there were no mitigating operator actions. Although the current licensing basis analyses of the Loss of Feedwater Heating event (which assumes a 200 degrees F temperature reduction) remains bounding, the GLSC transient results in a 196 degrees F feedwater temperature reduction. In order to avoid thermal and mechanical overpower limit violations, a reduction in the plant's MAPLHGR limits was required. Since the GLSC transient may be even more limiting at lower flows, the APRM Flow-Biased High Flux Reactor Scram was credited to establish the initial power and flow conditions for this transient necessary to ensure the fuel thermal limits are maintained

The APRM Flow-Biased High Flux Reactor Scram logic circuitry at Millstone Unit 1 does not have redundant flow converters; a single flow converter provides a common flow reference signal to each of the three APRMs associated with each RPS trip system. The individual APRMs compute a flow referenced high flux trip setting based upon the flow reference signal. When the monitored flux signal exceeds this flow referenced trip setting, a channel trip is generated. The channel trip outputs are combined in a one-out-of-three taken-twice logic such that a full reactor scram is generated when at least one APRM in each trip system exceeds the flow referenced trip setting. However, since all three APRMs in each trip system receive the same flow reference, a single high signal failure of either flow converter would prevent this scram from occurring as credited in the setting of the initial conditions for the GLSC transient. This is contrary to the requirement of IEEE 279, "Criteria for Protection Systems for Nuclear Power Generating Stations," which requires any single failure within the protection system shall not prevent proper protective action at the system level when generation station conditions require such action (i.e. to mitigate design basis transients).

An upscale or inoperative output from either flow converter or excessive deviation between the two flow converters would be annunciated in the control room and generate a control rod block. This would alert the operator to a flow converter problem. Additionally, when initiated from high power, the GLSC transient is likely to result in a turbine trip and initiate the RPS logic unless turbine first stage pressure is reduced below 45% (when the turbine trip RPS logic is automatically bypassed). Also, the GLSC is a relatively slow transient and it is expected that the operator would take other mitigating actions.

Without credit for the APRM Flow Biased high Flux Reactor Scram for a GLSC transient, initial conditions below rated flow can be postulated for which the effects on the fuel thermal limits have not been analyzed. Therefore, this event is pursuant to 10CFR50.73(a)(2)(ii)(B) as a condition outside the design basis of the plant. Also, since the minimum numbers of channels per trip system as required by Technical Specification (TS) table 3.1.1 could not be met with a single flow converter, this event is also reportable pursuant to 10CFR50.73(a)(2)(i)(B) as a condition prohibited by the plant's TS.

IV. Corrective Action

This report will be supplemented by March 31, 1997, with the cause of the event and required corrective actions.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)					PAGE (3)
		YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	
Millstone Nuclear Power Station Unit 1	05000245	97	--	007	--	00	4 of 4

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

V. Additional Information

Similar Events

LER 93-010-01 "Generator Load Reject Analysis Inconsistencies"
This LER reported discrepancies between the analysis assumptions and the plant design. This event is similar in that the analysis assumed the functioning of a reactor scram that is not single failure proof. In fact, LER 93-010-01 discusses the fact that the loss of stator cooling is non-limiting. This conclusion was based on the proper functioning of the APRM Flow-Biased High Flux Reactor Scram to set the power to flow conditions used in analyzing the loss of stator cooling event.

LER 96-036-00 "Potential to Bypass Turbine Stop Valve / Turbine Control Valve Closure Scram Signal When Required To Be Operable"

Manufacturer Data

Not Applicable

EIIS System Codes

Flow-Biased High Flux Reactor Scram	JC, IG
RPS trip system	JC

EIIS Component Function Identifier

Average Power Range Monitor	JIC
single flow converter	CNV, FM