



**Northeast
Nuclear Energy**

Rope Ferry Rd. (Route 156), Waterford, CT 06385

Millstone Nuclear Power Station
Northeast Nuclear Energy Company
P.O. Box 128
Waterford, CT 06385-0128
(860) 444-4300
Fax (860) 444-4277

The Northeast Utilities System

APR 15 1996

Docket No. 50-336
B15643

Re: 10 CFR 50.73

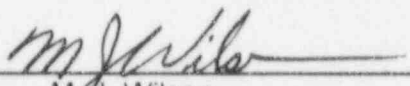
U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

This letter forwards Licensee Event Report (LER) 96-013-00 documenting an event that occurred at Millstone Nuclear Power Station, Unit No. 2 on March 14, 1996. This LER is being submitted pursuant to 10 CFR 50.73(a)(2)(vii).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

For: P. M. Richardson
Director - Millstone Unit No. 2


By: M. J. Wilson
Manager - Operations
Millstone Unit No. 2

Attachment: LER 96-013-00

cc: T. T. Martin, Region I Administrator
P. D. Swetland, Senior Resident Inspector, Millstone Unit No. 2
G. S. Vissing, NRC Project Manager, Millstone Unit No. 2

9604220330 960415
PDR ADOCK 05000336
S PDR

220096

IE22
111

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: 50.0 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, IT-
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) Millstone Nuclear Power Station Unit 2	DOCKET NUMBER (2) 05000336	PAGE (3) 1 of 4
---	-------------------------------	--------------------

TITLE (4)

Annunciator Circuit Provides a Potential Common Mode Failure Path for the Four Redundant Wide Range
Nuclear Instrumentation Channels

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	
03	14	96	96	013	00	04	15	96	FACILITY NAME	DOCKET NUMBER	
OPERATING MODE (9)		5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
POWER LEVEL (10)		0%	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)			50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iv)			50.36(c)(2)			<input checked="" type="checkbox"/> 50.73(a)(2)(vii)					

LICENSEE CONTACT FOR THIS LER (12)

NAME G. P. van Noordennen, Nuclear Licensing Supervisor	TELEPHONE NUMBER (Include Area Code) (860)440-2084
--	---

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
B	JC	JA	T078	N/A					

SUPPLEMENTAL REPORT EXPECTED (14)

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

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

On March 14, 1996 at 1125 hours with the plant in mode 5 at 0% power, operations personnel assessed Wide Range Logarithmic Neutron Flux Monitors (WR) Nuclear Instrumentation (NI), channels A, B, C, and D as inoperable due to their potential susceptibility to a common mode failure. This event is being reported pursuant to the requirements of 10 CFR 50.73(a)(2)(vii)(D), "any event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a system designed to mitigate the consequences of an accident."

The cause of this event was that the original design and installation resulted in the WR channels being susceptible to EMI.

Action was taken to restore the four WR channels to operable status. A modification to address the potential for common mode failure of the WR NIs is being considered.

There were no automatic or manually initiated safety systems activated as a result of this event.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)
		YEAR	SEQUENTIAL NUMBER		REVISION NUMBER	
		96	--	013	--	00
Millstone Nuclear Power Station Unit 2	05000336					2 of 4

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

I. Description of Event

On March 14, 1996 at 1125 hours with the plant in mode 5 at 0% power, operations personnel concluded that the Wide Range Logarithmic Neutron Flux Monitors (WR) Nuclear Instrumentation (NI), channels A, B, C, and D, were inoperable due to their potential susceptibility to a common mode failure.

The operability assessment was based on an investigation that was initiated subsequent to an event that occurred on March 8, 1996 at 0341 hours, with the plant in mode 5 at 0% power. During this event, several alarms were received indicating that one or more WR NIs were inoperative. Operator checks revealed that NI WR channels B and C were reading abnormally high.

At 0410 hours WR channels B and C were declared inoperable. It was determined that a 15 Volt power supply in the Channel C WR NI drawer had failed. The power supply failed in such a manner that its DC output voltage dropped to a nominal value of approximately 12.6 Volts with a significant 60 Hertz AC ripple superimposed.

The investigation determined that the power supply failure caused the coil of a relay with output contacts in an annunciator circuit to pick up and drop out in a cyclic manner. The annunciator alarm circuit is common to all four WR channels. Alarm contacts from the linear and WR drawers in the four channels are wired in series back to the annunciator. It is this design that creates a potential path for a common mode failure. On March 14, 1996 the investigation concluded that all four WR channels were potentially susceptible to a common mode failure. Additionally, the linear range NIs are potentially susceptible to this failure. However, the failure caused by this interaction would not prevent proper protective action.

On March 15, 1996 at 1855 hours with the plant in mode 5 at 0% power, a report was submitted pursuant to the requirements of 10 CFR 50.72(b)(1)(ii)(B), "any event or condition during operation that results in the nuclear power plant being in a condition that is outside the design basis of the plant."

There were no automatic or manually initiated safety systems activated as a result of this event. Additionally, operator action was taken to verify shutdown margin in accordance with the Technical Specifications requirements.

II. Cause of Event

The cause of this event was that the original design and installation resulted in the WR channels being susceptible to EMI.

III. Analysis of Event

On March 14, 1996 the investigation concluded that all four WR channels were potentially susceptible to a common mode failure. This event is being reported pursuant to the requirements of 10 CFR 50.73(a)(2)(vii)(D), "any event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a system designed to mitigate the consequences of an accident."

Additionally, on March 14, 1996 at 1125 hours with the plant in mode 5 at 0% power, operations personnel assessed the WR channels A, B, C, and D as inoperable. The action requirements for Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.3.1.1, "Reactor Protective Instrumentation," which is applicable in

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		96	-- 013 --	00		
Millstone Nuclear Power Station Unit 2	05000336					3 of 4

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

modes 3, 4 and 5, specify that with less than 2 WR channels operable, action shall be taken to "immediately verify compliance with the SHUTDOWN MARGIN requirements of Specification 3.1.1.1 or 3.1.1.2 as applicable, at least once per 4 hours thereafter." Compliance with the shutdown margin requirements was verified in accordance with the TS.

The WR channel NI provides indication of neutron flux power. This instrumentation also provides input to the reactor protection system zero power mode bypass to enable manual bypass of certain reactor protection system (RPS) trips for low-power testing.

The WR nuclear instrumentation channels at Millstone Unit 2 were manufactured by Gulf Electronics Systems. In the original Millstone Unit 2 design, the rate-of-change of WR power could produce a reactor trip. This trip function was eliminated from the Millstone Unit 2 RPS in 1978. Additionally, the original detectors and preamplifiers have been replaced by Gamma-Metrics fission chambers and amplifiers, modifying this system such that two of these channels are used to meet Regulatory Guide 1.97 Post Accident Monitoring requirements. The WR channels provide a signal proportional to the logarithm of neutron flux over the range from 10E-08 percent to 125 percent of full power. An additional "extended range" feature allows monitoring at lower power levels, with readings in counts per second.

The NI system at Millstone Unit 2 provides annunciation on the main control board should failure of a power supply occur in the WR channels. This alarm circuit is not safety-related, but is common to the four channels. The 125 VDC power supply to the annunciator is routed through a normally-open bistable contact in each WR instrumentation drawer, where it is connected in series with similar contacts for each of the four channels. Failure of a 15 VDC power supply within the WR drawer (to approximately 12.6 VDC) with a ripple voltage output caused chattering of the high voltage bistable in the channel C WR drawer. The failure was manifested in the main control room as a "NI CHANNEL INOP" lighted annunciator and increased indication in WR instrumentation channels B and C. Chatter of the 125 VDC contacts in the channel C annunciator circuit is believed to have induced EMI into channel B.

ABB-Combustion Engineering (CE), the designer and supplier of the WR NI instrumentation, performed an assessment of WR NI design. CE confirmed that the design employs coil-to-contact isolation in the annunciator circuit outputs to "reduce the likelihood of interactions between channels during maintenance operations or in the event of a channel malfunction" as required by IEEE 279-1971. For these units, the manufacturer (CE) of this instrumentation has taken credit for coil-to-contact isolation of the annunciator circuit relays to maintain isolation; the faults credited include open and short circuits, and shorting to the maximum credible fault voltages. Although the WR nuclear instrumentation can be sensitive to EMI, CE's engineering review concluded that the WR instrumentation design confirms that high levels of EMI will not prevent a valid component actuation from occurring and therefore, the governing IEEE 279-1971 design bases are satisfied. Accordingly, Combustion Engineering's review indicates that the operability of the RPS is not compromised by the potential for EMI on the WR NI channels.

Northeast Nuclear Energy Company has concluded that the WR nuclear instrumentation does not meet a strict interpretation of IEEE 279-1971 design basis requirements for channel independence to minimize EMI susceptibility. This susceptibility, where a failure in one channel may affect multiple channels, could result in erratic indication of WR power.

As a result of the potential for a common mode failure, the WR nuclear instrumentation channels were declared inoperable, although 2 channels remained functional. Since the unit was in cold shutdown (mode 5), immediate

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)
		YEAR	SEQUENTIAL NUMBER		REVISION NUMBER	
		96	--	013	--	00
Millstone Nuclear Power Station Unit 2	05000336					4 of 4

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

verification of the shutdown margin and verification every 4 hours thereafter, is required by the Technical Specifications. The failed power supply was replaced, a by-pass jumper was installed to bypass the annunciator circuit, and the WR channels were subsequently declared operable.

The potential for EMI induced problems with the Regulatory Guide 1.97 functions of the WR nuclear instrumentation depends on the plant-specific design of the annunciator interface and the physical proximity of the potential noise source to the RG 1.97 channels.

The actual and potential safety significance of this event is low since the shutdown margin requirements of the TS were always met and multiple channels of the WR NIs, although inoperable, were at all times available.

IV. Corrective Action

Subsequent to determining the WR NI channels inoperable, operator action was taken to verify shutdown margin in accordance with the TS requirements.

Action was taken to restore the four WR channels to operable status. The action included replacement of the failed power supply and the installation of a temporary bypass jumper to eliminate WR NI channels susceptibility to common mode failure. Additionally, temporary guidance has been established requiring operations personnel to monitor the WR NI channels while the annunciator is inoperable. The WR channels were subsequently declared operable on March 15, 1996 at 2110 hours.

A modification to address the potential for common mode failure of the WR NIs will be considered.

V. Additional Information

Similar Events

None

Manufacturer Data

Power Supply: Technipower MC 14.5 - 2.0, date code R7136

Wide Range Instrumentation: Gulf Electronics System, model NLW3