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
(203) 444-4300
Fax (203) 444-4277

The Northeast Utilities System

Donald B. Miller Jr.,
Senior Vice President - Millstone

Re: 10CFR50.73(a)(2)(v)

September 11, 1995
MP-95-281

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

Reference: Facility Operating License No. DPR-65
Docket No. 50-336
Licensee Event Report 94-040-02

This letter forwards updated Licensee Event Report 94-040-02.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Donald B. Miller, Jr.
Senior Vice President - Millstone Station

DBM/PHB:dlr

Attachment: LER 94-040-02

cc: T. T. Martin, Region I Administrator
P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3
G. S. Vissing, NRC Project Manager, Millstone Unit No. 2

NRC Form 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES: 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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 2	05000336	1 OF 9

TITLE (4)
Ventilation Design Deficiency Affecting Enclosure Building Integrity

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
										05000
12	6	94	94	- 040 -	02	09	11	95	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	*	THIS REPORT IS BEING SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)					
		20.402(b)	20.405(c)		50.73(a)(2)(iv)		73.71(b)
POWER LEVEL (10)	0	20.405(a)(1)(i)	50.36(c)(1)	X	50.73(a)(2)(v)		73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)		50.73(a)(2)(vii)		OTHER
		20.405(a)(1)(iii)	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iv)	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
		20.405(a)(1)(v)	50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Philip J. Lutzi, Nuclear Licensing	(203) 440-2072

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 DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On December 6, 1994, at 2223 hours, with the plant defueled, it was determined that a release path existed from the Enclosure Building that would allow for a direct discharge to atmosphere following a Loss of Coolant Accident (LOCA) that would not receive charcoal filtration.

Further investigation revealed that there were other potential single failure scenarios that could have resulted in a release path from the Enclosure Building that would allow a direct discharge to the atmosphere without charcoal filtration following a LOCA if Enclosure Building Purging operations were being performed.

The root cause is a deficiency in the original design.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Millstone Nuclear Power Station Unit 2	05000336	94	-- 040 --	02	02 OF 09

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

I. Description of Event

On December 6, 1994, at 2223 hours, with the plant defueled, it was determined that a release path existed from the Enclosure Building that would allow a direct discharge to the atmosphere during a Loss of Coolant Accident (LOCA) that would not receive charcoal filtration. The cause of this event has been determined to be an oversight in the original design of the discharge flow path for the Hydrogen analyzers. With the establishment of the system engineering program, the engineer reviewing a work package immediately identified the discrepancy in this non-safety related system and initiated an investigation.

The design basis of the Enclosure Building Filtration System is to collect any leakage from the Containment Structure during a LOCA and process the leakage through a High Efficiency Particulate (HEPA) and Charcoal Filtration system. This method of discharge minimizes the publics exposure to Iodine and maintains off site dose less than 10CFR100 limits.

A hydrogen analyzer cabinet and sample hood exhaust fan was found to take a suction on the enclosure building and discharge approximately 1000 cfm out the Unit 2 Main Exhaust stack. This flow path has HEPA filters but does not have any Charcoal Adsorber filtration. This non-safety related exhaust fan normally runs to maintain a negative pressure on the sample hood to prevent technicians from being exposed to gas while obtaining routine chemistry samples. The fan has no automatic shut off feature and there are no isolation dampers in the line to prevent a release during an event that would actuate the Enclosure Building Filtration System.

The Radiological Assessment branch performed an evaluation to determine the effects of this condition. Their analysis was based upon a major accident assuming a substantial meltdown of the core with subsequent release of appreciable quantities of fission products as identified in 10CFR100 and concluded that the calculated site boundary thyroid dose would exceed 10CFR100 limits.

Following the discovery of this condition on December 6, 1994, immediate corrective action was to declare the enclosure building integrity inoperable. The plant was in an undefined mode due to the core being off loaded when the discrepancy was found and declared inoperable. Enclosure Building integrity is not required in Mode 5 or 6, therefore, no additional operator actions were required.

Further investigation of ventilation systems with penetrations into the Enclosure Building resulted in additional findings. On February 9, 1995, at 1300 hours, with the plant defueled, a potential design deficiency in the enclosure building purge system was identified. In the event of a single facility or component failure, a release path from the Enclosure Building would allow for a direct discharge to the atmosphere without charcoal filtration following a LOCA if Enclosure Building Purging operations were being performed.

Completion of the investigation revealed that there were two system configuration discrepancies. It is important to note that in order for any of these unsatisfactory conditions to exist, Enclosure Building Purge operations must be in progress coincident with the Design Basis Accident and a single facility or component failure must occur.

The first single failure problem scenario deals with AC-1. (Reference attached drawing for clarification). If the Enclosure Building is being purged, and a complete failure of facility 1 Engineered Safety Actuation System (ESAS) operation is postulated, then AC-1 will remain open and EBFS fan 'A' will not get a start signal. EBFS fan 'B' will attempt to draw down the Enclosure Building to the required negative of 0.25 w.g. and most likely would not achieve this requirement.

The second problem deals with AC-11. If the Enclosure Building is being purged and damper AC-11 fails to close (either facility 2 ESAS or mechanical damper failure), then fans 34A, B, and C (main exhaust fans) will have a direct suction on the Enclosure Building atmosphere (AC-8 is open for the purge) and will result in an unfiltered release which may exceed 10CFR100 limits for offsite dose - post LOCA.

However Radiation Monitoring alarms and trends would indicate an abnormal condition and alert the operators to take corrective action to quickly terminate the event.

A review of historical documents has determined that the existing condition of the CEBPS was acceptable and has existed since initial startup. These conditions were addressed in correspondence and accepted by the NRC as meeting the Design Basis. Historical information can be found in Attachment 1.

There were no automatic or manually initiated safety systems actuated as a result of these events.

II. Cause of Event

The root cause of the hydrogen analyzer event is the design and installation of the hydrogen analyzer cabinet ventilation system.

The root cause of the Enclosure Building Purge deficiencies is the original design of the system. The Enclosure Building purge system was not originally designed for single failure, coincident with purging operations. The system does have isolation signals to individual components in the flow path.

III. Analysis of Event

Based on event investigation, this condition is reportable under the criteria of 10CFR50.73(a)(2)(v), "Any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident."

The Radiological Assessment branch performed an evaluation to determine the effects of the hydrogen analyzer condition. Their analysis was based upon a major accident assuming a substantial meltdown of the core with subsequent release of appreciable quantities of fission products as identified in 10CFR100 and concluded that the calculated site boundary thyroid dose would exceed 10CFR100 limits. This configuration has existed since initial plant construction and startup.

The Radiological Assessment branch performed an additional evaluation to determine the effects of the enclosure building purge condition. Their analysis was based upon a major accident assuming a substantial meltdown of the core with subsequent release of appreciable quantities of fission products as identified in 10CFR100 coincident with Enclosure Building purge operations, a single failure of a facility or component and significant leakage from containment into the enclosure building. The Radiological Assessment branch concluded that the calculated site boundary thyroid dose would exceed 10CFR100 limits if the release went undetected. Based upon the previous discussion, however it has been concluded that the plant is adequately and safely designed to mitigate the consequences of a LOCA.

IV. Corrective Action

Following the discovery of this condition on December 6, 1994, immediate corrective action was to declare the Enclosure Building integrity inoperable. Since the plant was defueled when the discrepancy was found and Enclosure Building integrity is not required in Mode 5 or 6, no additional immediate actions were required.

Work has been completed to relocate the hydrogen analyzer and sample hood to outside the enclosure building to correct this deficiency.

Since postulating a single failure during purging operation is beyond the original licensing basis of the plant, no further corrective action is required. However, after the single failure vulnerability was identified by our engineering staff, it was decided to install a gravity damper in the supply duct to provide redundant isolation capability and preclude the potential for an unmonitored release path. This modification is currently scheduled to be completed in October 1995.

V. Additional Information

Similar LERs: None

EIIS Codes

Hydrogen Analyzer Cabinet	IK-CAB
Hydrogen Analyzer Cabinet Fan	IK-FAN
Containment Leakage Control System	BD
Reactor Containment Building	NG
Plant Exhaust System	VL

Attachment 1

The Containment and Enclosure Building Purge System (CEBPS) is designed to ventilate the Enclosure Building (all modes) and the Containment (modes 5 and 6 only). It was purchased and installed as non-QA, and non seismic. The portion of the CEBPS which penetrates the containment and ties to EBFS was purchased and installed as QA and seismic class I. The purge fan (F23), was purchased as non-QA, non seismic. Documents prior to 1977 support this determination.

Post 1977, dampers which isolate the CEBPS from the Enclosure Building (AC-1 & 11) were upgraded to QA status. This was to accomplish the isolation function from CIAS signals post LOCA. Purge fan (F23) gets a Containment Isolation Actuation Signal (CIAS) shutdown signal and thus its breaker and controls are QA.

The EBFS system was purchased and installed as QA and seismic class I. The EBFS tie to CEBPS is QA and seismic class I also.

The Enclosure Building was not part of the 1973 Millstone Unit 2 design. It was added at the request of the Atomic Energy Commission as a measure to reduce offsite doses post-LOCA. The building was designed to be seismic class I. During the latter part of Millstone Unit 2 construction, many Enclosure Building penetrations were designed and installed non seismic.

In September 1977, NNECo informed the NRC of a fan penetration in the Enclosure Building that was not seismic. They considered it a reportable situation. The next year they realized more penetrations were not seismic and made seismic design improvements. Finally, in 1979 we clearly defined the Enclosure Building design basis. Although the building was seismically designed, many of its penetrations are not seismic. After a seismic event (SSE), it will not maintain negative pressure in the Enclosure Building Filtration Region. The sheet metal siding may be damaged and some penetrations may fail. *This condition, however is within the plant's original licensing basis*. Therefore, EBFS may not be operable for LOCA mitigation post SSE. Justification for clearly separating the SSE event and LOCA mitigation is the NRC staff's Safety Evaluation Report, section 3.9 for the MP-2 operating license and the NRC NUREG CR-1889 which determines the coincident occurrence to have a probability of 1.8×10^{-12}.

A review of NRC Questions and Answers applicable to the CEBPS and Enclosure Building during the plant operating license process in 1973-1974 clearly states our position:

Qstn 5.39

"...assess through line leakage from the containment which may bypass the Enclosure Building."

Answer

NNECO stated the following assumptions to postulate the scenarios:

- There is either a seismic occurrence and all non seismic lines are broken, or there is not a seismic occurrence and all non seismic lines are intact.
- The single failure criterion applies only to seismic class I components.

Qstn 6.17

"... specify containment isolation valves 2AC-06 and 07 Technical Specification leakage limits assuming either 2AC-08 or 03 fail to open (to vent leakage gasses to the Enclosure Building)."

Answer

NNECO discussed expected leakage past the containment isolation valves of 4.8 scfh, and expressed that this wasn't a concern since it was less than 0.1% of that assumed for off site boundary dose analysis. Then the stated, "However, damper leakage (2AC-06 or 07) is considered to be released to the Enclosure Building Filtration Region even with the failure of dampers 2AC--03 or 08 to close.". This is apparently a typo at the end, since the assessment is 2AC--03 or 08 "in the closed position".

Qstn 6.15.4

"demonstrate flow in purge lines will be inward following a LOCA including failure of AC-01 or 11."

Answer

NNECO calculated for AC-01, that with 2 EBFS fans running, that flow would still be into the Enclosure Building through the 48" open damper. Then they stated that this was more conservative that the 2AC-11 scenario.

Review of the NRCs ***Safety Evaluation for MP-2,*** dated May 10, 1974 came up with the following sections which contribute to our licensing basis:

Section 6-20 "Based on our review of the proposed design and predicted performance of the EBFS, we have concluded that the system meets the intent of the GDC 41, 42, 43, and 64."

Section 7.3 "Engineered Safety Feature Actuation System

The Unit 2 engineered safety feature actuation system (EBFAS) is functionally identical to the Calvert Cliffs system, except for two additional actuation channels: (1) an enclosure building filtration actuation channel, which is actuated automatically by a safety injection actuation signal or by actuation channel, which is actuated by high radiation in the fuel handling area or by manual actuation from the main control board. The applicants have documented that this system is designed and is being constructed in accordance with IEEE-279. We have evaluated the documentation of the electrical diagrams and conclude that the designs are acceptable."

Section 7.4 "Bypass Status of ESF systems

Unit 2 has included a bypass safety status panel to satisfy the intent of Regulatory guide 1.47. In addition to the position indicating lights for valves, pumps, fans and dampers, each safety related equipment item, which is automatically initiated to satisfy safety functions, is provide with a white and blue status light. These lights are located on the safety status panel and are grouped according to their safety function. Normally all the panel lights are off.

The white light indicates the availability of the control circuit and is arranged to energize whenever power to control circuit is lost for any reason including a blown fuse, tripped or racked out circuit breaker, loss of power, or an equipment item that is administratively bypassed for maintenance.

The blue light indicates that the equipment item is in the safe position or safe operating mode, and therefore, all blue lights in safety function group should be lit when the safety actuation signal exists. Thus, it will be readily apparent to the operator if any of the equipment is not in the safe mode for the safety function required. This design if acceptable."

The PRA group was asked to evaluate the safety significance of the single failure deficiencies. They produced, "The Single Failures of EBFS and Their Impact on Public Safety".

PRA concludes the following:

- The public safety impact associated with these single failures is negligible. The benefit determination, when averted person-REM is used, shows a benefit of $60 over the remaining plant life.
- Due to the significance of maintaining the functionality for EBFS for design basis events, we recommend "Negligible Risk Significance" as a basis to not perform modifications here. They recommend compensatory actions in light of the single failures:
  - AC-11 - - - Trip main exhaust fans or shut 2AC-8 both from the control room.
  - AC-01 - - - Manually start EBFS fan 25A from control room.

Additionally, the single failure scenarios discussed earlier can only occur when the plant is at power and is ventilating the Enclosure Building. This is an infrequent plant operation and is only performed at power, when the Enclose Building gets too hot for comfort. 1994 the Enclosure Building was only ventilated for 600 hours. This is 6.8% of the year. Therefore if the PRA calculation has the Core Damage Frequency reduced to 6.8% of the assumed 6.0E-6/yr; then the resulting $60 for the plants remaining life is reduced to $4.

To reduce the risk of the single failures resulting in any significant complication, there are other actions that can be expected without procedure changes:

- If main exhaust is still running enough time after the LOCA when containment leakage is highly radioactive; the discharge will go to the MP-2 stack. There rad monitor elements and control room alarms from instrument loop 8132 will tell the operators of the unfiltered release condition and they will secure main exhaust fans.
- If AC-11 sticks open, post LOCA, and main exhaust fans continue to pull air from the Enclosure Building, the supply will quickly dwindle to negligible amounts as the EBFS fans will start to pull 13,900 cfm until vacuum results in the Enclosure Building. At this point, the design in-leakage into the Enclosure Building Filtration Region will allow only about 2500 cfm. The greater suction capabilities of the EBFS fans will remove most of this leakage. Main exhaust fans have suction demands satisfied by other sources (Auxiliary Building, condenser-air removal, fuel hall).

Also, indication of dampers AC-1 & 11 position and EBFS fans A & B status is shown on control board C01X "Safety Status Panel". The operators will have the indication of the postulated 'wrong' accident positions, although we're not taking credit here for any immediate actions on them.

In assessing how original design could overlook so large an oversight as the single failures of AC-1 and 11; it becomes apparent that it wasn't so large an oversight but more a position taken as the result of evaluation of integrated plant systems response and risk significance.

Reasons that come up to address why AC-1 and 11 weren't fully single failure proof designs are:

- The single failures postulated for AC-1 and 11 are only possible when the plant is ventilating the Enclosure Building. The original design may have taken credit for this operation being an infrequently performed evolution and thus not necessary for single failure design philosophy.

The Enclosure Building purging while at power is still an infrequent operation as seen by last years 6.8% occurrence of the operation.

This alone reduces the vulnerability to these single failure occurrences by a factor of ten.

- NNECO evaluated that minor leakage past CEBPS containment isolation valves AC-6 and 7 would vent to the Enclosure Building upon a AC-8 failure to close. This is reasonable as the ducting is about 100' in length between the Containment and the Enclosure Building exit and is low pressure, SMACNA, non seismic ducting. This type ducting normally leaks much higher flow rates than the few cfm from the containment isolation valves.
- Containment isolation valve leakage was estimated to be a very low of overall offsite dose leakage.
- The original electrical single failure of AC-1 was only a damper failure. We are assuming a much more conservative failure of one entire ESAS cabinet, resulting in AC-1 remaining open, EBFS fan A not starting and A diesel generator not starting.

Looking at the scenarios of events, after one of the two single failures described above, it can be expected that operators will accomplish the reasonable steps required from their indications and existing procedures.

Therefore it is recommended by the assessment of "Negligible Risk Significance to Public Safety" that the plant is adequately and safety designed to mitigate the consequences of a LOCA and is at no further risk now than previously expressed at plant original licensing.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
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Millstone Nuclear Power Station Unit 2	05000336	94	- 040 -	02	09 OF 09

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