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The Northeast Utilities System

SEP 23 1998

Docket No. 50-336
B17444

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

Millstone Nuclear Power Station, Unit No. 2
Independent Corrective Action Verification Program
Unresolved Discrepancy Reports

The purpose of this letter is to submit for NRC review two Millstone Unit No. 2 ICAVP discrepancy reports that have been placed in unresolved status as part of the ICAVP inspection by Parsons Power. The designation of these two discrepancy reports as unresolved has occurred after extensive reviews and discussions held under the ICAVP protocol by Northeast Nuclear Energy Company (NNECO) and Parsons Power.

As part of the ICAVP protocol for Millstone Unit No. 2, NNECO requests that the NRC evaluate NNECO's position on discrepancy reports DR-0027 (Item 2) and DR-0312 (Item 1), and provide a final determination of whether or not Millstone Unit No. 2 is within its licensing bases for the specific topics addressed in this submittal.

Attachment 1 provides a summary of the NNECO position on the subject discrepancy reports and why NNECO believes that Millstone Unit No. 2 currently meets its licensing bases for each issue. NNECO concludes therein that the discrepancy reports should be classified as non-discrepant as part of the final record for this program.

Attachment 2 provides a copy of the handout used at the August 17, 1998, ICAVP meeting to discuss DR-0027. Attachment 3 provides a copy of DR-0027, and Attachment 4 provides a copy of DR-0312. These attachments are provided as supplemental information and do not expand the licensing bases of the unit.

There are no commitments contained within this letter.

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PDR ADOCK 05000336
P PDR

Should there be any further questions on the information provided in this letter, please contact Mr. R. T. Laudenat at (860) 444-5248.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Martin L. Bowling, Jr.
Recovery Officer - Technical Services

cc: L. J. Callan, Executive Director of Operations
H. J. Miller, Region 1 Administrator
D. G. McDonald, Jr., NRC Senior Project Manager, Millstone Unit No. 2
D. P. Beaulieu, Senior Resident Inspector, Millstone Unit No. 2
E. V. Imbro, Director, Millstone ICAVP Inspections
W. D. Lanning, Director Millstone Inspections
J. P. Durr, Chief, Inspections Branch, Millstone Inspections
D. L. Curry, Parsons Power Group

Docket No. 50-336
B17444

Attachment 1

Millstone Nuclear Power Station, Unit No. 2

Specific Information On Discrepancy Report DR-0027, "Enclosure Building Filtration & Containment/Enclosure Building Purge System Design," Rev. 5, dated October 8, 1997, and Discrepancy Report DR-0312, "Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply Tanks," Rev. 3, dated January 27, 1998.

September 1998

Millstone Nuclear Power Station, Unit No. 2

Specific Information On Discrepancy Report DR-0027, "Enclosure Building Filtration & Containment/Enclosure Building Purge System Design," Rev. 5, dated October 8, 1997, and Discrepancy Report DR-0312, "Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply Tanks," Revision 3, dated January 27, 1998

DR-0027

Parsons Power Group Discrepancy Report DR-0027, "Enclosure Building Filtration and Containment/Enclosure Building Purge System Design," Rev. 5, dated October 8, 1997

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened)

In Item 2, Parsons Power has postulated the failure of a non-safety damper (2-AC-11) to close, which could challenge the enclosure building integrity. On this basis, Parsons has determined this item to be a discrepant significance Level 1 finding.

NNECO has concluded that the issue reported in Item 2 of DR-0027 does not represent a discrepant condition because the issue postulated by Parsons Power is outside the licensing bases of Millstone Unit No. 2. The licensing bases (including the design bases) for Millstone Unit No. 2 do not require the pathway that includes damper 2-AC-11 to meet single failure criteria for its isolation function during purging of the Enclosure Building. This conclusion was provided in DR-0027 responses dated October 28, 1997, and May 1, 1998, and was reviewed with the NRC and Parsons Power in a public meeting held on August 17, 1998.

Specifically, the Millstone Unit No. 2 configuration is described by an evaluation documented in Licensee Event Report (LER) 94-040-02, "Ventilation Design Deficiency Affecting Enclosure Building Integrity," dated September 11, 1995. LER 94-040-01, dated March 10, 1995, reported, in part, a single failure vulnerability associated with damper 2-AC-11. The single failure would create a release path from the Enclosure Building to the atmosphere without charcoal filtration following a Loss of Coolant Accident (LOCA) during an Enclosure Building purge operation. A Probabilistic Risk Assessment (PRA) was completed to evaluate the safety significance of the single failure deficiency (Attachment 1 to LER 94-040-02). The PRA concluded that the plant is designed to adequately and safely mitigate consequences of a LOCA, and is at no further risk due to radiological releases now than when previously evaluated at the time of initial licensing.

As part of LER 94-040-02, NNECO provided results of a licensing and design bases review of the Containment and Enclosure Building Purge System and Enclosure

Building (Attachment 1 to LER 94-040-02). This review included reconsideration of NRC Questions and Answers applicable to these systems during the plant's initial licensing process, and the NRC's Safety Evaluation for Millstone Unit No. 2 dated May 10, 1974.

As part of their evaluation of the LER, the NRC prepared a Safety Evaluation dated March 28, 1996.[1] This NRC review concluded that in the unlikely event of a failure of damper 2-AC-11 to close during purging operation, the condition would be detected and operator actions taken to mitigate the condition in sufficient time as to not be of sufficient consequence to support the requirement for a backfit modification.

NNECO recognizes that the NRC's decision not to invoke a backfit requirement in 1996, while based on the same failure as postulated in DR-0027, would not necessarily encompass the DR-0027 scenario if different consequences resulted. However, NNECO has reviewed the DR-0027 postulated scenario for consequences, even though it is outside of the current licensing and design bases, and concluded that there would not be an increase in the consequences of the event previously evaluated by the NRC in the 1996 Safety Evaluation.

DR-0312

Parsons Power Group Discrepancy Report DR-0312, "Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply Tanks," Rev. 3, dated January 27, 1998

Item 1: Water in Diesel Oil Storage Tank T47A Could Enter Diesel Oil Supply Tanks

In Item 1, Parsons Power has postulated the ingress of water into the underground Diesel Oil Storage Tanks. When the water transfers to the Diesel Oil Supply Tanks during several design basis scenarios the diesel generators would shutdown a short time later, causing a condition that would be outside Millstone Unit No. 2's design basis.

NNECO has concluded that the condition described in Discrepancy Report DR-0312 does not represent a discrepant condition. NNECO has evaluated each of the design basis scenarios that could be at issue relative to the diesel generators and the potential for failure of the units due to water intrusion into the underground Diesel Oil Storage Tank and concluded that these conditions are within the licensing bases of Millstone Unit 2. The scenarios evaluated include:

- Extended Full Power Operation Followed By A Loss Of Normal Power, With Or Without A LOCA;

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[1] USNRC Memorandum from C. H. Berlinger to P. F. McKee, "Millstone 2, Safety Evaluation - Enclosure Building Single Failure Vulnerabilities (TAC M93652)," dated March 28, 1996.

- Extended Full Power Operation Followed By Unit Shutdown In Accordance With The Technical Specifications Prior To Arrival Of A Probable Maximum Hurricane (PMH) And Associated Design Basis Flood Levels;

- Extended Full Power Operation Followed by a Unit Manual or Automatic Trip Due a Seismic Event Without a LOCA.

NNECO notes that in each instance, the licensing bases are met.

The Diesel Oil Storage Tank was designed to maintain leak tightness for the maximum water levels associated with the PMH, which supports our licensing basis. This is evident by the placement of the single open-to-atmosphere connection to the tank (i.e., the vent pipe with flame arrestor) which is at approximate elevation (+)25'-0", a point which is higher than the maximum design basis wave runup level.

NNECO notes that the Diesel Oil Storage Tank (T47A), and its associated transfer pumps (P47A&B) and piping, are designated in the plant's original design basis as non-Category 1 systems. Diesel oil has been identified in the FSAR as being automatically transferred from the underground diesel oil storage tank to each of the diesel oil supply tanks. The diesel oil supply tanks fulfill the licensing basis requirements for Category 1 fuel supply.

Docket No. 50-336
B17444

Attachment 2

Millstone Nuclear Power Station, Unit No. 2

DR-0027 Handout Used at ICAVP Meeting

September 1998

NRC/Parsons DR 0027

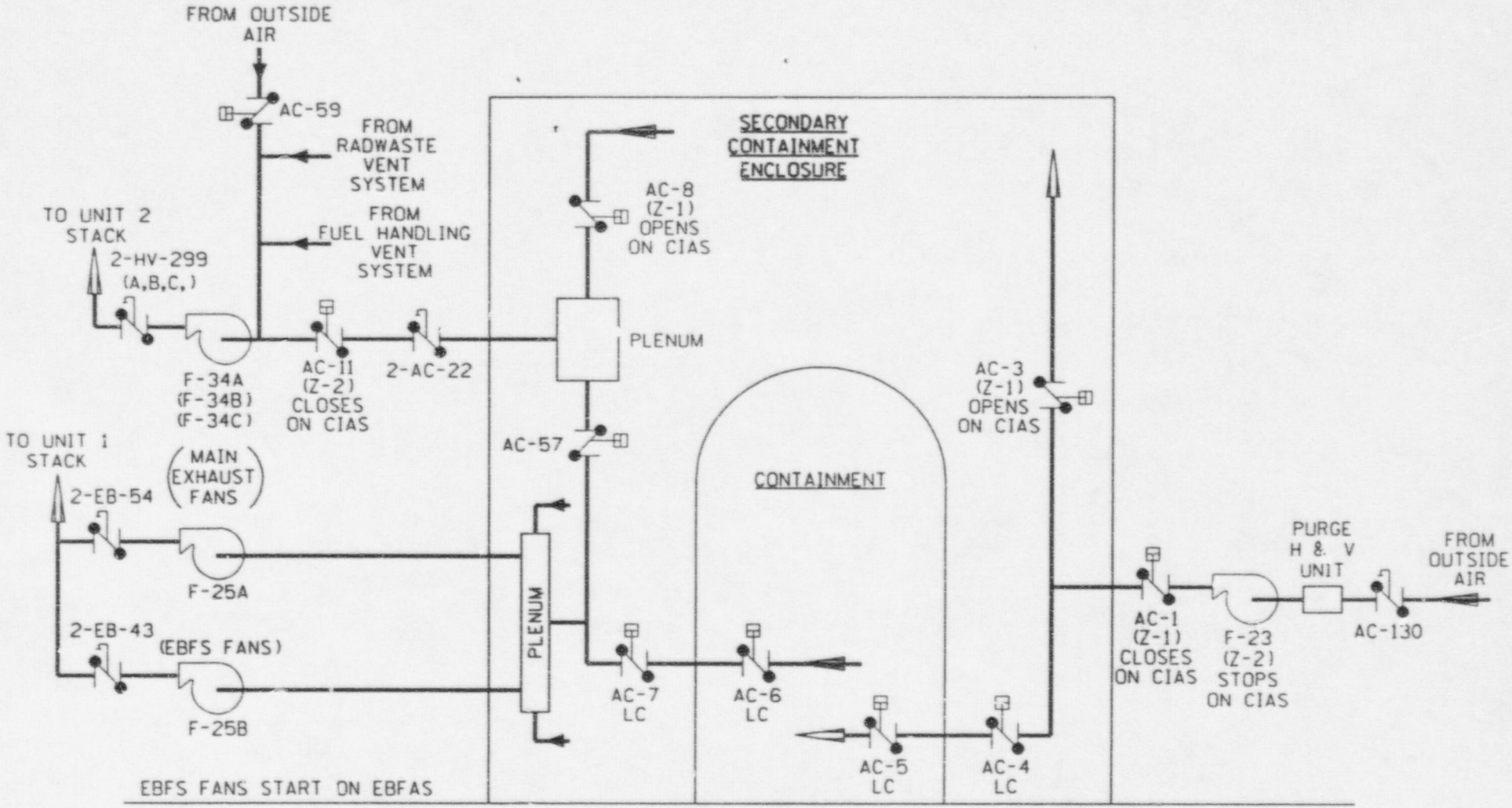
Enclosure Building Design

Overview, Mike Ahern

- Five Issue DR Rated Significance Level 1
- Issues Discussed in Detail in Previous Public Meetings with Parsons
- One Remaining Level 1 Issue; Enclosure Building Integrity following a single Failure of 2-AC-11
- NU Concludes Millstone 2 Complies with License Bases, Public Health and Safety Assured

Issue Description, Clark Maxson

- Millstone 2 Enclosure Building Ventilation Layout
- Scenario
  - Infrequent Purge Operation, research of a sample year concluded Enclosure Building purge occurs less than 7% of the time
  - LOCA Coincident with Single Failure of 1-AC-11 to close
  - Results in Main Exhaust Fans and EBFS Fans Pulling on Enclosure Building



EBFS AND CONTAINMENT & ENCLOSURE BUILDING PURGE SYSTEM

SKM-MCR-EBFS.dgn

License Bases

- Lack of single failure isolation for 2-AC-11 was addressed at the time of Plant License and later reaffirmed Post Startup in 1995

- Both times concluded 2-AC-11 does not need to be Single Failure Proof based on acceptable consequences

License Bases, Original

- 1973-1974 NRC/NU Question and Answers
- NRC Question-"...demonstrate flow in purge lines will be inward following a LOCA including failure of AC-1 or AC-11"

License Bases, Original (cont.)

- NNECO Response- Evaluation of bounding AC-1 failure determined that with 2 EBFS fans running, that flow would still be into the Enclosure Building

- NRC SER for Millstone 2 dated May 10,1974- "Based on our review of the proposed design and predicted performance of the EBFS, we have concluded that the system meets the intent of GDC 41,42,43, and 64

License Bases, Post Startup

- **1995 Engineering Analysis in support of LER 94-040-02:**
  - Postulating a single failure of 2-AC-11 during purging is beyond the License Bases
  - Negligible Public Safety Impact based on the probability of occurrence and consequences

License Bases, Post Startup (cont.)

- Instrumentation would alert operators to the potential release and terminate it by shutting off the main exhaust fans
- Thus, the plant is adequately and safely designed to mitigate the consequences of a LOCA
- No modifications are required to eliminate the 2-AC-11 single failure

License Bases, Post Startup (cont.)

- **NRC reviewed LER 94-040-02 and the NRC Safety Evaluation concluded:**
  - "The fact that the vulnerability exists only during purging of the Enclosure Building reduces the **probability** by at least an order of magnitude", and

License Bases, Post Startup (cont.)

– "The fact that the potential release path is monitored for radioactivity provides a **high degree of confidence that manual action would be quickly taken** to terminate the release by shutting off the main ventilation fans"

License Bases, Post Startup (cont.)

– "Based on these considerations, the staff accepts the licensee's position that the **correction of the AC-11 single failure vulnerability is unnecessary**. It is also noted that the licensee has performed an Integrated Safety Assessment Program cost benefit analysis...and determined that **the potential safety benefit is insignificant**."

Beyond License Bases, "What If"

- Instrumentation would alert operators to the potential release and terminate it by shutting off the main exhaust fans
- Enclosure Building will not be significantly impacted
  - Enclosure Building is designed and model tested to greater than 8 in. w.g.
  - Maximum possible Enclosure Building negative pressure is 6 in. w.g.

Beyond License Bases, "What If" (cont.)

- Low probability event, purge operation is infrequent

- Conclusion, Public Health and Safety is Assured

Conclusions, Mike Ahern

- Millstone 2 Complies with License Bases
- Significant Design Margin Covers "What If"
- Public Health and Safety Assured

Docket No. 50-336
B17444

Attachment 3

Millstone Nuclear Power Station, Unit No. 2

Discrepancy Report DR-0027

September 1998

PARSONS POWER GROUP INC.
ICAVP MILLSTONE UNIT 2
DISCREPANCY REPORT

2675 Morgantown Road, Reading, PA 19607
(610) 855-2000 • FAX: (610) 855-2509

DR NUMBER: DR-0027
DR TITLE: Enclosure Bldg Filtration & Containment/Enclosure Bldg Purge System Design
REVISION: 5
ISSUE DATE: 10/8/97
ORIGINATING GROUP: 2
SIGNIFICANCE LEVEL: UNRESOLVED

DISCREPANCY

Background

Operation of the Enclosure Building Filtration System (EBFS) is credited in the Loss of Coolant Accident (LOCA) analyses for the calculation of offsite dose. Maintaining the Enclosure Building Filtration Region (EBFR) at a negative pressure ensures any containment penetration leakage into the EBFR remains in the Enclosure Building for controlled release via the installed filtration system. Thus, the offsite dose is reduced due to filtration and elevated release via the Unit-1 stack.

System Design

Per FSAR Section 6.7.4.1, the EBFS can maintain the EBFR under a minimum negative pressure of 0.25 in.wg with one fan operating. The capacity of one fan is 9,000 CFM and the design in-leakage rate into the EBFR is 2560 CFM. Assuming the failure of the purge supply damper 2-AC-1 as the single failure, both EBFS fans are relied upon to operate in order to maintain the minimum pressure of -0.25 in. wg. in the EBFR. In order to handle the additional 8400 CFM of in-leakage through the open damper both fans are required to operate.

The Enclosure Building is designed to a maximum negative pressure of 2.0 in.wg.

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

In the event of an emergency condition, an Enclosure Building Filtration Actuation System (EBFAS) signal will start the two EBFS fans F-25A & F-25B. The fans will run until shutdown by the plant operators. Damper 2-AC-1 (EB air supply isolation damper) will close upon receipt of the emergency signal, if not in the normally closed position. FSAR Section 6.7.2.1 states that 2.0 in.wg. is the maximum differential pressure that the enclosure metal siding can sustain and still maintain its leak-tight characteristics. Since the EBFS does not have pressure control provisions to prevent exceeding the building maximum pressure limit, a potential exists for breaching the integrity of the enclosure building when two fans operate with damper 2-AC-1 closed.

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened):

If a CIAS occurs while purging the Enclosure Building, the purge supply fan F-23 and damper AC-1 are automatically stopped and closed, respectively. The Enclosure Building purge exhaust damper AC-8 remains open. The main exhaust fans will continue to operate and, if damper 2-AC-11 fails open, draw air from the Enclosure Building until the fans are turned off manually following a Unit 2 Stack high radiation alarm. The EBFS is also activated automatically and both fans operate.

Damper AC-1 is a pneumatic damper. The sudden closure of this damper while the main exhaust fans are exhausting air from the Enclosure Building, could cause a sudden increase in negative pressure in the building. The design exhaust rate from the building is 32,000 CFM and the operating pressure in the main exhaust plenum is - 5.5 in.wg. (Dwg 25203-26057). This pressure is significantly higher than the - 2.0 in.wg maximum pressure limit for the building.

When the main exhaust fans are operating, the air exhausted from the Enclosure Building (via exhaust damper AC-11) is mixed with exhaust air from the other buildings prior to discharge to the Unit 2 stack. It is possible that the main exhaust fans will continue to operate together with the EBFS fans. The negative pressure induced by the main exhaust fans in the building is a back pressure to the EBFS fans and will cause the EBFS fans to operate to the left of the their combined fan curve, thus, increasing the building negative pressure.

An analysis of this potential breaching of Enclosure Building leak-tightness integrity does not exist.

NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference I.1) addressed the failure of non-safety damper AC-11 from the perspective of releases via the main exhaust path. NNECo committed to perform certain operator actions to shutdown this release path following receipt of a high radiation signal. However, the Safety Evaluation did not consider the potential for excessive negative pressure in the Enclosure Building due to damper AC-11 remaining in the open position. The closure of damper AC-11 may be necessary to ensure Enclosure Building integrity.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position:

Consider the case for which a LOCA occurs with damper 2-AC-1 in the open position. In addition, consider the single failure of damper 2-AC-1 as failing in the open position. For this scenario, the design building in-leakage is 2560 + 8400 = 10,960 CFM. Since the in-leakage exceeds the design capacity of one fan (9000 cfm) it is concluded that both fans must operate to achieve the design 0.25 in.wg negative pressure. Using FSAR Figure 6.7-3 to estimate the two fan operating capacity indicates that the system may not be capable of handling the in-leakage. Thus, the design minimum -0.25 in.wg building pressure may not be achieved.

Item 4: Inability to Maintain Minimum Negative Pressure with One EBFS Fan Operating and AC-1 Opened

According to the NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference I.1):

> "...In the event of a LOCA or MSLB during purging, with failure of actuation signal CH1-CIAS, damper AC-1 would fail to close and fan F-25A would fail to start. This combination of lack of isolation (AC-1) and reduced filtered exhaust capability (loss of one train of exhaust/cleanup) would prevent the secondary containment from functioning properly as a fission product cleanup system for primary containment leakage as the single operating F-25 fan would not have sufficient capacity to establish and maintain the necessary negative pressure in the unisolated Enclosure Building...
>
> ... Although the licensee claims that corrective action is not required by the original licensing basis, a modification has been proposed to eliminate the AC-1 vulnerability. A gravity damper

would be installed as shown in the drawing. It would be weighted such that operation of purge fan F-23 opens it, but a -0.25 wg. vacuum due to operation of an EBFS fan would not cause it to open. This action would eliminate the AC-1 single failure condition."

According to the NOTE 2 under 4.1.13 of SP 2609E, "Approximately 5 pounds of force applied to F-23 suction damper, AC-130, counter weight lever is sufficient to open the damper." The damper size is 47" x 47". For conservatism, use half of the damper area as the effective area that is subjected to a differential pressure. Thus, a pressure differential of about 0.13 in. wg. will open the gravity damper. According to drawing 25203-26057, the static pressure in the vicinity of AC-130 (pressure point 13) is -0.11 in.wg. Test data (attached to Reference B.13) shows that one EBFS fan operating can create higher negative pressures than 0.25 in. wg (-0.35 to -0.75 in.wg).

In addition, during containment purge using the EBFS containment cleanup flow path, AC-1 is manually opened, but the purge supply fan must not be started (refer to 4.1.12 of SP 2314B). Thus, AC-130 is relied upon to open by the differential pressure created by the EBFS fan for makeup air during containment cleanup.

The above contradicts the AC-130 performance requirement as stated in the AC-1 resolution. AC-130 will open at less than the design negative pressure of 0.25 in. wg. with the purge supply fan F-23 shutdown.

Calculation Review

To resolve items 1 and 3 above, the calculations noted under Reference B were reviewed. The review found a generic problem in that the calculations are out of date and have several analytical problems. A preliminary review of the UIRs for the system (Reference C) initially confirmed the same finding. However, the UIRs were not specific enough to indicated that items 1 and 3 above will be corrected.

Request for Additional Information

RAI-468 was issued on 09/17/97 requesting the following:

1. Copies of the latest completed test procedures, performance data and operational data used to measure building pressure, fan flow rate, and building in-leakage rate for the following conditions:
   a. One fan operating with purge supply damper 2-AC-1 in the open and close positions.
   b. Two fans operating with purge supply damper 2- AC-1 in the open and close positions.
2. The basis for in-leakage rate of 2560 CFM referenced in FSAR Section 6.7.4.1.
3. Documentation which identifies the design features used to prevent the EBFR from exceeding the maximum allowed 2.0 in. wg. negative pressure.
4. Up-dated calculation or other documentation that determines the system capacity with one fan operating and two fans operating.

The purpose of the request was to determine:

- The as-built leak-tightness of the building and the air in-leakage rate.
- The capacity of the system when two fans are operating and damper 2-AC-1 is opened.
- If the pressure in the building does not exceed the maximum allowed of -2.0 in. wg. when two fans are operating and damper 2-AC-1 is closed.
- If the CMP had recognized the potential problem of breaching the integrity of the building when two fans are operating with damper 2-AC-1 closed.

NU responded to the request on 09/26/97 by providing copies of the following:

- Memo MP2-DE-96-0485 (Reference G.1)
- UIRs 3129, 3171, 956, 2224, 984, and 971
- SP 2609A, B, C, D, E (Reference E)

Evaluation of RAI-468 Information

The review of the above Surveillance Procedures (SPs) indicated the system is tested with only one fan operating. The building negative pressure and the time to achieve the design pressure are the only parameters tested and recorded.

The SPs do not test the system with two fans operating. Thus, the capability of the system to achieve and maintain the building minimum design pressure, when damper AC-1 is in the open position, has not been verified. Assurance that the building integrity pressure limit is not exceeded when the damper is in the closed position has not been demonstrated.

UIRs 3171, 956, 2224, 984, and 971 indicated that the CMP has recognized the need to update the existing calculations. The UIRs, however, are not sufficiently detailed to indicate that the specific discrepancies are recognized.

Item 5: UIR-3129 Conclusions and Corrective Action

The CMP via UIR 3129 recognized the need for a new analysis/calculation to provide the system operating curve and operating procedure to test both fans operating simultaneously. The UIR Recommended Disposition Details are repeated below:

"1. AR 97019618-01 is written for CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis esults.

2. AR 97019618-02 is written for CMP to verify that EBFR siding to sustain and still maintain leak-tight characteristics at upper limit of 2 inch of W.G. negative pressure.

3. AR 97019618-03 is written for CMP to generate new calculation showing system operating curve with one fan operating and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

The UIR Final Disposition is repeated below:

"Expert Panel: AGREES with Recommended Disposition Details.
AR 97019618-01, CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis results. AR 97019618-02, CMP to verify that EBFR siding to sustain and maintain leak-tight characteristics at 2 inch of W.G. AR 97019618-03, CMP to generate new calculation showing system operating curve with one fan and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

It is clear from the above that damper 2-AC-1 concerns were not recognized by the UIR. The need for a test is subject to the analysis results and not mandated. Mandated testing is required since, at best, an analysis is subjective for the EBFS. Testing for in-leakage rate was not addressed, therefore, degradation of the building leak-tightness characteristics can not be monitored.

The UIR (section 1, item 1) states "...two (2) fans in operation must be capable of maintaining a negative pressure in the EBFR less than the upper limit of 2 inches W.G." The UIR (section 2, item 1) states "System performance calculation for the fans are inadequate." UIR section 2, item 4 states "There is no

procedure to test these two fans operating simultaneously and record a maximum negative pressure developed in the EBFR."

Maintaining the structural integrity of the EB is essential in order to take credit for the filtered, elevated release path used to meet 10CFR100 release limits. However, the system design calculations and testing program are inadequate to demonstrate that the system meets its design requirement. However, the UIR states as conclusion 1 (Section 2), "This UIR has been determined not to require a CR and has not identified a potential safety significant condition." The Final Disposition Section of the UIR did not contradict this statement. This conclusion is inconsistent with the information presented in the UIR. NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

Basis for Significance Level 1:

One of the safety functions of EBFS is to collect and process potentially radioactive airborne particles and gases in the EBFR following a LOCA and limit the site boundary radiation doses to the 10CFR100 requirements. Due to the lack of supporting calculations and/or test procedures/results the ability of the EBFS to perform its primary safety function cannot be assured.

Discrepancies identified may:

1. Breach Enclosure Building integrity due to excess negative pressure (items 1 & 2), and

2. Fail to maintain the minimum required negative pressure with design building in-leakage (items 3 & 4).

NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

REFERENCES:

A. FSAR

1.	Section 5.3	Enclosure Building
2.	Chapter 6	Engineered Safety Features Systems
3.	Section 6.7	Enclosure Building Filtration System
4.	Section 9.9.2	Containment and Enclosure Building Purge System
5.	Figure 6.7-1	EBFR Negative Pressure vs. Time After DBI
6.	Figure 6.7-3	Enclosure Building Filtration System Fan Performance Curve

B. Calculations

1. 1K21-01, 10/31/74, Enclosure Building Filtration System
2. 1K21-03, 8/14/73, EBFS Flow & Delta P Calculation
3. 1K21-04, 8/23/73, EBFS P Drop Calculation
4. 1K121-05, 6/11/73, EBFS In-leakage
5. 1K21-06, 6/11/73, In-leakage Calculations for Various Rooms
6. 1K21-08, 4/6/71, Enclosure Building Filtration System
7. 1K21-11, 3/24/71, Summary of Calculation of Air Flow through the EBFS Filter Units with Given Crack Areas
8. 1K21-14, 12/02/69, EBFS Fan Selection
9. 1K21-15, 8/21/69 - Enclosure Building Filtration System
10. 1K21-17, 8/18/69, Enclosure Building Filtration System
11. 1K21-18, 12/04/69, Pressure in EBFR Transient Conditions
12. NUSCo Calc. XX-XXX-10RA "EBFS Initiation Time Effect on LOCA Dose" Rev. 01, 12/05/78
13. 2-ENG-174, 10/4/91, Air Flow through a 4" Hole from the Enclosure Building at Design Pressure

C. UIRs

959	976	981	987
956	977	982	988
971	978	984	3129
972	979	985	3171
974	980	986	

D. Operating Procedures

1. OP 2314B Containment and Enclosure Purge, Rev 16
2. OP 2314G Enclosure Building Filtration System, Rev 11

E. Surveillance Procedures

1. SP 2609 A, EBFS and Control Room Vent. Operability Test, Fac. 1 , Rev 12
2. SP 2609 B, EBFS and Control Room Vent. Operability Test, Fac. 2 , Rev 14
3. SP 2609 C, Enclosure Building Integrity Verification, Rev 5
4. SP 2609 D, Enclosure Building Filtration System Filter Testing-Refuel, Rev 10
5. SP 2609 E, Enclosure Building Filtration System Testing, Rev 6

F. RAIs

1. RAI-0221, 08/07/97
2. RAI-0415, 09/0997
3. RAI-0468, 09/17/97

G. Drawings:

25203-26028, sh1, Rev 30
25203-26028, sh2, Rev 35
25203-26028, sh3, Rev 10
25203-26028, sh5, Rev 15
25203-26059, Rev 1
25203-29640, Rev 1
25203-26028, sh4, Rev 7
25203-26057, Rev 0

H. Technical Specification

1. LCO and SR, 3/4.6.5, Secondary Containment
2. Bases, 3/4.6.5, Secondary Containment

I. Miscellaneous

1. Memo MP2-DE-96-0485, AC-1 and 11 "MP2 Enclosure Building Secondary Containment Integrity Single Failure Deficiencies" and NRC Memorandum (Carl Berlinger to Philip Mckee, Dated 3/28/96) covering disposition of this apparent deficiency along with the safety evaluation.
2. Millstone Inspection Report 97-02, June 24,1997, page 55 of 91: E8.2 (Closed) Unresolved Item 50 336/95-25-03; Enclosure Building Filtration System Single Failure Vulnerability

D. R. Ramos	Tier-2	10/8/97
Originator	**Group**	**Date**

EVALUATION		
☒ BASIS VALID	☐ BASIS INVALID - CLOSED	☐ PREVIOUSLY IDENTIFIED BY NNECo - CLOSED
Basis Valid		

R. T. Glaviano
Group Lead

10/8/97
Date

REVIEW AND APPROVAL

Reviewed: E.A. Blocher
Deputy Project Director

10/8/97
Date

Approved: D.L. Curry
Project Director

10/8/97
Date

Forwarded to NNECo, NEAC, and NRC: 10/8/97
Date

Posted to WWW: 10/13/97
Date

SUMMARY OF NNECo PROPOSED CORRECTIVE ACTION

NU has concluded that Item 1 has been previously discovered and is considered to be a significance level 3 discrepancy, and postulated fan/damper scenarios in DR Items 2, 3, 4, and 5 are non-discrepant. A summary of the conclusion for each item is listed in the Conclusion Continuation. CR M2-97-2294 has been issued to provide any follow-on activities associated with this DR.

Item 1: NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU in UIR No. 3129 and is a Significance level 3. UIR No. 3129 identified that a calculation or procedure does not exist to verify the enclosure building upper limit negative pressure of 2 in. w.g.. Corrective Actions consisting of creating a new calculation, evaluating the enclosure building integrity verses the new calculation results, and review the need for a new surveillance procedure to test both fans were initiated; reference AR 97019618, assignments 01, 02, and 03.

Item 2: NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU believes that the original plant licensing basis does not require damper AC-11 to be subject to single failure criteria. This is based on the lack of redundancy in the system design and research of the licensing basis documentation. In addition, probability analysis has been performed which indicates that based on the relatively short amount of time that the enclosure building is being purged, the probability of occurrence of the single failure for damper AC-11 is low and the risk to public safety was determined to be negligible. The postulated single failure question for damper AC-11 was previously reported via LER 94-040.

Item 3: NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 does not represent a discrepant condition. A new counterbalanced gravity damper, AC-130, has been installed upstream of damper AC-1 which has been designed and is tested to remain closed at a negative pressure of 0.25 in. w.g.. This new damper will provide the necessary isolation of the supply air flow path so that the Enclosure Building Filtration Fans will be able to draw the required negative pressure of 0.25 in. w.g..

Item 4: NU has concluded that the issues reported in Item 4 of Discrepancy Report DR-0027 do not represent a discrepant condition. First, the five pound applied force was provided in surveillance procedure SP2609E to assist the operator in determining what method to use to manually open the damper for testing and it is not a design requirement. Testing of damper AC-130 shows that it opens at a negative pressure of approximately 0.40 in. w.g.. Second, the normal flow path for makeup air for containment purge using the Enclosure Building Filtration System flow path is not through damper AC-130 but through AC-3. AC-3 is manually positioned during the test procedure to allow enclosure building air to be used for makeup.

Item 5: NU has concluded that the issue reported in Item 5 of Discrepancy Report DR-0027 does not represent a discrepant condition. The Enclosure Building integrity was not considered an issue because a preliminary review indicated that the fan performance was not considered sufficient to reach a negative pressure which would challenge the enclosure building design. Single failure vulnerabilities were also addressed in past assessments and documentation, the results of which were deemed applicable to this issue. Based on this engineering documentation, the engineering staff and the UIR expert panel, who approves the UIR resolution, concurred that the issue was not safety significant and a CR was not deemed necessary.

Second response received from NNECo on 05/07/98.

Disposition: This response provides additional information to the initial DR-0027 response, M2-IRF-00481.

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

Calculation 97-EBF-02000-M2, Rev. 0, "Enclosure Building Inleakage and Negative Pressure," dated 12/18/97 calculated the negative pressure in the EB with both the EBFS fans operating in parallel. The

calculation results establish that the negative pressure is 0.5 in. w.g. which is below the negative pressure of 2.0 in. w.g. described in the FSAR. Calculation 97-EBF-02000-M2, Rev. 0 is currently being revised. All required FSAR (section 6.7) changes and procedure changes associated with the calculation results will be made following approval of Revision 1. The response to DR-0426 will address the calculation revision and the associated required FSAR and procedure changes.

As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 and is a Significance Level 3 discrepancy. Significance Level 3 was chosen because the design basis was not fully verified as the formal pressure calculations were not performed.

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened):

The previous response, M2-IRF-00481, to DR-0027, Item 2, stated that a new calculation will be created to determine the EB performance assuming the failure modes identified in DR-0027, Item 2. Due to the variables associated with the single failure scenario and the lack of test data a calculation could not be performed. Instead, Technical Evaluation, M2-EV-98-0095 was prepared to describe the single failure scenarios associated with the CEBPS Isolation dampers 2-AC-1 and 2-AC-11 and provide justification that the Enclosure Building Filtration System (EBFS), CEBPS and the Enclosure Building (EB) meet their design and licensing basis.

The Technical Evaluation concludes that the 2-AC-11 single failure scenario condition of having both the MES fans and the EBFS fans drawing down the EB would not impact the EB leak-tightness integrity based on the original qualification testing of the EB. As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU considers the single failure scenarios associated with 2-AC-1 and 2-AC-11 beyond the original licensing and design basis of the CEBPS and no further corrective actions are required.

Note: The required FSAR changes associated with the single failure scenarios are addressed in UIR 2224, UIR 3367, and ACR M2-96-0788. In addition, all required FSAR (section 6.7) changes and procedure changes associated with the calculation change results will be made following approval of the calculations. The response to DR-0426 will address the revision to Calculation 97-EBF-02000-M2, Rev. 0, and the associated required FSAR and procedure changes.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position:

The previous response, M2-IRF-00481, to DR-0027, Item 3, stated that the 2-AC-1 single failure scenario was eliminated by implementation of PDCR MP2-041-95. Surveillance testing per SP2609E verifies that the required negative pressure will be maintained with one EBFS fan operating and 2-AC-1 open.

Calculation 97-EBF-02000-M2, Rev. 0, calculated the inleakage into the EB to be 8,700 cfm for one EBFS fan operating. The calculated inleakage value does not match the inleakage value provided in the FSAR (section 6.7). Calculation 97-EBF-02000-M2, Rev. 0 is currently being revised. All required FSAR (section 6.7) changes and procedure changes associated with the calculation results will be made following approval of Revision 1. The response to DR-0426 will address the calculation revision and the associated required FSAR and procedure changes.

NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 (calculation) and UIR 3367 (FSAR section

6.7 and 5.3.5). NU considers Item 3 a Significance Level 3 discrepancy based on the FSAR changes. The EBFS is capable of performing its intended function as verified by surveillance testing per SP2609E.

Items 4 and 5

No additional response. Response provided in M2-IRF-00481 concluded that Items 4 and 5 do not represent discrepant conditions

Conclusion: This response provides additional information to the initial DR-0027 response, M2-IRF-00481. NU has concluded that DR-0027, has identified a condition previously discovered by NU which requires correction. NU considers the issues identified in DR-0027 to be a Significance Level 3.

Item 1

As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 and is a Significance Level 3 discrepancy. The response to DR-0426 will address the revision to Calculation 97-EBF-02000-M2, Rev. 0 and the associated required FSAR and procedure changes.

Item 2

Technical Evaluation M2-EV-98-0095 concludes that the 2-AC-11 single failure scenario would not impact the EB leak-tightness integrity. As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU considers the single failure scenarios associated with 2-AC-1 and 2-AC-11 beyond the original licensing and design basis of the CEBPS and no further corrective actions are required.

Item 3

NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 and UIR 3367. NU considers Item 3 a Significance Level 3 discrepancy based on the required FSAR changes. The EBFS is capable of performing its intended function as verified by surveillance testing per SP2609E.

Items 4 and 5

No additional response. Response provided in M2-IRF-00481 concluded that Items 4 and 5 do not represent discrepant conditions

COMMENT ON NNECo PROPOSED CORRECTIVE ACTION
REVISED

General

DR-0027 contains several complex technical issues. The below chronology is presented to aid in understanding of the response/comments on this DR.

DR Chronology:

10/08/97 - Preliminary DR-0027 issued to NNECo.
10/28/97 - NNECO issued response to DR-0027.
12/22/97 - NNECo issued Calculation 97-EBF-02000-M2 Rev. 0
01/19/98 - Working meeting conducted to discuss the DR-0027 issues. NNECO committed to revise the initial response.
03/24/98 - Preliminary DR-0426 issued to NNECO. This DR listed additional issues related to Enclosure Building Ventilation System.
05/07/98 - NNECo issued revised response to DR-0027. This response tied resolution of DR-0027 to resolution of DR-0426.
06/30/98 - NNECo issued response to DR-0426 and revised Calculation 97-EBF-02000-M2 Rev 1.
08/17/98 - Meeting at NNECo to discuss DR-0027.

The comments provided herein represent the initial Parsons comments on the NNECo responses.

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

UIR-3129 identified that the existing supporting calculations and testing of the 2 EBFS Fan operating condition did not support the -2.0 in.wg. building negative pressure limit (See Item 5). NU performed calculation 97-EBF-02000-M2 Rev 1, using the average 1993 as-tested inleakage condition of 8700 cfm at -0.35 in.wg. to calculate the expected maximum negative pressure for a two-fan operating configuration. Calculation 97-EBF-02000-M2 Rev 1 reports an expected negative pressure of -0.5 in.wg at 10600 cfm inleakage for the two fan operating condition.

The FSAR states the Enclosure Building design inleakage rate is 2560 CFM at -0.25 in wg. This DR identified that operation of 2 EBFS fans at this building integrity condition will cause the Enclosure Building negative pressure to exceed the FSAR-stated limit of -2 in.wg. NU did not perform an analysis to verify this discrepancy or include this configuration in calculation 97-EBF-02000-M2 Rev 1.

Proposed Corrective Actions:
NU acknowledged the need to change the FSAR to incorporate the calculation results and proposes two corrective actions:
1) Change the FSAR-stated building design negative pressure limit to match the value (-9.75 in.wg.) determined in the 1972 qualification testing, and
2) Change the building design inleakage value to 8700 cfm.

Parsons Comments:

1) The qualification test chamber configuration differs from the actual plant configuration (See DR-0594). Scaling up the qualification test configuration to match the plant configuration gives a predicted building inleakage of 46 cfm at -9.75 in.wg. The average actual building inleakage is 8700 cfm at -0.35 in.wg. No rationale has been presented to document the applicability of the 1972 qualification test to the existing Millstone Unit 2 configuration. Thus, the qualification test is not a valid basis for changing the Enclosure Building design negative pressure limit.

2) Changing the building design inleakage rate to 8700 cfm should maintain the enclosure building below the -2.0 in.wg limit for the two-fan operating condition. It would also be necessary to specify a minimum required inleakage to ensure building pressure remains below the -2.0 in.wg limit for the two-fan operating configuration. Note, however, that changing the building design inleakage value will aggravate the issue identified in item 2 below.

This item remains DISCREPANT and is classified as Significance Level 3. This item remains open pending implementation of the proposed corrective action to raise the building design inleakage value. It is emphasized that raising the inleakage value will aggravate the issue identified in item 2 below and will also invalidate the inleakage value used in LER 94-040-02.

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened):

NNECo Response:

The damper failure vulnerabilities described in this DR have been previously addressed and found by NU to be of sufficiently low probability to be below regulatory significance. Per NU, the fan combinations and system alignments in conjunction with the damper single failure are not part of the MP2 original licensing basis.

Parsons Comment:

In response to NNECo LER 94-040-02, the NRC issued an SER (attached to NU memo MP2-DE-96-0458, dated 9/9/96) which evaluated the AC-11 single failure scenario. The NRC evaluation of the radiological consequence of the AC-11 failure considered:

1. Infrequency of the subject operating mode
2. Timely mitigation of the unfiltered release via operator action to secure the main exhaust fans on a high radiation alarm
3. With AC-11 open, the five fan operating condition will not cause excessive negative pressure in the building because the three main exhaust fans have suction demands that can be satisfied from other sources. The two EBFS fans with a combined operating capacity of 13,900 CFM will create a vacuum in the building. Enclosure Building inleakage will not exceed the 2560 cfm licensing basis value.

The NRC concluded that a backfit was not required based on the above items.

Regarding the above factors:

1. Parsons concurs that the NRC evaluated an operating frequency of approximately 600 hours per year, which is less than 10% of the plant operating time.
2. Parsons concurs that operator action to shutdown the Main Exhaust Fans on a high radiation alarm is appropriate.

3. The FSAR & LER stated inleakage value of 2560 cfm, combined with the 13,900 cfm fan capacity, implies an excess fan capacity of about 11,000 cfm. However, these are not the actual plant conditions. The actual inleakage of 8700 cfm, combined with a calculated fan capacity of 10,600 cfm, gives an excess fan capacity of approximately 2,000 cfm. Thus, this implied basis for the NRC's SER is negated by the actual plant conditions not matching the values stated in the LER.

   According to NU's latest evaluation, a five fan operating mode, at worst, could create a -6.0 in. wg. pressure. This is excessive when compared with the building licensing basis -2.0 in.wg. maximum leakage integrity limit. Thus, the evaluation result negates the basis for the NRC's SER that the five fan combination will not cause excessive negative pressure in the building.

   Parsons concludes that the SER basis, i.e., the plant configuration and performance reported in the LER, does not match the installed configuration.

The Parsons concerns regarding the five fan operating scenario are as follows:
1. An excessive negative building pressure (-6.0 in. wg.) results from a 5 fan operating configuration.
2. Leak tight integrity further degrades (seam cracking) due to the excessive negative pressure causing a permanent increase in building leakage. SP 2314B states that to prevent the potential for seam cracking the building must be maintained between +0.4 and -0.4 in. wg. This limitation was the basis for modification PDCR 2-91-77 and PDCR 2-32-84.
3. Operators shutdown the Main Exhaust Fans.
4. EBFS fans actual excess capacity of 2000 cfm is insufficient to handle the increased leakage due to the degraded building and AC-11 open. Thus the EBFS cannot maintain the minimum -0.25 in.wg. pressure.

Proposed Corrective Action:
NU proposes to:
1. Change the FSAR-stated building design negative pressure limit to match the value (-9.75 in.wg.) determined in the 1972 qualification testing, and
2. Increase the building design inleakage value to 8700 cfm.

Parsons Comment:
1. As stated in issue 1 above, changing the building pressure to -9.75 in.wg. is not supported by the 1972 qualification test, and
2. With an increased Enclosure Building design inleakage value (to 8700 cfm), degraded leakage integrity, and AC-11 open, the EBFS fans will not be able to maintain the minimum required negative pressure.

In accordance with the August 17, 1998 meeting at NNECo, this issue is categorized as UNRESOLVED.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position

Item a:
Parsons agrees that the installation of damper AC-130 by PDCR MP2-041-95 resolves the single failure vulnerability of 2-AC-1. SP 2609E appropriately tests the damper for its proper function.

FSAR section 6.7.4.1 discusses the two-fan flow capability as sufficient to mitigate an AC-1 failure. FSAR section 5.3.5 specifies the installation of AC-130 as the means for mitigating an AC-1 failure. NU identified, via UIR-3367, the need to update FSAR Section 6.7.4.1 to specify AC-130 as the means for mitigating an AC-1 failure. Parsons concurs that this issue is "PREVIOUSLY IDENTIFIED" by NNECo.

Item b:
The calculation 97-EBF-02000-M2, Rev 1 results also indicated that when two fans are operating, the flow rate is 10,600 CFM and not 13,900 CFM as stated in the FSAR. Parsons considers this issue to be "PREVIOUSLY IDENTIFIED" by NNECo. NU acknowledged the need to change the FSAR to incorporate the calculation results.

Item 4: Inability to Maintain Minimum Negative Pressure with One EBFS Fan Operating and AC-1 Opened

Parsons agrees that the installation of damper AC-130 by PDCR MP2-041-95 resolves the single failure vulnerability of 2-AC-1. NU's initial response to DR-0027, M2-IRF-00481, provided additional information that shows that the setpoint for AC-130 is 0.40 in. wg. The setpoint is correctly selected and will ensure that AC-130 will not prematurely open in the event that 2-AC-1 fails in the open position. SP 2609E appropriately tests the damper for its proper function. Parsons concurs that this item is NON-DISCREPANT.

Item 5: UIR-3129 Conclusions and Corrective Action

Several AR's were generated to address the issues raised in UIR 3129. The assigned actions included additional calculations and testing. Licensing basis issues, and the safety significance of UIR-3129, were not identified at the discovery complete date. They were subsequently identified in the calculation 97-EBF-02000-M2, Rev 1 results. Thus, this issue remains DISCREPANT as Significance Level 4.

Prepared: D.R. Ramos / R. Glaviano — 8/26/98
Group Lead — Date

Reviewed: E.A. Blocher — 8/26/98
Deputy Project Director — Date

Approved: D.L. Curry — 8/31/98
Project Director — Date

Forwarded to NNECo, NEAC, and NRC: 9/1/98 Date **Posted to WWW:** _____ Date

FINAL RESOLUTION	
Item 1:	OPEN (Significance Level 3)
Item 2:	UNRESOLVED
Item 3:	PREVIOUSLY IDENTIFIED
Item 4:	NON-DISCREPANT
Item 5:	OPEN (Significance Level 4)

E.A. Blocher Eric Blocher 31AUG-98

Deputy Project Director **Date**

PARSONS POWER GROUP INC.
ICAVP MILLSTONE UNIT 2
DISCREPANCY REPORT

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DR NUMBER: DR-0027
DR TITLE: Enclosure Bldg Filtration & Containment/Enclosure Bldg Purge System Design
REVISION: 4
ISSUE DATE: 10/8/97
ORIGINATING GROUP: 2
SIGNIFICANCE LEVEL: 1

DISCREPANCY

Background

Operation of the Enclosure Building Filtration System (EBFS) is credited in the Loss of Coolant Accident (LOCA) analyses for the calculation of offsite dose. Maintaining the Enclosure Building Filtration Region (EBFR) at a negative pressure ensures any containment penetration leakage into the EBFR remains in the Enclosure Building for controlled release via the installed filtration system. Thus, the offsite dose is reduced due to filtration and elevated release via the Unit-1 stack.

System Design

Per FSAR Section 6.7.4.1, the EBFS can maintain the EBFR under a minimum negative pressure of 0.25 in.wg with one fan operating. The capacity of one fan is 9,000 CFM and the design in-leakage rate into the EBFR is 2560 CFM. Assuming the failure of the purge supply damper 2-AC-1 as the single failure, both EBFS fans are relied upon to operate in order to maintain the minimum pressure of -0.25 in. wg. in the EBFR. In order to handle the additional 8400 CFM of in-leakage through the open damper both fans are required to operate.

The Enclosure Building is designed to a maximum negative pressure of 2.0 in.wg.

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

In the event of an emergency condition, an Enclosure Building Filtration Actuation System (EBFAS) signal will start the two EBFS fans F-25A & F-25B. The fans will run until shutdown by the plant operators. Damper 2-AC-1 (Enclosure supply isolation damper) will close upon receipt of the emergency signal, if not in the normally closed position. FSAR Section 6.7.2.1 states that 2.0 in.wg. is the maximum differential pressure that the enclosure metal siding can sustain and still maintain its leak-tight characteristics. Since the EBFS does not have pressure control provisions to prevent exceeding the building maximum pressure limit, a potential exists for breaching the integrity of the enclosure building when two fans operate with damper 2-AC-1 closed.

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened).

If a CIAS occurs while purging the Enclosure Building, the purge supply fan F-23 and damper AC-1 are automatically stopped and closed, respectively. The Enclosure Building purge exhaust damper AC-8 remains open. The main exhaust fans will continue to operate and, if damper 2-AC-11 fails open, draw air from the Enclosure Building until the fans are turned off manually following a Unit 2 Stack high radiation alarm. The EBFS is also activated automatically and both fans operate.

Damper AC-1 is a pneumatic damper. The sudden closure of this damper while the main exhaust fans are exhausting air from the Enclosure Building, could cause a sudden increase in negative pressure in the building. The design exhaust rate from the building is 32,000 CFM and the operating pressure in the main exhaust plenum is - 5.5 in.wg. (Dwg 25203-26057). This pressure is significantly higher than the -2.0 in.wg maximum pressure limit for the building.

When the main exhaust fans are operating, the air exhausted from the Enclosure Building (via exhaust damper AC-11) is mixed with exhaust air from the other buildings prior to discharge to the Unit 2 stack. It is possible that the main exhaust fans will continue to operate together with the EBFS fans. The negative pressure induced by the main exhaust fans in the building is a back pressure to the EBFS fans and will cause the EBFS fans to operate to the left of the their combined fan curve, thus, increasing the building negative pressure.

An analysis of this potential breaching of Enclosure Building leak-tightness integrity does not exist.

NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference I.1) addressed the failure of non-safety damper AC-11 from the perspective of releases via the main exhaust path. NNECo committed to perform certain operator actions to shutdown this release path following receipt of a high radiation signal. However, the Safety Evaluation did not consider the potential for excessive negative pressure in the Enclosure Building due to damper AC-11 remaining in the open position. The closure of damper AC-11 may be necessary to ensure Enclosure Building integrity.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position:

Consider the case for which a LOCA occurs with damper 2-AC-1 in the open position. In addition, consider the single failure of damper 2-AC-1 as failing in the open position. For this scenario, the design building in-leakage is 2560 + 8400 = 10,960 CFM. Since the in-leakage exceeds the design capacity of one fan (9000 cfm) it is concluded that both fans must operate to achieve the design 0.25 in.wg negative pressure. Using FSAR Figure 6.7-3 to estimate the two fan operating capacity indicates that the system may not be capable of handling the in-leakage. Thus, the design minimum -0.25 in. wg building pressure may not be achieved.

Item 4: Inability to Maintain Minimum Negative Pressure with One EBFS Fan Operating and AC-1 Opened

According to the NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference I.1):

> "...In the event of a LOCA or MSLB during purging, with failure of actuation signal CH1-CIAS, damper AC-1 would fail to close and fan F-25A would fail to start. This combination of lack of isolation (AC-1) and reduced filtered exhaust capability (loss of one train of exhaust/cleanup) would prevent the secondary containment from functioning properly as a fission product cleanup system for primary containment leakage as the single operating F-25 fan would not have sufficient capacity to establish and maintain the necessary negative pressure in the unisolated Enclosure Building...

... Although the licensee claims that corrective action is not required by the original licensing basis, a modification has been proposed to eliminate the AC-1 vulnerability. A gravity damper would be installed as shown in the drawing. It would be weighted such that operation of purge fan F-23 opens it, but a -0.25 wg. vacuum due to operation of an EBFS fan would not cause it to open. This action would eliminate the AC-1 single failure condition."

According to the NOTE 2 under 4.1.13 of SP 2609E, "Approximately 5 pounds of force applied to F-23 suction damper, AC-130, counter weight lever is sufficient to open the damper." The damper size is 47" x 47". For conservatism, use half of the damper area as the effective area that is subjected to a differential pressure. Thus, a pressure differential of about 0.13 in. wg. will open the gravity damper. According to drawing 25203-26057, the static pressure in the vicinity of AC-130 (pressure point 13) is -0.11 in.wg. Test data (attached to Reference B.13) shows that one EBFS fan operating can create higher negative pressures than 0.25 in. wg. (-0.35 to -0.75 in.wg).

In addition, during containment purge using the EBFS containment cleanup flow path, AC-1 is manually opened, but the purge supply fan must not be started (refer to 4.1.12 of SP 2314B). Thus, AC-130 is relied upon to open by the differential pressure created by the EBFS fan for makeup air during containment cleanup.

The above contradicts the AC-130 performance requirement as stated in the AC-1 resolution. AC-130 will open at less than the design negative pressure of 0.25 in. wg, with the purge supply fan F-23 shutdown.

Calculation Review

To resolve items 1 and 3 above, the calculations noted under Reference B were reviewed. The review found a generic problem in that the calculations are out of date and have several analytical problems. A preliminary review of the UIRs for the system (Reference C) initially confirmed the same finding. However, the UIRs were not specific enough to indicated that items 1 and 3 above will be corrected.

Request for Additional Information

RAI-468 was issued on 09/17/97 requesting the following:

1. Copies of the latest completed test procedures, performance data and operational data used to measure building pressure, fan flow rate, and building in-leakage rate for the following conditions:
   a. One fan operating with purge supply damper 2-AC-1 in the open and close positions.
   b. Two fans operating with purge supply damper 2- AC-1 in the open and close positions.
2. The basis for in-leakage rate of 2560 CFM referenced in FSAR Section 6.7.4.1.
3. Documentation which identifies the design features used to prevent the EBFR from exceeding the maximum allowed 2.0 in. wg. negative pressure.
4. Up-dated calculation or other documentation that determines the system capacity with one fan operating and two fans operating.

The purpose of the request was to determine:

- The as-built leak-tightness of the building and the air in-leakage rate.
- The capacity of the system when two fans are operating and damper 2-AC-1 is opened.
- If the pressure in the building does not exceed the maximum allowed of -2.0 in. wg. when two fans are operating and damper 2-AC-1 is closed.

- If the CMP had recognized the potential problem of breaching the integrity of the building when two fans are operating with damper 2-AC-1 closed.

NU responded to the request on 09/26/97 by providing copies of the following:

- Memo MP2-DE-96-0485 (Reference G.1)
- UIRs 3129, 3171, 956, 2224, 984, and 971
- SP 2609A, B, C, D, E (Reference E)

Evaluation of RAI-468 Information

The review of the above Surveillance Procedures (SPs) indicated the system is tested with only one fan operating. The building negative pressure and the time to achieve the design pressure are the only parameters tested and recorded.

The SPs do not test the system with two fans operating. Thus, the capability of the system to achieve and maintain the building minimum design pressure, when damper AC-1 is in the open position, has not been verified. Assurance that the building integrity pressure limit is not exceeded when the damper is in the closed position has not been demonstrated.

UIRs 3171, 956, 2224, 984, and 971 indicated that the CMP has recognized the need to update the existing calculations. The UIRs, however, are not sufficiently detailed to indicate that the specific discrepancies are recognized.

Item 5: UIR-3129 Conclusions and Corrective Action

The CMP via UIR 3129 recognized the need for a new analysis/calculation to provide the system operating curve and operating procedure to test both fans operating simultaneously. The UIR Recommended Disposition Details are repeated below:

"1. AR 97019618-01 is written for CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis results.

2. AR 97019618-02 is written for CMP to verify that EBFR siding to sustain and still maintain leak-tight characteristics at upper limit of 2 inch of W.G. negative pressure.

3. AR 97019618-03 is written for CMP to generate new calculation showing system operating curve with one fan operating and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

The UIR Final Disposition is repeated below:

"Expert Panel: AGREES with Recommended Disposition Details.
AR 97019618-01, CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis results. AR 97019618-02, CMP to verify that EBFR siding to sustain and maintain leak-tight characteristics at 2 inch of W.G. AR 97019618-03, CMP to generate new calculation showing system operating curve with one fan and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

It is clear from the above that damper 2-AC-1 concerns were not recognized by the UIR. The need for a test is subject to the analysis results and not mandated. Mandated testing is required since, at best, an analysis is subjective for the EBFS. Testing for in-leakage rate was not addressed, therefore, degradation of the building leak-tightness characteristics can not be monitored.

The UIR (section 1, item 1) states "... two (2) fans in operation must be capable of maintaining a negative pressure in the EBFR less than the upper limit of 2 inches W.G." The UIR (section 2, item 1) states "System performance calculation for the fans are inadequate." UIR section 2, item 4 states "There is no procedure to test these two fans operating simultaneously and record a maximum negative pressure developed in the EBFR."

Maintaining the structural integrity of the EB is essential in order to take credit for the filtered, elevated release path used to meet 10CFR100 release limits. However, the system design calculations and testing program are inadequate to demonstrate that the system meets its design requirement. However, the UIR states as conclusion 1 (Section 2), "This UIR has been determined not to require a CR and has not identified a potential safety significant condition." The Final Disposition Section of the UIR did not contradict this statement. This conclusion is inconsistent with the information presented in the UIR. NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

Basis for Significance Level 1:

One of the safety functions of EBFS is to collect and process potentially radioactive airborne particles and gases in the EBFR following a LOCA and limit the site boundary radiation doses to the 10CFR100 requirements. Due to the lack of supporting calculations and/or test procedures/results the ability of the EBFS to perform its primary safety function cannot be assured.

Discrepancies identified may:

1. Breach Enclosure Building integrity due to excess negative pressure (items 1 & 2), and

2. Fail to maintain the minimum required negative pressure with design building in-leakage (items 3 & 4).

NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

REFERENCES:

A. FSAR

1.	Section 5.3	Enclosure Building
2.	Chapter 6	Engineered Safety Features Systems
3.	Section 6.7	Enclosure Building Filtration System
4.	Section 9.9.2	Containment and Enclosure Building Purge System
5.	Figure 6.7-1	EBFR Negative Pressure vs. Time After DBI
6.	Figure 6.7-3	Enclosure Building Filtration System Fan Performance Curve

B. Calculations

1. 1K21-01, 10/31/74, Enclosure Building Filtration System
2. 1K21-03, 8/14/73, EBFS Flow & Delta P Calculation
3. 1K21-04, 8/23/73, EBFS P Drop Calculation
4. 1KI21-05, 6/11/73, EBFS In-leakage
5. 1K21-06, 6/11/73, In-leakage Calculations for Various Rooms
6. 1K21-08, 4/6/71, Enclosure Building Filtration System
7. 1K21-11, 3/24/71, Summary of Calculation of Air Flow through the EBFS Filter Units with Given Crack Areas
8. 1K21-14, 12/02/69, EBFS Fan Selection
9. 1K21-15, 8/21/69 - Enclosure Building Filtration System
10. 1K21-17, 8/18/69, Enclosure Building Filtration System
11. 1K21-18, 12/04/69, Pressure in EBFR Transient Conditions
12. NUSCo Calc. XX-XXX-10RA "EBFS Initiation Time Effect on LOCA Dose" Rev. 01, 12/05/78
13. 2-ENG-174, 10/4/91, Air Flow through a 4" Hole from the Enclosure Building at Design Pressure

C. UIRs

959	976	981	987
956	977	982	988
971	978	984	3129
972	979	985	3171
974	980	986	

D. Operating Procedures

1. OP 2314B Containment and Enclosure Purge, Rev 16
2. OP 2314G Enclosure Building Filtration System, Rev 11

E. Surveillance Procedures

1. SP 2609 A, EBFS and Control Room Vent. Operability Test, Fac. 1 , Rev 12
2. SP 2609 B, EBFS and Control Room Vent. Operability Test, Fac. 2 , Rev 14
3. SP 2609 C, Enclosure Building Integrity Verification, Rev 5
4. SP 2609 D, Enclosure Building Filtration System Filter Testing-Refuel, Rev 10
5. SP 2609 E, Enclosure Building Filtration System Testing, Rev 6

F. RAIs

1. RAI-0221, 08/07/97
2. RAI-0415, 09/0997
3. RAI-0468, 09/17/97

G. Drawings:

25203-26028, sh1, Rev 30
25203-26028, sh2, Rev 35
25203-26028, sh3, Rev 10
25203-26028, sh5, Rev 15
25203-26059, Rev 1
25203-29640, Rev 1
25203-26028, sh4, Rev 7
25203-26057, Rev 0

H. Technical Specification

1. LCO and SR, 3/4.6.5, Secondary Containment
2. Bases, 3/4.6.5, Secondary Containment

I. Miscellaneous

1. Memo MP2-DE-96-0485, AC-1 and 11 "MP2 Enclosure Building Secondary Containment Integrity Single Failure Deficiencies" and NRC Memorandum (Carl Berlinger to Philip Mckee, Dated 3/28/96) covering disposition of this apparent deficiency along with the safety evaluation.
2. Millstone Inspection Report 97-02, June 24,1997, page 55 of 91: E8.2 (Closed) Unresolved Item 50-336/95-25-03; Enclosure Building Filtration System Single Failure Vulnerability

D. R. Ramos	Tier-2	10/8/97
Originator	Group	Date

EVALUATION		
☒ BASIS VALID	☐ BASIS INVALID - CLOSED	☐ PREVIOUSLY IDENTIFIED BY NNECo - CLOSED
Basis Valid		

R. T. Glaviano
Group Lead

10/8/97
Date

REVIEW AND APPROVAL

Reviewed: E.A. Blocher
Deputy Project Director

10/8/97
Date

Approved: D.L. Curry
Project Director

10/8/97
Date

Forwarded to NNECo, NEAC, and NRC: 10/8/97
Date

Posted to WWW: 10/13/97
Date

SUMMARY OF NNECo PROPOSED CORRECTIVE ACTION

NU has concluded that Item 1 has been previously discovered and is considered to be a significance level 3 discrepancy, and postulated fan/damper scenarios in DR Items 2, 3, 4, and 5 are non-discrepant. A summary of the conclusion for each item is listed in the Conclusion Continuation. CR M2-97-2294 has been issued to provide any follow-on activities associated with this DR.

Item 1: NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU in UIR No. 3129 and is a Significance level 3. UIR No. 3129 identified that a calculation or procedure does not exist to verify the enclosure building upper limit negative pressure of 2 in. w.g.. Corrective Actions consisting of creating a new calculation, evaluating the enclosure building integrity verses the new calculation results, and review the need for a new surveillance procedure to test both fans were initiated; reference AR 97019618, assignments 01, 02, and 03.

Item 2: NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU believes that the original plant licensing basis does not require damper AC-11 to be subject to single failure criteria. This is based on the lack of redundancy in the system design and research of the licensing basis documentation. In addition, probability analysis has been performed which indicates that based on the relatively short amount of time that the enclosure building is being purged, the probability of occurrence of the single failure for damper AC-11 is low and the risk to public safety was determined to be negligible. The postulated single failure question for damper AC-11 was previously reported via LER 94-040.

Item 3: NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 does not represent a discrepant condition. A new counterbalanced gravity damper, AC-130, has been installed upstream of damper AC-1 which has been designed and is tested to remain closed at a negative pressure of 0.25 in. w.g.. This new damper will provide the necessary isolation of the supply air flow path so that the Enclosure Building Filtration Fans will be able to draw the required negative pressure of 0.25 in. w.g..

Item 4: NU has concluded that the issues reported in Item 4 of Discrepancy Report DR-0027 do not represent a discrepant condition. First, the five pound applied force was provided in surveillance procedure SP2609E to assist the operator in determining what method to use to manually open the damper for testing and it is not a design requirement. Testing of damper AC-130 shows that it opens at a negative pressure of approximately 0.40 in. w.g.. Second, the normal flow path for makeup air for containment purge using the Enclosure Building Filtration System flow path is not through damper AC-130 but through AC-3. AC-3 is manually positioned during the test procedure to allow enclosure building air to be used for makeup.

Item 5: NU has concluded that the issue reported in Item 5 of Discrepancy Report DR-0027 does not represent a discrepant condition. The Enclosure Building integrity was not considered an issue because a preliminary review indicated that the fan performance was not considered sufficient to reach a negative pressure which would challenge the enclosure building design. Single failure vulnerabilities were also addressed in past assessments and documentation, the results of which were deemed applicable to this issue. Based on this engineering documentation, the engineering staff and the UIR expert panel, who approves the UIR resolution, concurred that the issue was not safety significant and a CR was not deemed necessary.

Second response received from NNECo on 05/07/98.

Disposition: This response provides additional information to the initial DR-0027 response, M2-IRF-00481.

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

Calculation 97-EBF-02000-M2, Rev. 0, "Enclosure Building Inleakage and Negative Pressure," dated 12/18/97 calculated the negative pressure in the EB with both the EBFS fans operating in parallel. The calculation results establish that the negative pressure is 0.5 in. w.g. which is below the negative pressure of 2.0

in. w.g. described in the FSAR. Calculation 97-EBF-02000-M2, Rev. 0 is currently being revised. All required FSAR (section 6.7) changes and procedure changes associated with the calculation results will be made following approval of Revision 1. The response to DR-0426 will address the calculation revision and the associated required FSAR and procedure changes.

As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 and is a Significance Level 3 discrepancy. Significance Level 3 was chosen because the design basis was not fully verified as the formal pressure calculations were not performed.

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened):

The previous response, M2-IRF-00481, to DR-0027, Item 2, stated that a new calculation will be created to determine the EB performance assuming the failure modes identified in DR-0027, Item 2. Due to the variables associated with the single failure scenario and the lack of test data a calculation could not be performed. Instead, Technical Evaluation, M2-EV-98-0095 was prepared to describe the single failure scenarios associated with the CEBPS Isolation dampers 2-AC-1 and 2-AC-11 and provide justification that the Enclosure Building Filtration System (EBFS), CEBPS and the Enclosure Building (EB) meet their design and licensing basis.

The Technical Evaluation concludes that the 2-AC-11 single failure scenario condition of having both the MES fans and the EBFS fans drawing down the EB would not impact the EB leak-tightness integrity based on the original qualification testing of the EB. As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU considers the single failure scenarios associated with 2-AC-1 and 2-AC-11 beyond the original licensing and design basis of the CEBPS and no further corrective actions are required.

Note: The required FSAR changes associated with the single failure scenarios are addressed in UIR 2224, UIR 3367, and ACR M2-96-0788. In addition, all required FSAR (section 6.7) changes and procedure changes associated with the calculation change results will be made following approval of the calculations. The response to DR-0426 will address the revision to Calculation 97-EBF-02000-M2, Rev. 0, and the associated required FSAR and procedure changes.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position:

The previous response, M2-IRF-00481, to DR-0027, Item 3, stated that the 2-AC-1 single failure scenario was eliminated by implementation of PDCR MP2-041-95. Surveillance testing per SP2609E verifies that the required negative pressure will be maintained with one EBFS fan operating and 2-AC-1 open.

Calculation 97-EBF-02000-M2, Rev. 0, calculated the inleakage into the EB to be 8,700 cfm for one EBFS fan operating. The calculated inleakage value does not match the inleakage value provided in the FSAR (section 6.7). Calculation 97-EBF-02000-M2, Rev. 0 is currently being revised. All required FSAR (section 6.7) changes and procedure changes associated with the calculation results will be made following approval of Revision 1. The response to DR-0426 will address the calculation revision and the associated required FSAR and procedure changes.

NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 (calculation) and UIR 3367 (FSAR section 6.7 and 5.3.5). NU considers Item 3 a Significance Level 3 discrepancy based on the FSAR changes. The EBFS is capable of performing its intended function as verified by surveillance testing per SP2609E.

Items 4 and 5

No additional response. Response provided in M2-IRF-00481 concluded that Items 4 and 5 do not represent discrepant conditions

Conclusion: This response provides additional information to the initial DR-0027 response, M2-IRF-00481 NU has concluded that DR-0027, has identified a condition previously discovered by NU which requires correction. NU considers the issues identified in DR-0027 to be a Significance Level 3.

Item 1

As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 and is a Significance Level 3 discrepancy. The response to DR-0426 will address the revision to Calculation 97-EBF-02000-M2, Rev. 0 and the associated required FSAR and procedure changes.

Item 2

Technical Evaluation M2-EV-98-0095 concludes that the 2-AC-11 single failure scenario would not impact the EB leak-tightness integrity. As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU considers the single failure scenarios associated with 2-AC-1 and 2-AC-11 beyond the original licensing and design basis of the CEBPS and no further corrective actions are required.

Item 3

NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 and UIR 3367. NU considers Item 3 a Significance Level 3 discrepancy based on the required FSAR changes. The EBFS is capable of performing its intended function as verified by surveillance testing per SP2609E.

Items 4 and 5

No additional response. Response provided in M2-IRF-00481 concluded that Items 4 and 5 do not represent discrepant conditions

COMMENT ON NNECo PROPOSED CORRECTIVE ACTION

General

DR-0027 contains several complex technical issues. The below chronology is presented to aid in understanding of the response/comments on this DR.

DR Chronology:

10/08/97 - Preliminary DR-0027 issued to NNECo.
10/28/97 - NNECO issued response to DR-0027.
12/22/97 - NNECo issued Calculation 97-EBF-02000-M2 Rev. 0
01/19/98 - Working meeting conducted to discuss the DR-0027 issues. NNECO committed to revise the initial response.
03/24/98 - Preliminary DR-0426 issued to NNECO. This DR listed additional issues related to Enclosure Building Ventilation System.
05/07/98 - NNECo issued revised response to DR-0027. This response tied resolution of DR-0027 to resolution of DR-0426.
06/30/98 - NNECo issued response to DR-0426 and revised Calculation 97-EBF-02000-M2 Rev 1.

The comments provided herein represent the initial Parsons comments on the NNECo responses.

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

UIR-3129 identified that the existing supporting calculations and testing of the 2 EBFS Fan operating condition did not support the -2.0 in.wg. building negative pressure limit (See Item 5). NU performed calculation 97-EBF-02000-M2 Rev 1, using the average 1993 as-tested inleakage condition of 8700 cfm at -0.35 in.wg. to calculate the expected maximum negative pressure for a two-fan operating configuration. Calculation 97-EBF-02000-M2 Rev 1 reports an expected negative pressure of -0.5 in.wg at 10600 cfm inleakage for the two fan operating condition.

The FSAR states the Enclosure Building design inleakage rate is 2560 CFM at -0.25 in wg. This DR identified that operation of 2 EBFS fans at this building integrity condition will cause the Enclosure Building negative pressure to exceed the FSAR-stated limit of -2 in.wg. NU did not perform an analysis to verify this discrepancy or include this configuration in calculation 97-EBF-02000-M2 Rev 1.

Proposed Corrective Actions:
NU acknowledged the need to change the FSAR to incorporate the calculation results and proposes two corrective actions:

1) Change the FSAR-stated building design negative pressure limit to match the value (-9.75 in.wg.) determined in the 1972 qualification testing, and
2) Change the building design inleakage value to 8700 cfm.

Parsons Comments:

1) The qualification test chamber configuration differs from the actual plant configuration (See DR-0594). Scaling up the qualification test configuration to match the plant configuration gives a predicted building inleakage of 46 cfm at -9.75 in.wg. The average actual building inleakage is 8700 cfm at -0.35 in.wg. No rationale has been presented to document the applicability of the 1972 qualification test to the existing Millstone Unit 2 configuration. Thus, the qualification test is not a valid basis for changing the Enclosure Building design negative pressure limit.

2) Changing the building design inleakage rate to 8700 cfm should maintain the enclosure building below the -2.0 in.wg limit for the two-fan operating condition. It would also be necessary to specify a minimum required inleakage to ensure building pressure remains below the -2.0 in.wg limit for the two-fan operating configuration. Note, however, that changing the building design inleakage value will aggravate the issue identified in item 2 below.

This item remains DISCREPANT and is classified as Significance Level 3. This item remains open pending implementation of the proposed corrective action to raise the building design inleakage value.

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened):

NNECo Response:
The damper failure vulnerabilities described in this DF have been previously addressed and found by NU to be of sufficiently low probability to be below regulatory significance. Per NU, the fan combinations and system alignments in conjunction with the damper single failure are not part of the MP2 original licensing basis.

Parsons Comment:
In response to NNECo LER 94-040-02, the NRC issued an SER (attached to NU memo MP2-DE-96-0458, dated 9/9/96) which evaluated the AC-11 single failure scenario. The NRC evaluation of the radiological consequence of the AC-11 failure considered:

1. Infrequency of the subject operating mode,
2. Timely mitigation of the unfiltered release via operator action,
3. Based on the design inleakage value of 2560 cfm, two EBFS fans (with a capacity of 13,900 cfm) will maintain the required minimum negative pressure following operator action to shutdown the main exhaust fans,
4. Enclosure Building will perform as designed (implies that the building will not experience an excessive negative pressure).

The NRC concluded that a backfit was not required based on the above items.

Regarding the above factors:

1. Parsons concurs that the NRC evaluated an operating frequency of approximately 600 hours per year, which is less than 10% of the plant operating time.
2. Parsons concurs that operator action to shutdown the Main Exhaust Fans on a high radiation alarm is appropriate.
3. The FSAR & LER stated inleakage value of 2560 cfm, combined with the 13,900 cfm fan capacity, will give an excess fan capacity of about 11,000 cfm, which could make it possible to maintain the required negative pressure. However, these are not the actual plant conditions. The actual inleakage of 8700 cfm, combined with a calculated fan capacity of 10,600 cfm, gives an excess fan capacity of approximately 2,000 cfm, which would not be sufficient to maintain the required negative pressure with AC-11 open. Thus, this basis for the NRC's SER is negated by the actual plant conditions not matching the values stated in the LER. This condition would be further aggravated by degrading the building leakage integrity resulting from an excess negative pressure experienced during a five-fan operating condition.
4. In a five fan operating mode, the Enclosure Building will exhibit an excessive negative pressure at the licensing basis design inleakage rate. Thus, this basis for the NRC's SER is negated by the actual plant conditions not matching the conditions stated in the LER.

Parsons concludes that the SER basis, i.e., the plant configuration and performance reported in the LER and the NU responses to follow-up NRC questions, does not match the installed configuration.

The Parsons concerns regarding the five fan operating scenario are as follows:

1. An excessive negative building pressure results from a 5 fan operating configuration.
2. Leak tight integrity further degrades due to the excess negative pressure causing a permanent increase in building leakage.
3. Operators shutdown the Main Exhaust Fans.
4. EBFS fans are unable to handle the increased leakage due to the degraded building and AC-11 open. Thus the EBFS cannot maintain the minimum -0.25 in.wg. pressure.

Proposed Corrective Action:
NU proposes to:

1. Change the FSAR-stated building design negative pressure limit to match the value (-9.75 in.wg.) determined in the 1972 qualification testing, and
2. Increase the building design inleakage value to 8700 cfm.

Parsons comment:

1. As stated in issue 1 above, changing the building pressure to -9.75 in.wg. is not supported by the 1972 qualification test, and
2. With an increased Enclosure Building design inleakage value (to 8700 cfm), and AC-11 open, the EBFS fans will not be able to maintain the minimum required negative pressure.

This issue remains DISCREPANT at Significance Level 1.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position

Item a:
Parsons agrees that the installation of damper AC-130 by PDCR MP2-041-95 resolves the single failure vulnerability of 2-AC-1. SP 2609E appropriately tests the damper for its proper function.

FSAR section 6.7.4.1 discusses the two-fan flow capability as sufficient to mitigate an AC-1 failure. FSAR section 5.3.5 specifies the installation of AC-130 as the means for mitigating an AC-1 failure. NU identified, via UIR-3367, the need to update FSAR Section 6.7.4.1 to specify AC-130 as the means for mitigating an AC-1 failure. Parsons concurs that this issue is "PREVIOUSLY IDENTIFIED" by NNECo.

Item b:
The calculation 97-EBF-02000-M2, Rev 1 results also indicated that when two fans are operating, the flow rate is 10,600 CFM and not 13,900 CFM as stated in the FSAR. Parsons considers this issue to be "PREVIOUSLY IDENTIFIED" by NNECo. NU acknowledged the need to change the FSAR to incorporate the calculation results.

Item 4: Inability to Maintain Minimum Negative Pressure with One EBFS Fan Operating and AC-1 Opened

Parsons agrees that the installation of damper AC-130 by PDCR MP2-041-95 resolves the single failure vulnerability of 2-AC-1. NU's initial response to DR-0027, M2-IRF-00481, provided additional information that shows that the setpoint for AC-130 is 0.40 in. wg. The setpoint is correctly selected and will ensure that AC-130 will not prematurely open in the event that 2-AC-1 fails in the open position. SP 2609E appropriately tests the damper for its proper function. Parsons concurs that this item is NON-DISCREPANT.

Item 5: UIR-3129 Conclusions and Corrective Action

Several AR's were generated to address the issues raised in UIR 3129. The assigned actions included additional calculations and testing. Licensing basis issues, and the safety significance of UIR-3129, were not identified at the discovery complete date. They were subsequently identified in the calculation 97-EBF-02000-M2, Rev 1 results. Thus, this issue remains DISCREPANT as Significance Level 4

D.R. Ramos / R.T. Glaviano

Prepared: D.R. Ramos / R. Glaviano — 8/10/98

Group Lead — Date

D L Curry

E.A. Blocher (per telecon)

Reviewed: E.A. Blocher — 8/10/98

Deputy Project Director — Date

D L Curry

Approved: D.L. Curry — 8/11/98

Project Director — Date

Forwarded to NNECo, NEAC, and NRC:_____ Date **Posted to WWW:**_____ Date

FINAL RESOLUTION	
Item 1:	OPEN (Significance Level 3)
Item 2:	OPEN (Significance Level 1)
Item 3:	PREVIOUSLY IDENTIFIED
Item 4:	NON-DISCREPANT
Item 5:	OPEN (Significance Level 4)

E.A. Blocher (per telecon) D L Curry

E.A. Blocher — 8/11/97

Deputy Project Director — Date

PARSONS POWER GROUP INC.
ICAVP MILLSTONE UNIT 2
DISCREPANCY REPORT

2675 Morgantown Road, Reading, PA
19607
(610) 855-2000 • FAX: (610) 855-2509

DR NUMBER: DR-0027
DR TITLE: Enclosure Bldg Filtration & Containment/Enclosure Bldg Purge System Design
REVISION: 0
ISSUE DATE: 10/8/97
ORIGINATING GROUP: 2
SIGNIFICANCE LEVEL: 1

DISCREPANCY

Background

Operation of the Enclosure Building Filtration System (EBFS) is credited in the Loss of Coolant Accident (LOCA) analyses for the calculation of offsite dose. Maintaining the Enclosure Building Filtration Region (EBFR) at a negative pressure ensures any containment penetration leakage into the EBFR remains in the Enclosure Building for controlled release via the installed filtration system. Thus, the offsite dose is reduced due to filtration and elevated release via the Unit-1 stack.

System Design

Per FSAR Section 6.7.4.1, the EBFS can maintain the EBFR under a minimum negative pressure of 0.25 in.wg with one fan operating. The capacity of one fan is 9,000 CFM and the design in-leakage rate into the EBFR is 2560 CFM. Assuming the failure of the purge supply damper 2-AC-1 as the single failure, both EBFS fans are relied upon to operate in order to maintain the minimum pressure of -0.25 in. wg. in the EBFR. In order to handle the additional 8400 CFM of in-leakage through the open damper both fans are required to operate.

The Enclosure Building is designed to a maximum negative pressure of 2.0 in.wg.

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

In the event of an emergency condition, an Enclosure Building Filtration Actuation System (EBFAS) signal will start the two EBFS fans F-25A & F-25B. The fans will run until shutdown by the plant operators. Damper 2-AC-1 (EB air supply isolation damper) will close upon receipt of the emergency signal, if not in the normally closed position. FSAR Section 6.7.2.1 states that 2.0 in.wg. is the maximum differential pressure that the enclosure metal siding can sustain and still maintain its leak-tight characteristics. Since the EBFS does not have pressure control provisions to prevent exceeding the building maximum pressure limit, a potential exists for breaching the integrity of the enclosure building when two fans operate with damper 2-AC-1 closed.

Attachment 2
ICAVP Response Form

Response ID: M2-IRF-01767

RFI/RAI Number: NA NA **AR Number:** NA

DR Number: DR-0027 (Parsons) M2-DRT-00027(NU) **AR Number:** 97024996 **CR Number:** M2-97-2294

System Number/Name or Program ID/Name:
2314G/EBFS

Subject:
Request for replacement copy of document(s) previously transmitted by Northeast Utilities to Parsons. This discrepancy is rated as Significance Level 1 by Parsons.

Background:
DR-0027 response is for replacement of Response ID: **M2-IRF-01635**

☐ Continuation

Disposition:
Replacement copy required.

☐ Continuation

Conclusion:
Northeast Utilities is transmitting a replacement copy to Parsons of **M2-IRF-01635** and any applicable documents for response to **DR-0027**. Transmitting M2-EV-98-0095 Rev. 0 Attachment 3 Page 6 - 21, and Attachment 4, 5, and 6.

☐ Continuation

Preparer: D. L. Goodman (D. L. Goodman) Date: 5-12-98

Independent Reviewer: NA Date:

Unit Lead Review: M. Mattioli for (M. Mattioli) Date: 5/12/98

Technical Review Team Concurrence: N/A (G. Pitman) Date:

NU ICAVP Project Manager Approval: J. G. Fougere (J. G. Fougere) Date: 5/12/98

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened):

If a CIAS occurs while purging the Enclosure Building, the purge supply fan F-23 and damper AC-1 are automatically stopped and closed, respectively. The Enclosure Building purge exhaust damper AC-8 remains open. The main exhaust fans will continue to operate and, if damper 2-AC-11 fails open, draw air from the Enclosure Building until the fans are turned off manually following a Unit 2 Stack high radiation alarm. The EBFS is also activated automatically and both fans operate.

Damper AC-1 is a pneumatic damper. The sudden closure of this damper while the main exhaust fans are exhausting air from the Enclosure Building, could cause a sudden increase in negative pressure in the building. The design exhaust rate from the building is 32,000 CFM and the operating pressure in the main exhaust plenum is - 5.5 in.wg. (Dwg 25203-26057). This pressure is significantly higher than the -2.0 in.wg maximum pressure limit for the building.

When the main exhaust fans are operating, the air exhausted from the Enclosure Building (via exhaust damper AC-11) is mixed with exhaust air from the other buildings prior to discharge to the Unit 2 stack. It is possible that the main exhaust fans will continue to operate together with the EBFS fans. The negative pressure induced by the main exhaust fans in the building is a back pressure to the EBFS fans and will cause the EBFS fans to operate to the left of the their combined fan curve, thus, increasing the building negative pressure.

An analysis of this potential breaching of Enclosure Building leak-tightness integrity does not exist.

NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference I.1) addressed the failure of non-safety damper AC-11 from the perspective of releases via the main exhaust path. NNECo committed to perform certain operator actions to shutdown this release path following receipt of a high radiation signal. However, the Safety Evaluation did not consider the potential for excessive negative pressure in the Enclosure Building due to damper AC-11 remaining in the open position. The closure of damper AC-11 may be necessary to ensure Enclosure Building integrity.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position:

Consider the case for which a LOCA occurs with damper 2-AC-1 in the open position. In addition, consider the single failure of damper 2-AC-1 as failing in the open position. For this scenario, the design building in-leakage is 2560 + 8400 = 10,960 CFM. Since the in-leakage exceeds the design capacity of one fan (9000 cfm) it is concluded that both fans must operate to achieve the design 0.25 in.wg negative pressure. Using FSAR Figure 6.7-3 to estimate the two fan operating capacity indicates that the system may not be capable of handling the in-leakage. Thus, the design minimum -0.25 in. wg building pressure may not be achieved.

Item 4: Inat Maintain Minimum Negative Pressure with One EBFS Fan Operating and AC-1 Opened

According to the NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference I.1):

> "...In the event of a LOCA or MSLB during purging, with failure of actuation signal CH1-CIAS, damper AC-1 would fail to close and fan F-25A would fail to start. This combination of lack of isolation (AC-1) and reduced filtered exhaust capability (loss of one train of exhaust/cleanup) would prevent the secondary containment from functioning properly as a fission product cleanup system for primary containment leakage as the single operating F-25 fan would not have sufficient capacity to establish and maintain the necessary negative pressure in the unisolated Enclosure Building...

... Although the licensee claims that corrective action is not required by the original licensing basis, a modification has been proposed to eliminate the AC-1 vulnerability. A gravity damper would be installed as shown in the drawing. It would be weighted such that operation of purge fan F-23 opens it, but a -0.25 wg. vacuum due to operation of an EBFS fan would not cause it to open. This action would eliminate the AC-1 single failure condition."

According to the NOTE 2 under 4.1.13 of SP 2609E, "Approximately 5 pounds of force applied to F-23 suction damper, AC-130, counter weight lever is sufficient to open the damper." The damper size is 47" x 47". For conservatism, use half of the damper area as the effective area that is subjected to a differential pressure. Thus, a pressure differential of about 0.13 in. wg. will open the gravity damper. According to drawing 25203-26057, the static pressure in the vicinity of AC-130 (pressure point 13) is -0.11 in.wg. Test data (attached to Reference B.13) shows that one EBFS fan operating can create higher negative pressures than 0.25 in. wg. (-0.35 to -0.75 in.wg).

In addition, during containment purge using the EBFS containment cleanup flow path, AC-1 is manually opened, but the purge supply fan must not be started (refer to 4.1.12 of SP 2314B). Thus, AC-130 is relied upon to open by the differential pressure created by the EBFS fan for makeup air during containment cleanup.

The above contradicts the AC-130 performance requirement as stated in the AC-1 resolution. AC-130 will open at less than the design negative pressure of 0.25 in. wg, with the purge supply fan F-23 shutdown.

Calculation Review

To resolve items 1 and 3 above, the calculations noted under Reference B were reviewed. The review found a generic problem in that the calculations are out of date and have several analytical problems. A preliminary review of the UIRs for the system (Reference C) initially confirmed the same finding. However, the UIRs were not specific enough to indicated that items 1 and 3 above will be corrected.

Request for Additional Information

RAI-468 was issued on 09/17/97 requesting the following:

1. Copies of the latest completed test procedures, performance data and operational data used to measure building pressure, fan flow rate, and building in-leakage rate for the following conditions:
   a. One fan operating with purge supply damper 2-AC-1 in the open and close positions.
   b. Two fans operating with purge supply damper 2- AC-1 in the open and close positions.
2. The basis for in-leakage rate of 2560 CFM referenced in FSAR Section 6.7.4.1.
3. Documentation which identifies the design features used to prevent the EBFR from exceeding the maximum allowed 2.0 in. wg. negative pressure.
4. Up-dated calculation or other documentation that determines the system capacity with one fan operating and two fans operating.

The purpose of the request was to determine:

- The as-built leak-tightness of the building and the air in-leakage rate.
- The capacity of the system when two fans are operating and damper 2-AC-1 is opened.
- If the pressure in the building does not exceed the maximum allowed of -2.0 in. wg. when two fans are operating and damper 2-AC-1 is closed.

- If the CMP had recognized the potential problem of breaching the integrity of the building when two fans are operating with damper 2-AC-1 closed.

NU responded to the request on 09/26/97 by providing copies of the following:

- Memo MP2-DE-96-0485 (Reference G.1)
- UIRs 3129, 3171, 956, 2224, 984, and 971
- SP 2609A, B, C, D, E (Reference E)

Evaluation of RAI-468 Information

The review of the above Surveillance Procedures (SPs) indicated the system is tested with only one fan operating. The building negative pressure and the time to achieve the design pressure are the only parameters tested and recorded.

The SPs do not test the system with two fans operating. Thus, the capability of the system to achieve and maintain the building minimum design pressure, when damper AC-1 is in the open position, has not been verified. Assurance that the building integrity pressure limit is not exceeded when the damper is in the closed position has not been demonstrated.

UIRs 3171, 956, 2224, 984, and 971 indicated that the CMP has recognized the need to update the existing calculations. The UIRs, however, are not sufficiently detailed to indicate that the specific discrepancies are recognized.

Item 5: UIR-3129 Conclusions and Corrective Action

The CMP via UIR 3129 recognized the need for a new analysis/calculation to provide the system operating curve and operating procedure to test both fans operating simultaneously. The UIR Recommended Disposition Details are repeated below:

"1. AR 97019618-01 is written for CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis results.

2. AR 97019618-02 is written for CMP to verify that EBFR siding to sustain and still maintain leak-tight characteristics at upper limit of 2 inch of W.G. negative pressure.

3. AR 97019618-03 is written for CMP to generate new calculation showing system operating curve with one fan operating and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

The UIR Final Disposition is repeated below:

> "Expert Panel: AGREES with Recommended Disposition Details.
> AR 97019618-01, CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis results. AR 97019618-02, CMP to verify that EBFR siding to sustain and maintain leak-tight characteristics at 2 inch of W.G. AR 97019618-03, CMP to generate new calculation showing system operating curve with one fan and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

It is clear from the above that damper 2-AC-1 concerns were not recognized by the UIR. The need for a test is subject to the analysis results and not mandated. Mandated testing is required since, at best, an analysis is subjective for the EBFS. Testing for in-leakage rate was not addressed, therefore, degradation of the building leak-tightness characteristics can not be monitored.

The UIR (section 1, item 1) states "...two (2) fans in operation must be capable of maintaining a negative pressure in the EBFR less than the upper limit of 2 inches W.G." The UIR (section 2, item 1) states "System performance calculation for the fans are inadequate." UIR section 2, item 4 states "There is no procedure to test these two fans operating simultaneously and record a maximum negative pressure developed in the EBFR."

Maintaining the structural integrity of the EB is essential in order to take credit for the filtered, elevated release path used to meet 10CFR100 release limits. However, the system design calculations and testing program are inadequate to demonstrate that the system meets its design requirement. However, the UIR states as conclusion 1 (Section 2), "This UIR has been determined not to require a CR and has not identified a potential safety significant condition." The Final Disposition Section of the UIR did not contradict this statement. This conclusion is inconsistent with the information presented in the UIR. NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

Basis for Significance Level 1:

One of the safety functions of EBFS is to collect and process potentially radioactive airborne particles and gases in the EBFR following a LOCA and limit the site boundary radiation doses to the 10CFR100 requirements. Due to the lack of supporting calculations and/or test procedures/results the ability of the EBFS to perform its primary safety function cannot be assured.

Discrepancies identified may:

1. Breach Enclosure Building integrity due to excess negative pressure (items 1 & 2), and

2. Fail to maintain the minimum required negative pressure with design building in-leakage (items 3 & 4).

NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

REFERENCES:

A. FSAR

1.	Section 5.3	Enclosure Building
2.	Chapter 6	Engineered Safety Features Systems
3.	Section 6.7	Enclosure Building Filtration System
4.	Section 9.9.2	Containment and Enclosure Building Purge System
5.	Figure 6.7-1	EBFR Negative Pressure vs. Time After DBI
6.	Figure 6.7-3	Enclosure Building Filtration System Fan Performance Curve

B. Calculations

1. 1K21-01, 10/31/74, Enclosure Building Filtration System
2. 1K21-03, 8/14/73, EBFS Flow & Delta P Calculation
3. 1K21-04, 8/23/73, EBFS P Drop Calculation
4. 1KI21-05, 6/11/73, EBFS In-leakage
5. 1K21-06, 6/11/73, In-leakage Calculations for Various Rooms
6. 1K21-08, 4/6/71, Enclosure Building Filtration System
7. 1K21-11, 3/24/71, Summary of Calculation of Air Flow through the EBFS Filter Units with Given Crack Areas
8. 1K21-14, 12/02/69, EBFS Fan Selection
9. 1K21-15, 8/21/69 - Enclosure Building Filtration System
10. 1K21-17, 8/18/69, Enclosure Building Filtration System
11. 1K21-18, 12/04/69, Pressure in EBFR Transient Conditions
12. NUSCo Calc. XX-XXX-10RA "EBFS Initiation Time Effect on LOCA Dose" Rev. 01, 12/05/78
13. 2-ENG-174, 10/4/91, Air Flow through a 4" Hole from the Enclosure Building at Design Pressure

C. UIRs

959	976	981	987
956	977	982	988
971	978	984	3129
972	979	985	3171
974	980	986	

D. Operating Procedures

1. OP 2314B Containment and Enclosure Purge, Rev 16
2. OP 2314G Enclosure Building Filtration System, Rev 11

E. Surveillance Procedures

1. SP 2609 A, EBFS and Control Room Vent. Operability Test, Fac. 1 , Rev 12
2. SP 2609 B, EBFS and Control Room Vent. Operability Test, Fac. 2 , Rev 14
3. SP 2609 C, Enclosure Building Integrity Verification, Rev 5
4. SP 2609 D, Enclosure Building Filtration System Filter Testing-Refuel, Rev 10
5. SP 2609 E, Enclosure Building Filtration System Testing, Rev 6

F. RAIs

1. RAI-0221, 08/07/97
2. RAI-0415, 09/0997
3. RAI-0468, 09/17/97

G. Drawings:

25203-26028, sh1, Rev 30
25203-26028, sh2, Rev 35
25203-26028, sh3, Rev 10
25203-26028, sh5, Rev 15
25203-26059, Rev 1
25203-29640, Rev 1
25203-26028, sh4, Rev 7
25203-26057, Rev 0

H. Technical Specification

1. LCO and SR, 3/4.6.5, Secondary Containment
2. Bases, 3/4.6.5, Secondary Containment

I. Miscellaneous

1. Memo MP2-DE-96-0485, AC-1 and 11 "MP2 Enclosure Building Secondary Containment Integrity Single Failure Deficiencies" and NRC Memorandum (Carl Berlinger to Philip Mckee, Dated 3/28/96) covering disposition of this apparent deficiency along with the safety evaluation.
2. Millstone Inspection Report 97-02, June 24,1997, page 55 of 91: E8.2 (Closed) Unresolved Item 50-336/95-25-03; Enclosure Building Filtration System Single Failure Vulnerability

D. R. Ramos *D. R. Ramos*	**Tier-2**	**10/8/97**
Originator	**Group**	**Date**

EVALUATION		
☒ BASIS VALID	☐ BASIS INVALID - CLOSED	☐ PREVIOUSLY IDENTIFIED BY NNECo - CLOSED

Basis Valid

R. T. Graviano

R. T. Graviano

Group Lead

10/8/97

Date

REVIEW AND APPROVAL

Reviewed: E.A. Blocher

Deputy Project Director

10/8/97

Date

Approved: D.L. Curry

Project Director

10/8/97

Date

/s/ P. D. Hinnekamp
Form Approved by

9/30/97
Effective Date

97-535
SORC Mtg. No.

COPY

CR Form
Initiation

CR No. M2-97-2294

Section 1: To be completed by Initiator (please type or print)

Organization identifying condition:	Discovery date: 10/8/97 Discovery time: 1700	Affected Unit(s): 1☐ 2☒ 3☐ C☐	System #: 2390C
M2 ICAVP Response			

1. Condition description (including how condition was discovered, organization creating condition, what activity was in progress when event was discovered):

DR-0027. A discrepancy report concerning the Enclosure Building Filtration System has been issued by the ICAVP contractor. The specific condition description is contained in the attached Parsons Discrepancy Report DR-0027.

According to the ICAVP contractor, this is a Significance Level 1 (highest) discrepancy report. A Level 1 discrepancy is assigned to a discrepancy by Parsons when the system does not meet its licensing and design bases and cannot perform its intended function.

Component Identification Number:
Method of Discovery: **Ext. Oversight**

Continuation Sheet ☐

2. Immediate corrective action taken

The system engineer (Phil Bauman) has been notified by Audix.
CMP is currently reviewing whether this issue had been discovered during the PI-7 review of the EBFS system.

TR# AWO# Eng. Disp.#

Continuation Sheet ☐

3. Recommended corrective action

This CR should be assigned to Engineering for evaluation and disposition.

Continuation Sheet ☐

4. Initiator Name: Craig B. Swanner Time: 1738 Phone No.: 3432

Initiator's Signature: [signature] Date: 10/8/97 Cost Control Center: 82B

Initiator Requests Follow-up: YES

Supervisor Name: Joe Fougere Time: 1746

Supervisor Signature: [signature] Date: 10/8/97 Phone No: 5526

Section 2: To be completed by Operability/Reportability Screening Designee

1. Does CR have an actual or potential effect on plant or personnel safety, operability, reportability, (e.g., NGP 2.25, EPIP 4400) or plant operation?

☐ Yes or Don't Know (Section 3 required to be completed.)
☐ No

Notes:

Designee Date Time

If continuation sheets (RP 4-1, Page 7) are required, identify the section being continued by section number.

Attachment 2
ICAVP Response Form

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) **AR Number**: 97024996 **CR Number**: M2-97-2294
M2-DRT-00027 (NU)

System Number/Name or Program ID/Name: Tier 1

Subject: Enclosure Building Filtration & Containment/Enclosure Building Purge System Design. This discrepancy is rated as Significance Level 1 by Parsons.

Background: Operation of the Enclosure Building Filtration System (EBFS) is credited in the Loss of Coolant Accident (LOCA) analyses for the calculation of offsite dose. Maintaining the Enclosure Building Filtration Region (EBFR) at a negative pressure ensures any containment penetration leakage into the EBFR remains in the Enclosure Building for controlled release via the installed filtration system. Thus, the offsite dose is reduced due to filtration and elevated release via the Unit-1 stack. (continued on page 2 of 22)

☒ Continuation

Disposition: NU has concluded that this DR identifies issues involving a composite of design bases, equipment capability, operator intervention and startup and operational testing issues. As such, it is not appropriate to comment on NU's characterization of the individual issues as being valid, invalid, pre-discovered or of a particular Significance Level and the disposition of each of these without first providing a lead in discussion of the EBFS, Enclosure Building isolation features and NU's committed design of the system, as follows: (continued on page 10 of 22)

☒ Continuation

Conclusion: NU has concluded that Item 1 has been previously discovered and is considered to be a significance level 3 discrepancy, and postulated fan/damper scenarios in DR Items 2, 3, 4, and 5 are non-discrepant. A summary of the conclusion for each item is listed in the Conclusion Continuation. CR M2-97-2294 has been issued to provide any follow-on activities associated with this DR. (continued on page 22 of 22)

☒ Continuation

Preparer: Gary E. Komosky (G. Komosky) Date: 10/27/97

Independent Reviewer: R. Baumann / T.J. Doyle Date: 10/27/97

Unit Lead Review: Paul H. Bunte for F. Mattioli Date: 10/27/97

Technical Review Team Concurrence: J. Pitman Date: 10/27/97

NU ICAVP Project Manager Approval: J. Fougere Date: 10/27/97

NU CMP Director Approval: R. Necci Date: 10-28-97

Attachment 3
ICAVP
RFI/RAI Response Form Continuation Sheet

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) **AR Number**: 97024996 **CR Number**: M2-97-2294
M2-DRT-00027 (NU)

Background Continuation:

System Design

Per FSAR Section 6.7.4.1, the EBFS can maintain the EBFR under a minimum negative pressure of 0.25 in. w.g. with one fan operating. The capacity of one fan is 9,000 CFM and the design in-leakage rate into the EBFR is 2560 CFM. Assuming the failure of the purge supply damper 2-AC-1 as the single failure, both EBFS fans are relied upon to operate in order to maintain the minimum pressure of -0.25 in. w.g. in the EBFR. In order to handle the additional 8400 CFM of in-leakage through the open damper both fans are required to operate.

The Enclosure Building is designed to a maximum negative pressure of 2.0 in.w.g..

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

In the event of an emergency condition, an Enclosure Building Filtration Actuation System (EBFAS) signal will start the two EBFS fans F-25A & F-25B. The fans will run until shutdown by the plant operators. Damper 2-AC-1 (EB air supply isolation damper) will close upon receipt of the emergency signal, if not in the normally closed position. FSAR Section 6.7.2.1 states that 2.0 in. w.g. is the maximum differential pressure that the enclosure metal siding can sustain and still maintain its leak-tight characteristics. Since the EBFS does not have pressure control provisions to prevent exceeding the building maximum pressure limit, a potential exists for breaching the integrity of the enclosure building when two fans operate with damper 2-AC-1 closed.

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened):

If a CIAS occurs while purging the Enclosure Building, the purge supply fan F-23 and damper AC-1 are automatically stopped and closed, respectively. The Enclosure Building purge exhaust damper AC-8 remains open. The main exhaust fans will continue to operate and, if damper 2-AC-11 fails open, draw air from the Enclosure Building until the fans are turned off manually following a Unit 2 Stack high radiation alarm. The EBFS is also activated automatically and both fans operate.

Damper AC-1 is a pneumatic damper. The sudden closure of this damper while the main exhaust fans are exhausting air from the Enclosure Building, could cause a sudden increase in negative pressure in the building. The design exhaust rate from the building is 32,000 CFM and the operating pressure in the main exhaust plenum is - 5.5 in. w.g. (Dwg 25203-26057). This pressure is significantly higher than the -2.0 in.wg maximum pressure limit for the building.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Background Continuation: Item 2: (continued)

When the main exhaust fans are operating, the air exhausted from the Enclosure Building (via exhaust damper AC-11) is mixed with exhaust air from the other buildings prior to discharge to the Unit 2 stack. It is possible that the main exhaust fans will continue to operate together with the EBFS fans. The negative pressure induced by the main exhaust fans in the building is a back pressure to the EBFS fans and will cause the EBFS fans to operate to the left of the their combined fan curve, thus, increasing the building negative pressure.

An analysis of this potential breaching of Enclosure Building leak-tightness integrity does not exist.

NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference I.1) addressed the failure of non-safety damper AC-11 from the perspective of releases via the main exhaust path. NNECo committed to perform certain operator actions to shutdown this release path following receipt of a high radiation signal. However, the Safety Evaluation did not consider the potential for excessive negative pressure in the Enclosure Building due to damper AC-11 remaining in the open position. The closure of damper AC-11 may be necessary to ensure Enclosure Building integrity.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position:

Consider the case for which a LOCA occurs with damper 2-AC-1 in the open position. In addition, consider the single failure of damper 2-AC-1 as failing in the open position. For this scenario, the design building in-leakage is 2560 + 8400 = 10,960 CFM. Since the in-leakage exceeds the design capacity of one fan (9000 cfm) it is concluded that both fans must operate to achieve the design 0.25 in.wg negative pressure. Using FSAR Figure 6.7-3 to estimate the two fan operating capacity indicates that the system may not be capable of handling the in-leakage. Thus, the design minimum -0.25 in. wg building pressure may not be achieved.

Item 4: Inability to Maintain Minimum Negative Pressure with One EBFS Fan Operating and AC-1 Opened:

According to the NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference I.1):

"...In the event of a LOCA or MSLB during purging, with failure of actuation signal CH1-CIAS, damper AC-1 would fail to close and fan F-25A would fail to start. This combination of lack of isolation (AC-1) and reduced filtered exhaust capability (loss of one train of exhaust/cleanup) would prevent the secondary containment from functioning properly as a fission product cleanup system for primary containment leakage as the single operating F-25 fan would not have sufficient capacity to establish and maintain the necessary negative pressure in the unisolated Enclosure Building...

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Background Continuation: Item 4: (continued)

... Although the licensee claims that corrective action is not required by the original licensing basis, a modification has been proposed to eliminate the AC-1 vulnerability. A gravity damper would be installed as shown in the drawing. It would be weighted such that operation of purge fan F-23 opens it, but a -0.25 wg. vacuum due to operation of an EBFS fan would not cause it to open. This action would eliminate the AC-1 single failure condition."

According to the NOTE 2 under 4.1.13 of SP 2609E, "Approximately 5 pounds of force applied to F-23 suction damper, AC-130, counter weight lever is sufficient to open the damper." The damper size is 47" x 47". For conservatism, use half of the damper area as the effective area that is subjected to a differential pressure. Thus, a pressure differential of about 0.13 in. wg. will open the gravity damper. According to drawing 25203-26057, the static pressure in the vicinity of AC-130 (pressure point 13) is -0.11 in.wg. Test data (attached to Reference B.13) shows that one EBFS fan operating can create higher negative pressures than 0.25 in. wg. (-0.35 to -0.75 in.wg).

In addition, during containment purge using the EBFS containment cleanup flow path, AC-1 is manually opened, but the purge supply fan must not be started (refer to 4.1.12 of SP 2314B). Thus, AC-130 is relied upon to open by the differential pressure created by the EBFS fan for makeup air during containment cleanup.

The above contradicts the AC-130 performance requirement as stated in the AC-1 resolution. AC-130 will open at less than the design negative pressure of 0.25 in. wg, with the purge supply fan F-23 shutdown.

Calculation Review

To resolve items 1 and 3 above, the calculations noted under Reference B were reviewed. The review found a generic problem in that the calculations are out of date and have several analytical problems. A preliminary review of the UIRs for the system (Reference C) initially confirmed the same finding. However, the UIRs were not specific enough to indicated that items 1 and 3 above will be corrected.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Background Continuation: Item 4: (continued)

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1. Copies of the latest completed test procedures, performance data and operational data used to measure building pressure, fan flow rate, and building in-leakage rate for the following conditions:

   a. One fan operating with purge supply damper 2-AC-1 in the open and close positions.
   b. Two fans operating with purge supply damper 2- AC-1 in the open and close positions.

2. The basis for in-leakage rate of 2560 CFM referenced in FSAR Section 6.7.4.1.

3. Documentation which identifies the design features used to prevent the EBFR from exceeding the maximum allowed 2.0 in. wg. negative pressure.

4. Up-dated calculation or other documentation that determines the system capacity with one fan operating and two fans operating.

The purpose of the request was to determine:

- The as-built leak-tightness of the building and the air in-leakage rate.
- The capacity of the system when two fans are operating and damper 2-AC-1 is opened.
- If the pressure in the building does not exceed the maximum allowed of -2.0 in. wg. when two fans are operating and damper 2-AC-1 is closed.
- If the CMP had recognized the potential problem of breaching the integrity of the building when two fans are operating with damper 2-AC-1 closed.

NU responded to the request on 09/26/97 by providing copies of the following:

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Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Background Continuation: Item 4: (continued)

Evaluation of RAI-468 Information

The review of the above Surveillance Procedures (SPs) indicated the system is tested with only one fan operating. The building negative pressure and the time to achieve the design pressure are the only parameters tested and recorded.

The SPs do not test the system with two fans operating. Thus, the capability of the system to achieve and maintain the building minimum design pressure, when damper AC-1 is in the open position, has not been verified. Assurance that the building integrity pressure limit is not exceeded when the damper is in the closed position has not been demonstrated.

UIRs 3171, 956, 2224, 984, and 971 indicated that the CMP has recognized the need to update the existing calculations. The UIRs, however, are not sufficiently detailed to indicate that the specific discrepancies are recognized.

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The CMP via UIR 3129 recognized the need for a new analysis/calculation to provide the system operating curve and operating procedure to test both fans operating simultaneously. The UIR Recommended Disposition Details are repeated below:

"1. AR 97019618-01 is written for CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis results.

2. AR 97019618-02 is written for CMP to verify that EBFR siding to sustain and still maintain leak-tight characteristics at upper limit of 2 inch of w.g. negative pressure.

3. AR 97019618-03 is written for CMP to generate new calculation showing system operating curve with one fan operating and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Background Continuation: Item 5: (continued)

The UIR Final Disposition is repeated below:

"Expert Panel: AGREES with Recommended Disposition Details.
AR 97019618-01, CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis results. AR 97019618-02, CMP to verify that EBFR siding to sustain and maintain leak-tight characteristics at 2 inch of w.g. AR 97019618-03, CMP to generate new calculation showing system operating curve with one fan and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

It is clear from the above that damper 2-AC-1 concerns were not recognized by the UIR. The need for a test is subject to the analysis results and not mandated. Mandated testing is required since, at best, an analysis is subjective for the EBFS. Testing for in-leakage rate was not addressed, therefore, degradation of the building leak-tightness characteristics can not be monitored.

The UIR (section 1, item 1) states "...two (2) fans in operation must be capable of maintaining a negative pressure in the EBFR less than the upper limit of 2 inches w.g." The UIR (section 2, item 1) states "System performance calculation for the fans are inadequate." UIR section 2, item 4 states "There is no procedure to test these two fans operating simultaneously and record a maximum negative pressure developed in the EBFR."

Maintaining the structural integrity of the EB is essential in order to take credit for the filtered, elevated release path used to meet 10CFR100 release limits. However, the system design calculations and testing program are inadequate to demonstrate that the system meets its design requirement. However, the UIR states as conclusion 1 (Section 2), "This UIR has been determined not to require a CR and has not identified a potential safety significant condition." The Final Disposition Section of the UIR did not contradict this statement. This conclusion is inconsistent with the information presented in the UIR. NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

Basis for Significance Level 1:

One of the safety functions of EBFS is to collect and process potentially radioactive airborne particles and gases in the EBFR following a LOCA and limit the site boundary radiation doses to the 10CFR100 requirements. Due to the lack of supporting calculations and/or test procedures/results the ability of the EBFS to perform its primary safety function cannot be assured.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Background Continuation: Item 5: (continued)

Discrepancies identified may:

1. Breach Enclosure Building integrity due to excess negative pressure (items 1 & 2), and
2. Fail to maintain the minimum required negative pressure with design building in-leakage (items 3 & 4).

NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

REFERENCES:

A. FSAR

1. Section 5.3 Enclosure Building
2. Chapter 6 Engineered Safety Features Systems
3. Section 6.7 Enclosure Building Filtration System
4. Section 9.9.2 Containment and Enclosure Building Purge System
5. Figure 6.7-1 EBFR Negative Pressure vs. Time After DBI
6. Figure 6.7-3 Enclosure Building Filtration System Fan Performance Curve

B. Calculations

1. 1K21-01, 10/31/74, Enclosure Building Filtration System
2. 1K21-03, 8/14/73, EBFS Flow & Delta P Calculation
3. 1K21-04, 8/23/73, EBFS P Drop Calculation
4. 1KI21-05, 6/11/73, EBFS In-leakage
5. 1K21-06, 6/11/73, In-leakage Calculations for Various Rooms
6. 1K21-08, 4/6/71, Enclosure Building Filtration System
7. 1K21-11, 3/24/71, Summary of Calculation of Air Flow through the EBFS Filter Units with Given Crack Areas
8. 1K21-14, 12/02/69, EBFS Fan Selection
9. 1K21-15, 8/21/69 - Enclosure Building Filtration System
10. 1K21-17, 8/18/69, Enclosure Building Filtration System
11. 1K21-18, 12/04/69, Pressure in EBFR Transient Conditions
12. NUSCo Calc. XX-XXX-10RA "EBFS Initiation Time Effect on LOCA Dose" Rev. 01, 12/05/78
13. 2-ENG-174, 10/4/91, Air Flow through a 4" Hole from the Enclosure Building at Design Pressure

Attachment 3
ICAVP
RFI/RAI Response Form Continuation Sheet

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) **AR Number**: 97024996 **CR Number**: M2-97-2294
M2-DRT-00027 (NU)

Background Continuation: REFERENCES: (continued)

C. UIRs

959 976 981 987
956 977 982 988
971 978 984 3129
972 979 985 3171
974 980 986

D. Operating Procedures

1. OP 2314B Containment and Enclosure Purge, Rev 16
2. OP 2314G Enclosure Building Filtration System, Rev 11

E. Surveillance Procedures

1. SP 2609 A, EBFS and Control Room Vent. Operability Test, Fac. 1 , Rev 12
2. SP 2609 B, EBFS and Control Room Vent. Operability Test, Fac. 2 , Rev 14
3. SP 2609 C, Enclosure Building Integrity Verification, Rev 5
4. SP 2609 D, Enclosure Building Filtration System Filter Testing-Refuel, Rev 10
5. SP 2609 E, Enclosure Building Filtration System Testing, Rev 6

F. RAIs

1. RAI-0221, 08/07/97
2. RAI-0415, 09/0997
3. RAI-0468, 09/17/97

G. Drawings

25203-26028, sh1, Rev 30 25203-26028, sh5, Rev 15 25203-26028, sh4, Rev 7
25203-26028, sh2, Rev 35 25203-26059, Rev 1 25203-26057, Rev 0
25203-26028, sh3, Rev 10 25203-29640, Rev 1

H. Technical Specification
1. LCO and SR, 3/4.6.5, Secondary Containment
2. Bases, 3/4.6.5, Secondary Containment

Attachment 3
ICAVP
RFI/RAI Response Form Continuation Sheet

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) **AR Number**: 97024996 **CR Number**: M2-97-2294
M2-DRT-00027 (NU)

Background Continuation: REFERENCES: (continued)

I. Miscellaneous

1. Memo MP2-DE-96-0485, AC-1 and 11 "MP2 Enclosure Building Secondary Containment Integrity Single Failure Deficiencies" and NRC Memorandum (Carl Berlinger to Philip Mckee, Dated 3/28/96) covering disposition of this apparent deficiency along with the safety evaluation.
2. Millstone Inspection Report 97-02, June 24,1997, page 55 of 91: E8.2 (Closed) Unresolved Item 50-336/95-25-03; Enclosure Building Filtration System Single Failure Vulnerability

Disposition Continuation:

Throughout the Nuclear Industry, the general topic of Secondary Containment Drawdown, Filtration and Release systems (EBFS in Millstone 2's case) is one which is tempered by a degree of practical implication which stands in the way of achievement of full redundancy and single active failure compliance. While the fans, filters, and, to a degree, the dampers involved, lend themselves to conventional redundancy via a two train duplication of equipment, the buildings which are drawn down by these systems do not. This is due, in part, to the practical matter of personnel passageways (doors) which are not of an airlock design and which are operated by non-licensed personnel. The design of the secondary containment is a hybrid in many respects, possessing minimal resistance to the effects of external phenomena which conventional safety related structures must be able to withstand. It is rationalized that the secondary containment affords an additional degree of protection; but not one of such significant impact that it warrants the normal full pedigree of design features.

Since plant startup in 1975, there have been inconsistent interpretations of the design basis for the Containment and Enclosure Building Purge System (CEBPS), the Enclosure Building Filtration System (EBFS) and the Enclosure Building (EB). A series of NRC (AEC) questions and NU responses reflecting the position of the EBFS, CEBPS, and EB were provided during the plant operating license process in 1973-1974. Communications continued in 1977-1981 on the subject of the seismic qualification of the EB and the associated penetrations. In 1994, an LER 94-040, "Ventilation Enclosure Building Integrity," was initiated and a final position was provided relating to the license basis for the secondary containment and associated isolation and filtration systems.

This confusion is documented in the LER wherein NU describes two conditions in which the design does not satisfy single failure criteria. These are:

- The failure of damper AC-1 to close upon receipt of a CIAS signal and the resultant inability to achieve the required level of building drawdown, and,
- The failure of damper AC-11 to close upon receipt of a CIAS signal and the resultant release of radioactive gases via an unfiltered release path.

Attachment 3
ICAVP
RFI/RAI Response Form Continuation Sheet

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Disposition Continuation:

The CEBPS functions to maintain a suitable environment in the EB during all non-design basis accident modes of operation. The Main Exhaust System (MES) provides the exhaust pathway, including the exhaust fans, for the CEBPS. The CEBPS is normally not in use during plant operation except when it is necessary to improve the environment in the EB and does not provide accident mitigation functions. The 1973-1974 correspondence provided the license basis for the CEBPS and MES as non-QA and non-Seismic. In 1977, the CEBPS isolation dampers AC-1 (supply) and AC-11 (exhaust), including control circuits were upgraded to QA status.

The EBFS functions to collect and process potential containment leakage, to minimize radioactivity levels resulting from all sources of containment leakage in the event of a Loss Of Coolant Accident (LOCA). The EBFS is designed to maintain the Enclosure Building Filtration Region (EBFR) under a minimum negative pressure of 0.25 in. w.g. with one fan operating. Both EBFS subsystems operating in parallel will not exceed the enclosure building design pressure of -2.0 in. w.g.. NRC Safety Evaluation dated 5/10/74 concluded that the proposed design of the EBFS meets the intent of the GDCs 41, 42, 43, and 64.

The EBFR integrity is maintained during a LOCA by isolation of nonsafety-related ventilation systems that communicate with the EBFR and the design of the EB. The 1973-1974 correspondence provided a single failure evaluation of CEBPS isolation dampers AC-1 and AC-11. Dampers AC-1 and AC-11 receive a Containment Isolation Actuation Signal (CIAS) to close in order to isolate the EBFR. The correspondence concluded that the EBFR integrity will be maintained in the event of a failure of AC-1 or AC-11 following a LOCA. The 1979-1981 correspondence provided the license basis of the EB and the associated penetrations. The committed license basis does not require the EB to be designed to be functional subsequent to a Safe Shutdown Earthquake (SSE).

In 1994, potential single failure deficiencies with respect to AC-1 and AC-11 were identified in LER 2-94-040. Upon further evaluation, NU determined that single failure capability in all respects was not a committed design feature for the composite EBFS/Enclosure Building system. The result of this round of submittals was NU's voluntary upgrade of the AC-1 design feature to include a weighted damper in series with AC-1 and the NRC's acceptance of operator action upon receipt of a stack monitor high rad alarm signal to manually terminate the unfiltered release in the case of AC-11's failure. Low risk due mainly to low probability of occurrence coupled with decisive operator actions were factors leading to the NRC's concurrence with NU's position. The AC-1 single failure event was resolved with the implementation of Plant Design Change (PDCR) 2-041-95, "Containment and Enclosure Building Purge System Damper Modifications". The PDCR installed a counterbalanced gravity damper in the CEBPS supply duct to provide redundancy for damper AC-1. The modification was a system upgrade to mitigate the postulated single failure of the Facility 1 CIAS signal to AC-1.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Disposition Continuation:

The evaluations by NU and the NRC in response to LER 94-040 for the single failure vulnerability of AC-11 determined that correction of the AC-11 vulnerability is not required. The determination was based on the low probability of the event and operator action to isolate the radiological release path. The DR-identified issues relating to the failure of damper AC-11 to isolate and the resultant impact on EB integrity are discussed in detail with the appropriate DR Items below.

ITEM 1: The Breach of Enclosure Building Integrity due to Excess Negative Pressure with Damper AC-1 Closed and Two EBFS Fans Operating.

When an Enclosure Building Filtration Actuation System (EBFAS) actuation signal is received, the two Enclosure Building Filtration System (EBFS) fans, F-25A/B, will automatically start and run. The enclosure building air supply isolation damper, AC-1, and the enclosure building main exhaust isolation damper, AC-11, will both close on receipt of the emergency signal. No other flow paths would be open to the enclosure building during this type of event, hence, the two EBFS fans would draw the pressure down in the enclosure building. This is the expected response for the system.

The DR postulates that because there is no analysis or surveillance testing to support operation of two EBFS fans in parallel, that the maximum design pressure for the enclosure building, -2.0 in. w.g., could be exceeded.

During the PI-7 Graded System Review for the EBFS, UIR No 3129 was generated and identified that the supporting calculations and the testing of the operating conditions with the two EBFS fans operating in parallel were inadequate. AR 97019618, with assignments 01, 02, and 03 was initiated to track the corrective action. These AR assignments will track calculations and work activities to document the negative pressure within the enclosure building with one EBFS fan operating and with two EBFS fans operating in parallel, verify EB integrity and determine the need for additional surveillance or system testing. Calculation 97EBF-02000-M2 (in final preparation) was generated to determine the negative pressure in the EB with 2 EBFS fans operating in parallel in response to UIR 3129. In addition, Millstone Unit 2 Pre-Operational Test T2314GP,Rev. 1, 7/19/75, resulted in a pressure of approximately -0.7 in. w.g. in the enclosure building with 2 EBFS fans operating. The calculation currently supports the test data with a calculated pressure of -0.6 in. w.g..

The pre-operational testing and results of the "in-preparation" calculation, that resulted from the disposition of UIR 3129, demonstrate the acceptability of the existing design. The calculation, developed as part of the corrective action to UIR 3129, will provide the formal documentation to demonstrate that the building integrity is not jeopardized.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) **AR Number**: 97024996 **CR Number**: M2-97-2294
M2-DRT-00027 (NU)

Disposition Continuation: Item 1: (continued)

CONCLUSION:

Based on the above discussion, NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR No. 3129 and is a Significance Level 3 discrepancy. Significance Level 3 was chosen because the design basis was not fully verified as the formal pressure calculations were not performed. The EBFS will perform its intended design function as demonstrated by pre-operational testing and preliminary final calculation results.

ITEM 2: **The Breach of Enclosure Building Integrity Due to Excessive Negative Pressure with Damper AC-1 Closed, a Single Failure of AC-11 such that it is in the Open Position, Main Exhaust Fans Operating, and EBFS Fans Operating.**

If a Containment Isolation Actuation Signal (CIAS) occurs while purging the enclosure building, supply fan F-23 and damper AC-1 are automatically stopped and closed. EBFS fans F25A/B start and run drawing air from the enclosure building. Normally, main exhaust fans F-34A/B/C would continue to operate, damper AC-8 would go to its open position, and AC-11 would close which would isolate the main exhaust fan suction from the enclosure building. This is the designed response for the system(s).

The DR contends that if a single failure of damper AC-11 is postulated causing it to remain open, the main exhaust fans, in addition to the two EBFS fans, would, as a result, all be aligned and able to draw air from the enclosure building. The DR also postulates that the negative pressure created by the EBFS fans in conjunction with the main exhaust fans could exceed the maximum design pressure for the enclosure building, -2.0 in. w.g..

The issues raised in this item do not jeopardize the enclosure building design as listed below, based on the discussion that follows:

- The damper failure vulnerabilities described in this DR have been previously addressed by NU and have been found to be of sufficiently low probability to be below regulatory significance.
- The fan combinations and system alignments in conjunction with the damper single failure are not part of the MP2 original licensing basis.
- An assessment prepared to support the response to this DR indicates that the -2.0 in. w.g. pressure in the enclosure building with five fans operating can not be achieved.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Disposition Continuation: Item 2: (continued)

With regard to the scenario postulated in this DR item, Millstone 2's licensing basis does not require AC-11 to meet single failure criteria. This is supported by the design of the system which does not provide redundancy, which is further outlined in memo DE2-95-472. Memo DE2-95-472, "AC-1 and 11, MP2 Enclosure Building Secondary Containment Integrity Single Failure Deficiencies - Engineering Analysis", addresses the potential single failure of AC-11. This memo defines the licensing bases for the EBFS and main exhaust system. The licensing basis identified does not require damper AC-11 to meet single failure criteria. It also refers to a probability analysis that concluded that, based on relatively little amount of time the enclosure building is being purged, that the probability of occurrence of the single failure scenario for AC-11 is low and the risk to public safety was determined to be negligible.

Memo MP2-DE-96-458 also supports this single failure position and provides an NRC evaluation in which the single failure position was evaluated as acceptable. This memo addresses the results of the evaluation relative to the unidentified radiological release path reported in MP2 LER 94-040-01 and 02. The memo identified that the licensing bases for AC-11 did not require the damper be subject to single failure criteria. The analysis presented in this memo addressed a specific condition in which the exhaust system could be in service purging the enclosure building and damper AC-11 could fail in the open position thereby providing an unfiltered radiological release path to the environment. Subsequent to this analysis, this position was evaluated as acceptable by the NRC as indicated in the above noted memo.

If AC-11 was postulated to fail open and both the main exhaust fans and the EBFS fans were operating, the potential for drawing a pressure greater than -2.0 in. w.g. is not considered credible. A review performed in support of the response to this DR indicates that the pressure drops in the ducting and the cross-connected systems result in a pressure that would be substantially less negative than the design pressure of -6 in. w.g. at the main exhaust fans. Based on the five fan alignment presented in the DR, the flow paths from the auxiliary building, the fuel building, and the enclosure building through the main exhaust fans would be such that the main exhaust system would not significantly contribute to the negative pressure from the EBFS system and thus would not create a condition that would challenge the enclosure building's design limit. It should be noted that while the enclosure building metal siding pressure limit for maintaining leaktight characteristics is -2.0 in. w.g., the metal siding is designed and factory tested to perform without failure with a infiltration rate of one air change per 24 hours at a pressure of -8 in. w.g..

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) **AR Number**: 97024996 **CR Number**: M2-97-2294
M2-DRT-00027 (NU)

Disposition Continuation: Item 2: (continued)

The preliminary review postulated both EBFS fans operating, all three main exhaust fans operating, supply fan F-23 shut off with AC-1 damper closed, and damper AC-11 open, and assumed the enclosure building is at -2.0 inch wg. Given this scenario with all five fans operating, the pressure at the common plenum is the same for all three flow paths feeding the plenum. These flow paths are from the auxiliary building, the fuel building, and the enclosure building. The maximum negative pressure in the plenum is 6 in. w.g. before opening the outside makeup air path into the plenum. Considering only three paths, the negative pressure in the auxiliary building and fuel building cannot be obtained given the infiltration in those buildings and the differential pressure across the filter housings. The auxiliary building and the fuel building would provide additional paths of air infiltration so that a -6 in. w.g. pressure would not develop at the plenum. As such, a -2 in. w.g. pressure in the enclosure building with five fans operating can not be developed.

Based on the discussion provided above, NU considers that the scenario identified in the DR can not occur based on the design of the system. Additional mitigating actions are provided as the operators will stop the main exhaust fans with an Unit 2 Stack Gaseous Alarm per procedure ARP 2590H (Corrective Action 3a). This procedural requirement was the NRC approved corrective action resulting from LER 94-040 to minimize an unfiltered radiological release out the Unit 2 stack.

The DR states that damper AC-11 is Non-QA. It should be noted that damper AC-11 was originally purchased Non-QA but was upgraded to QA status because it receives a CIAS signal to close post LOCA. Consistent with the licensing and design basis as described above however, it is not qualified to seismic criteria nor does it meet EEQ requirements.

CONCLUSION:

Based on the above discussion NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU does not consider the scenario presented in the DR to be consistent with the MP2 licensing basis. However, NU considers it important to formally document the design reviews performed to assess the issues presented in DR-0027. Therefore, NU has initiated additional corrective actions to those created for UIR 3129 and is performing a new calculation (AR 97019618-04) to document Enclosure Building performance assuming the failure modes identified in DR-0027, Item 2.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Disposition Continuation:

ITEM 3: **The Operating Capacity of Two EBFS Fans may be below the Enclosure Building Design In-leakage with a Single Failure of Damper AC-1 such that it is in the Open Position.**

If a LOCA occurs while purging the enclosure building, supply fan F-23 and damper AC-1 are automatically stopped and closed. EBFS fans F25A/B start and run drawing air from the enclosure building. Normally, main exhaust fans F-34A/B/C would continue to operate, damper AC-8 goes to its open position, and AC-11 will close which would isolate the main exhaust fan suction. This is the expected design response for the system(s).

The DR contends that if one postulates a single failure of damper AC-1 causing it to remain open, the expected flow from the supply system, 8400 cfm, in addition to the enclosure building infiltration, 2560 cfm, equates to a flow of 10,960 cfm. With this flow rate, one EBFS fan would not be able to create the required pressure, -0.25 in. w.g.. Two EBFS fans would be necessary and their effectiveness to create the required negative pressure is questionable.

LER-94-040 identified the single failure vulnerability associated with AC-1. Memos M2-DE-96-458 and DE2-95-472 regarding MP2 Enclosure Building Secondary Containment Integrity Single Failure Deficiencies for AC-1 and AC-11, address the potential single failure of AC-1 and found that the assumption of single failure for these dampers was not consistent with the MP2 licensing basis. Despite this conclusion, NU considered the benefit of design improvements and the AC-1 single failure vulnerability was eliminated by implementation of Plant Design Change Record (PDCR) MP2-041-95, Containment and Enclosure Building Purge System Damper Modifications.

The PDCR installed a counterbalanced gravity damper, AC-130, on the inlet to purge supply fan F-23. The gravity damper is designed to close when the purge supply fan is isolated and will remain closed with a negative pressure of up to approximately 0.40 in. w.g. in the enclosure building. The damper will remain closed at enclosure building pressures less than 0.40 in. w.g. and open at negative pressures greater than 0.40 to ensure that the minimum negative pressure of 0.25 in. w.g. is maintained. The negative pressure of 0.25 in. w.g. can be maintained with a single fan operating. In addition, surveillance procedure, SP 2609E, section 4.3, is performed on a refueling frequency to ensure the required negative pressure is obtained relying only on the operation of AC-130 with AC-1 open. This surveillance verifies the ability to maintain the building negative pressure per the design requirements.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Disposition Continuation: Item 3: (continued)

The current FSAR section 6.7.4.1 addresses the previous basis for failure of AC-1. UIR 2224 and ACR M2-96-0788 were initiated to update this section of the FSAR to reflect the current basis as described in Memo MP2-DE-96-0458. It should be noted that FSARCR 95-MP2-42 had already provided the appropriate information by adding FSAR Section 5.3.5 which addressed the current single failure reliability basis for dampers AC-1 and AC-11 including the addition of damper AC-130.

CONCLUSION:

Based on the above discussion, NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 does not represent a discrepant condition.

ITEM 4: The Inability to Maintain Minimum Negative Pressure with One EBFS Fan Operating, AC-1 Open, and AC-130 Projected to Open at Less Than the Design Negative Pressure of 0.25 in. w.g.; The Reliance on Damper AC-130 Alone for Make-up Air for Containment Cleanup Actions.

1) If a LOCA occurs while purging the enclosure building, supply fan F-23 and damper AC-1 are automatically stopped and closed. EBFS fans F25A/B start and run drawing air from the enclosure building. Normally, main exhaust fans F-34A/B/C would continue to operate, damper AC-8 would go to its open position, and AC-11 would close which would isolate the main exhaust fan suction. This is the expected response for the system(s).

The DR contends that gravity damper, AC-130, could open at less than the required negative pressure, -0.25 in. w.g.. The DR postulated this condition based on an analysis which assumed five pounds of force applied to the counter-balance arm could open the damper with one EBFS fan operating. The five pound applied force was indicated in surveillance procedure SP2609E as an operator aid in determining the approximate manual force needed to open the damper and assure no damper binding.

Surveillance Procedure SP2609E, Enclosure Building Filtration System Testing - Refueling, verifies operability of the EBFS. To test AC-1, AC-130 must be manually opened. The procedure Note in section 4.1.13 and 4.2.14 of SP2609E identifies an approximate "manual" force required to hold the suction damper AC-130 open with the use of the counterbalance lever arm. The note was included in the procedure to assist the operator in determining what method to use to manually open the damper for testing and it is not a design requirement.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Disposition Continuation: Item 4: (continued)

2) When containment is purged using the EBFS containment cleanup flow path, one EBFS fan F-25A or B draws air from containment. The fresh air supply utilizes the flow path from the supply system without fan F-23 operating.

The DR contends that during containment purge, using the EBFS containment cleanup flow path, damper AC-130 is relied upon alone to open by the differential pressure created by the EBFS fan for the supply of makeup air.

During containment purge using the EBFS containment cleanup flow path, AC-1 is manually opened. If the differential pressure created by the EBFS fans is greater than approximately 0.40 in. w.g., damper AC-130 will automatically open to supplement the air supply to containment as governed by the amount of back pressure. The main supply of air during this purging evolution is provided from the enclosure building as damper AC-3 is manually positioned in the "mid" location. Procedure OP2314B, step 4.1.12b, sets up this flow path.

GENERAL COMMENTS

Two general comments were made at the end of Item 4 of the DR relating to HVAC calculation review and evaluation of RAI-468 information. The text of this portion of the DR appeared to be more of a narrative explaining the basis for the ICAVP auditor review rather than explanation of a physical discrepancy. However, the following is a response to these comments:

Calculation Review - the DR contends that some HVAC calculations reviewed were found to have a generic problem in that the calculations were out of date and have several analytical problems. A weakness with HVAC calculations in general was previously identified by NU. Engineering Work Request, EWR #2-96-105, was authorized to review and revise these calculations. This task is currently underway. M2 HVAC calculations have been identified, reviewed, and indexed. Currently, the deficient QA calculations are being corrected, the Non-QA calculations will follow.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) **AR Number**: 97024996 **CR Number**: M2-97-2294
M2-DRT-00027 (NU)

Disposition Continuation: Item 4 (continued)

Evaluation of RAI-468 Information - the DR contends that the Surveillance Procedures do not test the system with two fans operating. Thus, the capability of the system to achieve and maintain the building minimum design pressure, when damper AC-1 is in the open position, has not been verified. Assurance that the building integrity pressure limit is not exceeded when the damper is in the closed position has not been demonstrated.

Based on the installation and testing of gravity damper AC-130, located upstream of damper AC-1, a flow path from the supply ducting is not considered c ble. Hence, verification of the minimum design pressure is not necessary. Assurance that the building integrity pressure limit is not exceeded with the damper in the closed position has been previously identified and is addressed in DR Item 1.

ITEM 5: UIR-3129 Conclusions and Corrective Action - NU did not Recognize the Potential Safety Significance of the Consequence of Breaching the Enclosure Building Integrity.

The DR contends that based on the lack of testing and inadequate tem design calculations identified in UIR 3129, NU did not generate a CR. It is postulated that NU did not recognize the potential safety significance of the consequence of breaching the enclosure building integrity due to a perceived negative pressure greater than the limit of -2.0 in. w.g.. Maintaining the structural integrity of the enclosure building is essential in order to take credit for the filtered, elevated release path used to meet 10CFR100 release limits.

The DR contained a partial listing of the engineering documentation used to support the EBFS system licensing and design bases. Existing ACRs/CRs, LERs, and modifications, as well as preliminary assessments were evaluated and used in the PI-7 Graded System Review Packages to support the system LB/DB. During the PI-7 review, a number of UIRs and CRs were prepared to address issues that could not be substantiated.

When these UIRs were dispositioned, assessments were made regarding their significance and if the finding had already been addressed on an existing ACR/CR. If follow-on work was necessary (i.e. calculations, modifications, etc.) before the exact impact of a potential finding was known, the UIR dispositioner performed assessments and/or preliminary calculations to determine if the finalization of the problem resolution would identify a significant condition. In the case of UIR 3129, the review of the EBFS design, calculations, test data, existing LERs, and ACR/CRs indicated that the existing design would meet its design basis but additional calculations and completion of existing corrective actions were necessary to completely document the support of the DB.

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) **AR Number**: 97024996 **CR Number**: M2-97-2294
M2-DRT-00027 (NU)

Disposition Continuation: Item 5: (continued)

Enclosure Building integrity was not considered an issue because fan performance was not considered sufficient to reach a negative pressure which would challenge the enclosure building design as described in item 1 and 2 above. Single failure vulnerabilities were also addressed in past assessments and documentation, the results of which were deemed applicable to this case. Based on engineering documentation, a CR was not deemed necessary at the time of the UIR resolution.

All UIRs were prepared, dispositioned, reviewed, and ultimately approved by the Expert Panel (EP) in accordance with PI-14, "Configuration Management Plan Project Administrative Instruction". One of the purposes of the expert panel approval was to evaluate reportability and operability issues, ensure CRs were issued as required, and all appropriate correction actions were defined.. In fact, during the EP approval for UIR 3129, the preparer/dispositioner was questioned as to why a CR had not been issued to address the findings. Based on the UIR preparer's response, the EP was satisfied with the existing documentation and his assessments that a significant condition did not exist. In the case of UIR 3129, a CR was not necessary until the implementation of the corrective actions showed otherwise. On this basis, the UIR was dispositioned without the issuance of a new CR.

DR-0027 was issued by the ICAVP contractor as a Level 1 DR. As further substantiation to the significance and reportability of the issues raised in DR-0027, CR M2-97-2294 was issued to document this potential discrepancy independent of the Parsons Significance Level and if pre-discovered by NU (NU discovered DR issues are not processed separately through the NU "corrective action system"). The associated CR review subsequently conducted and presented to M2 PORC for approval did not identify any reportable conditions.

CONCLUSION:

Based on the above discussion, NU has concluded that the issue reported in Item 5 of Discrepancy Report DR-0027 does not represent a discrepant condition.

Attachment 3
ICAVP
RFI/RAI Response Form Continuation Sheet

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number:** N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number:** 97024996 **CR Number:** M2-97-2294

References (Previously Transmitted):

1) Startup Field Report No. HV-81, enclosure Building Filtration, 3/27/75.
2) MP2 LER 94-040-02, Ventilation Design Deficiency Affecting Enclosure Building Integrity, 9/11/95.
3) Memo M2-DE-96-0458, AC-1 and AC-11, MP2 Enclosure Building Secondary Containment Integrity Single Failure Deficiencies, 9/9/96.
4) PDCR 2-041-95, Rev. 0, Containment and Enclosure Building Purge System Damper Modifications.
5) UIR 2224, The EBFS is not single failure proof in accordance with FSAR Chapter 6.7 with respect to 2-AC-11.
6) ACR M2-96-0788, FSAR not updated with respect with 2-AC-11 single failure requirements.
7) SP 2609E, Rev 6, Enclosure Building Filtration System Testing - Refueling.
8) ARP 2590H, Rev. 2, Alarm Response for Control Room Radiation Monitor Panels, RC-14
9) OP 2314G, Rev. 12, Enclosure Building Filtration System.
0) OP 2314B, Rev. 16, Containment and Enclosure Building Purge.
11) PIR 2-95-126, Design Flow in Main Exhaust/Ctmt Enclosure Building Purge Preliminary Review, dated 2/9/95.
12) Memo DE2-95-0472, AC-1 and AC-11, MP2 Enclosure Building Secondary Containment Integrity Single Failure Deficiencies - Engineering Analysis, 6/6/95.
13) Memo DE2-95-0543, Containment and Enclosure Building Purge System Single Failure Problems - AC-1 and AC-11, 6/14/95.
14) Memo NE-95-SAB-225, Single Failures of EBFS and Their Impact on Public Safety, 5/25/95.
15) Calculation 2-ENG-174, Rev. 0, Air Flow Through a 4" Hole From the Enclosure Building at Design Pressure.
16) UIR 3129 with action tracking assignments (ARs).

New References (Attached)

17) Millstone Unit 2 Pre-Operational Test T2314GP, Rev 1, 7/9/75

New References (Not Attached)

18) NU Calculation 97EBF-02000-M2, (in preparation), "Enclosure Building Inleakage and Negative Pressure"

Attachment 3
ICAVP
RFI/RAI Response Form Continuation Sheet

Response ID: M2-IRF-00481

RFI/RAI Number: N/A **AR Number**: N/A

DR Number: DR-0027 (Parsons) **AR Number**: 97024996 **CR Number**: M2-97-2294
M2-DRT-00027 (NU)

Conclusion Continuation:

Item 1: NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU in UIR No. 3129 and is a Significance level 3. UIR No. 3129 identified that a calculation or procedure does not exist to verify the enclosure building upper limit negative pressure of 2 in. w.g.. Corrective Actions consisting of creating a new calculation, evaluating the enclosure building integrity verses the new calculation results, and review the need for a new surveillance procedure to test both fans were initiated; reference AR 97019618, assignments 01, 02, and 03.

Item 2: NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU believes that the original plant licensing basis does not require damper AC-11 to be subject to single failure criteria. This is based on the lack of redundancy in the system design and research of the licensing basis documentation. In addition, probability analysis has been performed which indicates that based on the relatively short amount of time that the enclosure building is being purged, the probability of occurrence of the single failure for damper AC-11 is low and the risk to public safety was determined to be negligible. The postulated single failure question for damper AC-11 was previously reported via LER 94-040.

Item 3: NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 does not represent a discrepant condition. A new counterbalanced gravity damper, AC-130, has been installed upstream of damper AC-1 which has been designed and is tested to remain closed at a negative pressure of 0.25 in. w.g.. This new damper will provide the necessary isolation of the supply air flow path so that the Enclosure Building Filtration Fans will be able to draw the required negative pressure of 0.25 in. w.g..

Item 4: NU has concluded that the issues reported in Item 4 of Discrepancy Report DR-0027 do not represent a discrepant condition. First, the five pound applied force was provided in surveillance procedure SP2609E to assist the operator in determining what method to use to manually open the damper for testing and it is not a design requirement. Testing of damper AC-130 shows that it opens at a negative pressure of approximately 0.40 in. w.g.. Second, the normal flow path for makeup air for containment purge using the Enclosure Building Filtration System flow path is not through damper AC-130 but through AC-3. AC-3 is manually positioned during the test procedure to allow enclosure building air to be used for makeup.

Item 5: NU has concluded that the issue reported in Item 5 of Discrepancy Report DR-0027 does not represent a discrepant condition. The Enclosure Building integrity was not considered an issue because a preliminary review indicated that the fan performance was not considered sufficient to reach a negative pressure which would challenge the enclosure building design. Single failure vulnerabilities were also addressed in past assessments and documentation, the results of which were deemed applicable to this issue. Based on this engineering documentation, the engineering staff and the UIR expert panel, who approves the UIR resolution, concurred that the issue was not safety significant and a CR was not deemed necessary.

Attachment 2
ICAVP Response Form

Response ID: M2-IRF-01635

RFI/RAI Number: N/A **AR Number:** N/A

DR Number: DR-0027 (Parsons)
M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

System Number/Name or Program ID/Name: 2314G/EBFS

Subject: Enclosure Building Filtration & Containmen/Enclosure Building Purge System Design. This discrepancy is rated as Significance Level 1 by Parsons.

Background: Discrepancy Report, DR-0027, reports the following discrepancies concerning maintaining the Enclosure Building Filtration Region (EBFR) at a negative pressure.
(Continued on Page 2)

☒ Continuation

Disposition: This response provides additional information to the initial DR-0027 response, M2-IRF-00481.
(Continued on Page 7)

☒ Continuation

Conclusion: This response provides additional information to the initial DR-0027 response, M2-IRF-00481. NU has concluded that DR-0027, has identified a condition previously discovered by NU which requires correction. NU considers the issues identified in DR-0027 to be a Significance Level 3.
(Continued on Page 9)

☒Continuation

Preparer: C. Scully Date: 4/30/98

Technical Review: T. Doyle Date: 4/30/98

Unit Lead Review: F. Mattioli Date: 4/30/98

Technical Review Team Concurrence: G. Pitman Date: 4/30/98

NU ICAVP Project Manager Approval: J. Fougere Date: 5/1/98

NU CMP Director Approval: R. Necci Date: 5-1-98

Attachment 3
ICAVP
RFI/RAI Response Form Continuation Sheet

Response ID: M2-IRF-01635

RFI/RAI Number: N/A **AR Number:** N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

BACKGROUND CONTINUATION:

Attachment 1 provides Parsons comments to the initial response to DR-0027, M2-IRF-00481 as presented on 1/19/98.

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

In the event of an emergency condition, an Enclosure Building Filtration Actuation System (EBFAS) signal will start the two EBFS fans F-25A & F-25B. The fans will run until shutdown by the plant operators. Damper 2-AC-1 (EB air supply isolation damper) will close upon receipt of the emergency signal, if not in the normally closed position. FSAR Section 6.7.2.1 states that 2.0 in. w.g. is the maximum differential pressure that the enclosure metal siding can sustain and still maintain its leak-tight characteristics. Since the EBFS does not have pressure control provisions to prevent exceeding the building maximum pressure limit, a potential exists for breaching the integrity of the enclosure building when two fans operate with damper 2-AC-1 closed.

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened):

If a CIAS occurs while purging the Enclosure Building, the purge supply fan F-23 and damper AC-1 are automatically stopped and closed, respectively. The Enclosure Building purge exhaust damper AC-8 remains open. The main exhaust fans will continue to operate and, if damper 2-AC-11 fails open, draw air from the Enclosure Building until the fans are turned off manually following a Unit 2 Stack high radiation alarm. The EBFS is also activated automatically and both fans operate.

Damper AC-1 is a pneumatic damper. The sudden closure of this damper while the main exhaust fans are exhausting air from the Enclosure Building, could cause a sudden increase in negative pressure in the building. The design exhaust rate from the building is 32,000 CFM and the operating pressure in the main exhaust plenum is - 5.5 in. w.g. (Dwg 25203-26057). This pressure is significantly higher than the -2.0 in.wg maximum pressure limit for the building.

When the main exhaust fans are operating, the air exhausted from the Enclosure Building (via exhaust damper AC-11) is mixed with exhaust air from the other buildings prior to discharge to the Unit 2 stack. It is possible that the main exhaust fans will continue to operate together with the EBFS fans. The negative pressure induced by the main exhaust fans in the building is a back pressure to the EBFS fans and will cause the EBFS fans to operate to the left of the their combined fan curve, thus, increasing the building negative pressure.

An analysis of this potential breaching of Enclosure Building leak-tightness integrity does not exist.

NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference 1.1) addressed the failure of non-safety damper AC-11 from the perspective of releases via the main exhaust path. NNECo committed to perform certain operator actions to shutdown this release path following receipt of a high radiation signal. However, the Safety Evaluation did not consider the potential for excessive negative pressure in the Enclosure Building due to damper AC-11 remaining in the open position. The closure of damper AC-11 may be necessary to ensure Enclosure Building integrity.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position:

Consider the case for which a LOCA occurs with damper 2-AC-1 in the open position. In addition, consider the single failure of damper 2-AC-1 as failing in the open position. For this scenario, the design building in-leakage is 2560 + 8400 = 10,960 CFM. Since the in-leakage exceeds the design capacity of one fan (9000 cfm) it is concluded that both fans must operate to achieve the design 0.25 in.wg negative pressure. Using FSAR Figure 6.7-3 to estimate the two fan operating capacity indicates that the system may not be capable of handling the in-leakage. Thus, the design minimum -0.25 in. wg building pressure may not be achieved.

Response ID: M2-IRF-01635

RFI/RAI Number: N/A **AR Number:** N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Item 4: Inability to Maintain Minimum Negative Pressure with One EBFS Fan Operating and AC-1 Opened:

According to the NRC Safety Evaluation Attached to MP2-DE-96-0485 (Reference I.1):

"...In the event of a LOCA or MSLB during purging, with failure of actuation signal CH1-CIAS, damper AC-1 would fail to close and fan F-25A would fail to start. This combination of lack of isolation (AC-1) and reduced filtered exhaust capability (loss of one train of exhaust/cleanup) would prevent the secondary containment from functioning properly as a fission product cleanup system for primary containment leakage as the single operating F-25 fan would not have sufficient capacity to establish and maintain the necessary negative pressure in the unisolated Enclosure Building...

...Although the licensee claims that corrective action is not required by the original licensing basis, a modification has been proposed to eliminate the AC-1 vulnerability. A gravity damper would be installed as shown in the drawing. It would be weighted such that operation of purge fan F-23 opens it, but a -0.25 wg. vacuum due to operation of an EBFS fan would not cause it to open. This action would eliminate the AC-1 single failure condition."

According to the NOTE 2 under 4.1.13 of SP 2609E, "Approximately 5 pounds of force applied to F-23 suction damper, AC-130, counter weight lever is sufficient to open the damper." The damper size is 47" x 47". For conservatism, use half of the damper area as the effective area that is subjected to a differential pressure. Thus, a pressure differential of about 0.13 in. wg. will open the gravity damper. According to drawing 25203-26057, the static pressure in the vicinity of AC-130 (pressure point 13) is -0.11 in.wg. Test data (attached to Reference B.13) shows that one EBFS fan operating can create higher negative pressures than 0.25 in. wg. (-0.35 to -0.75 in.wg).

In addition, during containment purge using the EBFS containment cleanup flow path, AC-1 is manually opened, but the purge supply fan must not be started (refer to 4.1.12 of SP 2314B). Thus, AC-130 is relied upon to open by the differential pressure created by the EBFS fan for makeup air during containment cleanup.

The above contradicts the AC-130 performance requirement as stated in the AC-1 resolution. AC-130 will open at less than the design negative pressure of 0.25 in. wg, with the purge supply fan F-23 shutdown.

Item 5: UIR 3129 Conclusions and Corrective Action

The CMP via UIR 3129 recognized the need for a new analysis/calculation to provide the system operating curve and operating procedure to test both fans operating simultaneously. The UIR Recommended Disposition Details are repeated below:

"1. AR 97019618-01 is written for CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis results.

2. AR 97019618-02 is written for CMP to verify that EBFR siding to sustain and still maintain leak-tight characteristics at upper limit of 2 inch of w.g. negative pressure.

3. AR 97019618-03 is written for CMP to generate new calculation showing system operating curve with one fan operating and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

The UIR Final Disposition is repeated below:

"Expert Panel: AGREES with Recommended Disposition Details. AR 97019618-01, CMP to evaluate need for additional surveillance or test based on AR 97019618-03 analysis results. AR 97019618-02, CMP to verify that EBFR siding to sustain and maintain leak-tight characteristics at 2 inch of w.g. AR 97019618-03, CMP to generate new calculation showing system operating curve with one fan and also, when two (2) fans operating in parallel. Upon completion evaluate for AR 97019618-01."

It is clear from the above that damper 2-AC-1 concerns were not recognized by the UIR. The need for a test is subject to the analysis results and not mandated. Mandated testing is required since, at best, an analysis is subjective for the EBFS. Testing for in-leakage rate was not addressed, therefore, degradation of the building leak-tightness characteristics can not be monitored.

The UIR (section 1, item 1) states "...two (2) fans in operation must be capable of maintaining a negative pressure in the EBFR less than the upper limit of 2 inches w.g." The UIR (section 2, item 1) states "System performance calculation for the fans are inadequate." UIR section 2, item 4 states "There is no procedure to test these two fans operating simultaneously and record a maximum negative pressure developed in the EBFR."

Maintaining the structural integrity of the EB is essential in order to take credit for the filtered, elevated release path used to meet 10CFR100 release limits. However, the system design calculations and testing program are inadequate to demonstrate that the system meets its design requirement. However, the UIR states as conclusion 1 (Section 2), "This UIR has been determined not to require a CR and has not identified a potential safety significant condition." The Final Disposition Section of the UIR did not contradict this statement. This conclusion is inconsistent with the information presented in the UIR. NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

Basis for Significance Level 1:

One of the safety functions of EBFS is to collect and process potentially radioactive airborne particles and gases in the EBFR following a LOCA and limit the site boundary radiation doses to the 10CFR100 requirements. Due to the lack of supporting calculations and/or test procedures/results the ability of the EBFS to perform its primary safety function cannot be assured.

Discrepancies identified may:

1. Breach Enclosure Building integrity due to excess negative pressure (items 1 & 2), and
2. Fail to maintain the minimum required negative pressure with design building in-leakage (items 3 & 4).

NNECo UIR-3129 did not recognize the potential safety significance of the consequence of breaching the Enclosure Building integrity.

Response ID: M2-IRF-01635

RFI/RAI Number: N/A **AR Number:** N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

DISPOSITION CONTINUATION:

Item 1: Breach of Enclosure Building Integrity due to Excess Negative Pressure (EBFS Fans Operating)

Calculation 97-EBF-02000-M2, Rev. 0, "Enclosure Building Inleakage and Negative Pressure," dated 12/18/97 calculated the negative pressure in the EB with both the EBFS fans operating in parallel. The calculation results establish that the negative pressure is 0.5 in. w.g. which is below the negative pressure of 2.0 in. w.g. described in the FSAR. Calculation 97-EBF-02000-M2, Rev. 0 is currently being revised. All required FSAR (section 6.7) changes and procedure changes associated with the calculation results will be made following approval of Revision 1. The response to DR-0426 will address the calculation revision and the associated required FSAR and procedure changes.

As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 and is a Significance Level 3 discrepancy. Significance Level 3 was chosen because the design basis was not fully verified as the formal pressure calculations were not performed.

Item 2: Breach of Enclosure Building Integrity Due to Excessive Negative Pressure (Main Exhaust Fans Operating and Exhaust Damper 2-AC-11 Opened):

The previous response, M2-IRF-00481, to DR-0027, Item 2, stated that a new calculation will be created to determine the EB performance assuming the failure modes identified in DR-0027, Item 2. Due to the variables associated with the single failure scenario and the lack of test data a calculation could not be performed. Instead, Technical Evaluation, M2-EV-98-0095 was prepared to describe the single failure scenarios associated with the CEBPS Isolation dampers 2-AC-1 and 2-AC-11 and provide justification that the Enclosure Building Filtration System (EBFS), CEBPS and the Enclosure Building (EB) meet their design and licensing basis.

The Technical Evaluation concludes that the 2-AC-11 single failure scenario condition of having both the MES fans and the EBFS fans drawing down the EB would not impact the EB leak-

tightness integrity based on the original qualification testing of the EB. As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU considers the single failure scenarios associated with 2-AC-1 and 2-AC-11 beyond the original licensing and design basis of the CEBPS and no further corrective actions are required.

Note: The required FSAR changes associated with the single failure scenarios are addressed in UIR 2224, UIR 3367, and ACR M2-96-0788. In addition, all required FSAR (section 6.7) changes and procedure changes associated with the calculation change results will be made following approval of the calculations. The response to DR-0426 will address the revision to Calculation 97-EBF-02000-M2, Rev. 0, and the associated required FSAR and procedure changes.

Item 3: Two Fan Operating Capacity below Design In-leakage with Damper 2-AC-1 In Open Position:

The previous response, M2-IRF-00481, to DR-0027, Item 3, stated that the 2-AC-1 single failure scenario was eliminated by implementation of PDCR MP2-041-95. Surveillance testing per SP2609E verifies that the required negative pressure will be maintained with one EBFS fan operating and 2-AC-1 open.

Calculation 97-EBF-02000-M2, Rev. 0, calculated the inleakage into the EB to be 8,700 cfm for one EBFS fan operating. The calculated inleakage value does not match the inleakage value provided in the FSAR (section 6.7). Calculation 97-EBF-02000-M2, Rev. 0 is currently being revised. All required FSAR (section 6.7) changes and procedure changes associated with the calculation results will be made following approval of Revision 1. The response to DR-0426 will address the calculation revision and the associated required FSAR and procedure changes.

NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 (calculation) and UIR 3367 (FSAR section 6.7 and 5.3.5). NU considers Item 3 a Significance Level 3 discrepancy based on the FSAR changes. The EBFS is capable of performing its intended function as verified by surveillance testing per SP2609E.

Response ID: M2-IRF-01635

RFI/RAI Number: N/A **AR Number:** N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Items 4 and 5

No additional response. Response provided in M2-IRF-00481 concluded that Items 4 and 5 do not represent discrepant conditions

CONCLUSION CONTINUATION:

Item 1

As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 1 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 and is a Significance Level 3 discrepancy. The response to DR-0426 will address the revision to Calculation 97-EBF-02000-M2, Rev. 0 and the associated required FSAR and procedure changes.

Item 2

Technical Evaluation M2-EV-98-0095 concludes that the 2-AC-11 single failure scenario would not impact the EB leak-tightness integrity. As previously stated in M2-IRF-00481, NU has concluded that the issue reported in Item 2 of Discrepancy Report DR-0027 does not represent a discrepant condition. NU considers the single failure scenarios associated with 2-AC-1 and 2-AC-11 beyond the original licensing and design basis of the CEBPS and no further corrective actions are required.

Item 3

NU has concluded that the issue reported in Item 3 of Discrepancy Report DR-0027 is a discrepant condition previously identified by NU, as documented in UIR 3129 and UIR 3367. NU considers Item 3 a Significance Level 3 discrepancy based on the required FSAR changes. The EBFS is capable of performing its intended function as verified by surveillance testing per SP2609E.

Attachment 3
ICAVP
RFI/RAI Response Form Continuation Sheet

Response ID: M2-IRF-01635

RFI/RAI Number: N/A **AR Number:** N/A

DR Number: DR-0027 (Parsons) M2-DRT-00027 (NU) **AR Number**: 97024996 **CR Number**: M2-97-2294

Items 4 and 5

No additional response. Response provided in M2-IRF-00481 concluded that Items 4 and 5 do not represent discrepant conditions

ATTACHMENTS:

1. Technical Evaluation, M2-EV-98-0095, Rev. 0, "Single Failure of Dampers 2-AC-1 and 2-AC-11, Impact on EB Integrity".

Docket No. 50-336
B17444

Attachment 4

Millstone Nuclear Power Station, Unit No. 2

Discrepancy Report DR-0312

September 1998

PARSONS POWER GROUP INC.
ICAVP MILLSTONE UNIT 2
DISCREPANCY REPORT

2675 Morgantown Road, Reading, PA 19607
(610) 855-2000 • FAX: (610) 855-2509

DR NUMBER: DR-0312
DR TITLE: Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply Tanks
REVISION: 3
ISSUE DATE: 1/27/98
ORIGINATING GROUP: Tier 1
SIGNIFICANCE LEVEL: 1

DISCREPANCY

References:

1.	AOP 2560	Storms, High Winds, and High Tides
2.	FSAR 8.3	Emergency Generators
3.	OP 2346B	Diesel Fuel Oil System
4.	SP 2672	Sampling and Inventory of Diesel Oil Storage Tank, T47A
5.	25203-29032	Diesel Oil Storage Tank T-47A
6.	7604-M-125	Miscellaneous Shop Assembled Tanks
7.	ARP 2590F	Emergency Operating Procedures and Guidelines, Alarm Response for Control Room Panel C-08
8.	Figure 7.3	"10CFR50.59 Safety Evaluation Screening", prepared to support PDCR 2-108-92, dated 8/27/97.
9.	MP2-DG	DBDPackage - Diesel Generator
10.	NRC Letter	Docket/License: 50-336/DPR-65
11.	OP 2346A	Emergency Diesel Generators
12.	SP 2613E	Diesel Generator Fuel Oil Sampling
13.	FSAR 4.2.2	Codes Adhered To
14.	MP 2721J	Periodic Inspection of Unit 2 Tanks
15.	91-BOP-813-ES, Rev. 3,	MP2 EDG Operating Time with 24,000 Gallons of Diesel Fuel Oil Available at a Continuous Rated Load of 2750 kW Fuel Consumption
16.	IPEEE	December 29, 1995, MP2, Response to Generic Letter 88-20, Supplements 4 and 5, Individual Plant Examination for External Events - Summary Report

Background:

Diesel Oil Storage Tank T47A is a 25,000-gallon underground, horizontal cylindrical tank. The tank is single-wall, carbon steel coated with "bitumastic mill undercoat" (exterior) and no interior coating. The tank was installed around 1972. A cathodic protection system (rectifier PO29A, zinc anodes, and test station) was added after October 1974.

Transfer Pumps P-47A and P-47B are installed in individual 24-inch diameter steel riser pipes connected to nozzles on the top of the tank. Bottom of tank = 1'-0" (plus or minus) depending upon which drawing

is used. Top of tank = 11' (plus or minus). Grade = 14'-8". Top of pump manways is 22' (plus or minus). Other connections extending to or above grade are fill, sample, vent, and level pipes. See Ref. 5.

The storage tank is not seismically qualified nor flood-protected. A sufficient quantity of oil is contained in the Diesel Oil Supply Tanks to operate the diesel(s) for approximately 7 days. Each Supply Tank (13,500-gallon nominal capacity) must contain 12,000 gallons. See Ref. 2. Pump(s) P-47A and P-47B "start(s) automatically when the respective level decreases below 95% and stops when tank level increases above 95%." See OP-2346B. (Setpoint Change #2-88-022, in process, changed minimum level to 93%.)

"Two EDGs operate for 8 hours, then one EDG operates for the remaining length of time. Fuel consumption is 3.6 gpm for each EDG at 2750 KW. During a LOCA with a LNP (loss of normal power) the two day tanks (Supply Tanks) are cross-connected." Ref. 15, dated April 1997. (The current license states one EDG for one hour instead of 8 hours with the other EDG continuous). The supply tanks are cross-connected via valve 2-FO-83, "Fuel Oil Supply Header Cross-tie".

Discrepancy:

Item 1:

Failure Mode

Water entering the underground Diesel Oil Storage Tank (T47A) will be automatically pumped into the Diesel Oil Supply Tanks T48A and T48B.

With water entry into the Diesel Oil Storage Tank from a single failure, during a LOCA in an LNP, it would take less than 3 hours to pump 6 inches of water into each Supply Tank. The fuel supply pipes are 6 inches above the bottom of the supply tanks. Water will shut down both EDGs a short time later. (With the currently licensed scenario i.e. one EDG for one hour, it would take up to six hours, assuming the tanks contribute equally, for the continuously running diesel to shut down. At that time the second EDG would not restart or if it starts it would not run for an extended length of time.)

If only one EDG were to started, it would run for 3 hours before automatically shutting down. At that time the other EDG would be started. It too would run for 3 hours before automatically shutting down.

Water Sources

Water sources are surface runoff, groundwater (normal or elevated), or flood water. Probable Maximum Precipitation can cause surface flooding between 15.5 to 16.2 feet MSL (mean sea level), Ref. 16. Normal groundwater level is elevation 5 feet MSL (halfway up the tank). The containment, turbine, and auxiliary buildings are protected from flooding. The design flood produces water levels up to elevation 18.1 feet MSL, stillwater and 25.2 feet MSL, wave runup, Ref. 16 for PMH (Probable Maximum Hurricane). According to reference 1, the EDGs will be operated during flooding up to and above a water level of elevation 22'.

Water Entry Point

We could not find documents that showed the Grade connections (fill, sampling) to be watertight under floodwater static head (approximately 7 feet). In addition, we could not find documentation to show that the Pump manways or vent pipe could not be damaged by floating debris during flooding. We could not find information concerning tank leakage under static head of flood water, ponded rainfall runoff, or groundwater. The Tank is single-wall steel and Refs. 8 and 9 imply that the tank may already leak. "The storage tank low level setpoint was lowered to reduce leaks," Ref. 8, and "In 1987, the concern for leaky storage tanks was raised," Ref. 9, page 3.4-1-17. For the purposes of clarifying this discussion we have assumed the vent pipe is damaged by floating debris during flooding, breaking a pipe weld, and providing an opening into the tank through which water can enter.

Detection of Water in Storage Tank

SP 2672 requires the storage tank T47A inventory to be checked weekly and fuel quality testing monthly. Water infiltration can occur between inventory checks or during site flooding. "A quarterly pumping of approx. 10 gallons of diesel fuel from the bottom of the storage tank to remove any moisture accumulation is being accomplished at present " (by AWO see Ref. 10). "Underground Tank Volumetric Test" is performed, frequency not given (see Ref. 14). "DIESEL OIL STOR TANK LVL, LI-7004" (C-06) has setpoint of 20%. "IF level is low, NOTIFY Operations Technician to order fuel " (see Ref. 7).

Water Pumped to Supply Tanks by Transfer Pumps

Diesel Oil Supply Tanks are automatically maintained level between 93% and 95 % full by automatic level control operation by the oil in the tanks. AOP 2560 does not address the shutdown of transfer pumps P-47A and P-47B during/ or after flooding. The Transfer Pumps take suction at approximately 11 inches above the bottom of the Storage Tank. There is no continuous monitoring for water in the Diesel Oil Storage Tank. The only reason we could find for the Transfer Pumps to be removed from automatic operation is in response to high level alarm (97%) at windows B32 and B33 on Control Room Panel C-08. In this case the pump supply breakers are opened to prevent tank overflow, Ref. 7.

Item 2:

Tank Elevation Discrepancies

Elevation of Diesel Oil Storage Tank T47A is recorded at three different elevations. The elevations are shown below:

Source Document	Tank Bottom Elevation (MSL)	Pump Mounting Plate Elev. (MSL)
SK-M-305, 7604-M-75	1'-0"	21'-6"
25203-28406-29	2'-0"	Not Shown
Calculation Y-T	0'-0"	22'-0"
25203-29032	Distance from bottom of tank to pump mounting plate = 20'-6"	

Significance Level:

"To provide a reliable onsite source of auxiliary power if the preferred source is lost, the unit has two onsite emergency generators. They are redundant, independent and separate, and are used for no purpose other than that described." FSAR 8.3.1.1. Automatic pumping from tank T47A removes the "independent and separate" provisions required by the licensing basis documents for this system. The Diesel Oil Supply Tanks are not "redundant" when operated as they are currently. A single failure (water in tank T47A) will cause loss of both EDGs.

Since both EDGs would shut down this is a **Level 1** discrepancy. The tank elevation discrepancies are **Level 4**.

Jon A. Winterhalter	**Tier 1**	**1/27/98**
Originator	**Group**	**Date**

EVALUATION		
☒ **BASIS VALID**	☐ **BASIS INVALID - CLOSED**	☐ **PREVIOUSLY IDENTIFIED BY NNECo - CLOSED**
Basis valid.		

M.J. Akins	**01/28/98**
Group Lead	**Date**

REVIEW AND APPROVAL

Reviewed:	**E.A. Blocher**	**01/28/98**
	Deputy Project Director	**Date**
Approved:	**D.L. Curry**	**01/30/98**
	Project Director	**Date**

Forwarded to NNECo, NEAC, and NRC: 01/30/98 **Date**

Posted to WWW: 02/08/98 **Date**

SUMMARY OF NNECo PROPOSED CORRECTIVE ACTION

Response received from NNECo on 05/06/98

Disposition:

Item 1 Disposition:

Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply Tanks

NU has concluded that the condition described as Item 1 in Discrepancy Report DR-0312 does not represent a discrepant condition. NU has evaluated each of the design basis scenarios that NU has concluded could be at issue relative to the diesel generators and the potential for failure of the units due to water intrusion into the underground Diesel Oil Storage Tank. We note that in each instance, the license and design bases are met. There are, however, procedural improvements that can and are currently being incorporated as a result of the evaluations associated with this DR. These changes, which are a direct result of NU's evaluation of the discrepancies identified by Parsons in this discrepancy report, decrease the likelihood that the diesel generators could be adversely impacted by any postulated failures associated with the evaluated scenarios. Our review went beyond the specific set of conditions identified by Parsons, to consider the potential for a seismic event damaging the underground storage tank without failure to the fuel transfer system, and the subsequent transfer of water-laden fuel to the Diesel Oil Supply Tanks. A seismic evaluation of the underground storage tank utilizing Generic Implementation Procedure (GIP) techniques for seismic evaluation of equipment in operating plants (developed for resolution of USI A-46 Program) has been completed. That evaluation concludes that the tank proper will survive the seismic event, but that the connections to the tank at the top of the tank may be degraded. Further discussion as to the impact of this degradation is presented in the detailed write-up that follows. The procedural improvements noted above also enhance Millstone 2's response to the seismic event, providing positive assurance that neither of the diesels would be adversely impacted.

A brief discussion of pertinent issues relating to Parsons' assumptions utilized in describing the physical fuel oil storage system and failure assumptions is in order, prior to NU's detailed discussion, as follows:

• Parsons notes that the underground storage tank is not flood-protected -- We note that, as discussed in detail later, the tank was designed to maintain leak tightness for the maximum water levels associated with the Probable Maximum Hurricane (PMH). This is evidenced by the placement of the single open-to-atmosphere connection to the tank; i.e., the vent pipe with flame arrestor, which is at approximate elevation (+)25'-0", a point which is higher than the maximum wave runup level. The issue of floating debris and the potential impact of that debris will be discussed in detail in the body of our response. We do agree that, from a vulnerability to floating debris standpoint, the vent appears to be the weakest link in the tank and related piping system.

• Parsons notes that the two Diesel Oil Supply Tanks are cross-connected -- The two dedicated Diesel Oil Supply Tanks are cross-connectable, but are not normally cross-connected.

Since there is confusion noted as to MP 2's design basis for the length of run time for both diesels following a LNP, we note that the current license basis run time for the two units is 24 hours. Refer to Amendment No. 212 to Facility Operating License No. DPR-65 dated January 23, 1998. Subsequent to that time, one unit would be secured as deemed appropriate by the operators and those in the Emergency Onsite Facility.

• Parsons notes the issue of "water entry into the Diesel Oil Storage Tank from a single failure", on page 2 of the DR. NU notes that, without a mechanism that differs from the day-to-day chronic age-related degradation of the tank present, we consider the tank a passive device, which failure does not need to be postulated in the short

term and which can be deemed incredible in both the long and short terms due to the lack of moving parts and critical seal or gasketing assemblies. By a mechanism, we refer to phenomena such as a seismic event. Thus, for a LOCA with a LNP, there is no mechanism since external events, including seismic, are not postulated to occur concurrent with the LOCA.

• Parsons notes that normal groundwater level is at 5 feet MSL in the vicinity of the underground tank -- We note that that level corresponds to a site average and was used in the buoyancy calculation for the tank (Bechtel Calculation Y-T, Revision 0 titled "Diesel Oil Storage Tank Foundation"), but that the original core borings that were taken in the three locations closest to the tank show the highest recorded groundwater level was at Elevation (+) 0 feet

• Parsons notes the conflicting information as to the elevation of the bottom of the Tank -- We agree that there are errors in our documentation of this elevation, and confirm that the actual elevation is Elevation (+)2'-7".

• Parsons notes that the design basis flood produces levels of stillwater of (+)18.1 feet MSL and wave runup of (+)25.2 feet MSL -- We correct the wave runup at to be (+)18.9 feet at the east side of the facility where the underground tank is located. (Refer to FSAR Table 2.5-1)

• Parsons notes that the tank "may already leak" and cites two references supporting this conclusion -- We note that this is not the case, and that the confusion on this issue is the result of statements identified by Parsons in Reference 8. The Diesel Oil Storage Tank low level setpoint was actually lowered to reduce the quantity of fuel stored on site. This was done to minimize oxidation and microbial growth affecting the entire stored fuel supply in the Diesel Oil Storage Tank. As stated in attached Memo MP-10401, dated 5/21/87 titled NOA 9213 - "Diesel Generator Fails Test Because of Degraded Fuel" (CR-0487-004) "By allowing this tank to be consumed to a lower level, it would allow a fresher supply of oil to be available for transfer to the day tanks".

Our evaluation follows:

• Extended Full Power Operation Followed By A Loss Of Normal Power, With Or Without A LOCA:

The water sources that need to be considered for this design basis scenario include surface runoff and/or groundwater intrusion into the Diesel Oil Storage Tank. The water intrusion paths into the tank would be the result of a long term, non-acute mechanistic degradation of the underground storage tank and/or its appurtenances.

Surveillances are performed on the contents of Diesel Oil Storage Tank T47A to ensure that diesel fuel samples drawn from the bottom of the tank contain less than 0.05% water. Procedure SP 2865, Revision 0, "Sampling and Analysis of Diesel Oil Storage Tank" (Attached) provides instructions to obtain a sample from the bottom of Tank T47A for analysis to determine the degree to which water may have accumulated and to monitor color. At least once every 31 days a sample is taken and analyzed to ensure that less than 0.05% of water is present in the sample. This surveillance is applicable during all modes of operation when fuel oil is in the diesel oil storage tank. Additionally, Procedure SP2613E, Revision 6, Ch 1-3, "Diesel Generator Fuel Oil Sampling" (Attached) provides for sampling of the Diesel Oil Storage Tank T47A for off-site analysis. This is completed at least once every 92 days to meet Technical Specification Surveillance Requirements 4.8.1.1.2.b for Tank T47A. Sampling is also performed following any deliveries of fuel oil to Tank T47A. This surveillance is performed during all Operational Modes. No evidence of water intrusion into the Diesel Oil Storage Tank has ever been identified.

As stated above, water intrusion paths into Diesel Oil Storage Tank T47A for this design basis scenario would be as a result of long term, non-acute mechanistic degradation of the tank. This type of damage would be caused by corrosion of the tank and/or its appurtenances (fill pipe, pump stands, vents, sampling connections, etc.). A cathodic protection system was installed in 1974 to prevent such corrosion from occurring. Cathodic protection systems are designed to prevent tanks from corroding by reversing the naturally occurring electrolytic cell produced current at the interface of the tank exterior and surrounding back-fill that can degrade tank walls. An impressed current protection system is used to protect the diesel oil storage tank. This impressed current protection system introduces an electric current into the ground through a series of anodes that are not attached to the tank. Since the electric current flowing from these anodes to the tank and its appurtenances is greater than the corrosive current attempting to flow from the tank and its appurtenances, the anodes are corroded rather than the tank. The diesel oil storage tank cathodic protection system is shown on Northeast Utilities Drawing 25203-35028 titled, "Cathodic Protection Off-Gas Pipe, Diesel Oil & Fuel Oil Tanks, TBCCW & RBCCW Ht. Exc.". Procedure MP2720A3, Rev. 2 Ch. 1 titled "Cathodic Protection Maintenance" (Attached) specifies the monthly maintaining and testing of the cathodic protection system. The Diesel Oil Storage Tank, rectifier P029A output voltage, current, and reference cell voltage are recorded monthly by the Technical Services Department, Corrosion Control Section.

The tank was procured under Bechtel Specification 7604-M-125 titled "Specification of Miscellaneous Shop Assembled Tanks for the Millstone Point Company, Millstone Nuclear Power Station Unit No. 2". To further reduce the potential for corrosion, the exterior of the tank was subjected to a commercial sandblast and painted with a coat of bitumastic mill undercoat. The interior of the tank was hand tooled clean in accordance with SPEC-SSPC-SP2-63 and coated with diesel oil. Applicable codes and specifications used in the procurement of the tank included NFPA No. 30 and Underwriters Laboratories No. 58 - Standards for Underground Tanks for Flammable Liquids.

Upon the unlikely event that water would enter the Diesel Oil Storage Tank, it would not be immediately pumped to the Diesel Oil Supply Tanks when the transfer pumps automatically start. Pumps P47A&B suction is taken approximately 11 inches off the tank bottom. Any water entering the tank would settle to the tank bottom and sump. The bottom eleven (11) inches of tank elevation below the pump suction point will accommodate the accumulation of approximately 1150 gallons of water prior to any water being transferred to the Diesel Oil Supply Tanks. In order to have 1150 gallons or more accumulate between the water testing surveillances identified in SP 2865, an in-leakage rate averaging approximately 1.5 gallons per hour over the course of the full 31 days would have to occur. This is judged to be a conservatively high flow rate following the breaching of the tank due to a age-related corrosion induced failure.

The breaching of the tank due to corrosion would have to occur concurrently with a source of either runoff or groundwater being present which could enter the tank. Surface runoff that could enter the tank would be kept to a minimum in the area of the Diesel Oil Storage Tank due to grade being covered directly above the tank with a concrete pad and curbing system. Areas around the concrete above the tank are covered with a layer of asphalt.

Ground water levels vary greatly depending on circumstances such as seasonal variations or heavy rainfall. Monitoring of the groundwater level in the vicinity of the Diesel Oil Storage Tank is not performed. Further investigation of the water level of Elevation (+) 5.0 feet identified in Calculation Y-T, Revision 0 titled "Diesel Oil Storage Tank Foundation", shows that this groundwater level was probably used based on information that was provided in Amendment No. 1 to the License Application dated 10/27/69. A blanket statement for the entire site is presented in Amendment No. 1, Section 6.0 stating "The actual water table is probably at approximate elevation (+) 5.0". Actual boring logs closest to the location of the Diesel Oil Storage Tank were retrieved from records. The "Boring Location Plan" is shown on NU Drawing 25203-10005, Revision 0 and the "Boring Logs" are presented on NU Drawing 25203-10006, Revision 0 . A review of the two referenced drawings shows that borings 2-DH-1, 2-DH-2, and 2-DH-9 are closest to the location of the Diesel Oil Storage Tank.

The approximate groundwater elevations at these locations which were taken in October, 1966 were as follows:

Boring Number	Groundwater Level
2-DH-1	(-) 7 feet
2-DH-2	(-) 4 feet
2-DH-9	(+) 0 feet

The following must be noted when reviewing the reported groundwater levels:

- Reading were taken over 30 years ago.
- Changes to the site have occurred since these readings were taken including the construction of both Millstone Units 2 and 3.
- All three readings would result in the groundwater table being below the bottom of the diesel oil storage tank by a minimum of two (2) feet and seven (7) inches.

No leakage of either water into the diesel oil storage tank or oil out of the tank has ever been identified. Due additionally to the ramifications of a leak of diesel oil to the environment, the tank is subjected to a volumetric test every three years to ensure its integrity. The most recent volumetric testing of Tank T47A was performed on 8/8/96 by Pennoni Associates Inc. EnvironTEL Division. The test results were satisfactory indicating no leakage into or out of Tank T47A. A visual inspection of the tank interior is completed every ten (10) years. Access to the underground tank is made via the 24 inch pump stand nozzles. Finally, we note that this tank is scheduled for replacement with a vaulted unit meeting current environmental standards in 2002 in accordance with State of Connecticut rules covering underground fuel oil storage tanks.

Original Bechtel Calculation Y-T, Revision 0, titled "Diesel Oil Storage Tank Foundation" provided for an anchorage system of the Diesel Oil Storage Tank T47A to its foundation under the worst case condition of the tank being fully submerged and empty with a saturated backfill. This design ensures no gross failure of Tank T47A due to buoyancy effects will occur. This calculation conservatively assumed ground water level to be at the top of the tank and also included a sketch indicating a water level which is the site average. We believe that this sketch is the basis for Parson's noted reference for the Elevation (+) 5.0 foot groundwater level versus the boring results in the vicinity of the tank noted above.

Based on the above discussion, NU concludes that for the unit trip from full power, with or without a LOCA case, the existing fuel forwarding system design does not present the potential for loss of either of the two (2) diesel generators.

• Extended Full Power Operation Followed By Unit Shutdown In Accordance With The TS Prior To Arrival Of A Probable Maximum Hurricane (PMH) And Associated Design Basis Flood Levels:

NU agrees with the Parson's observation that, given the maximum water level that could be experienced under PMH conditions, there could be water leakage into the underground storage tank by way of the externally exposed connections to the tank being damaged by floating debris. While these connections are protected to a degree from floating debris, that protection does not extend to the elevation that would be required to protect these connections in the worst case high water level event. As stated above, procedural improvements being made by NU, which are a direct result of this Parsons identified scenario, will be incorporated to eliminate any potential that the diesel generators could be adversely impacted.

It is apparent that design and installation documentation for the Diesel Oil Storage Tank did consider the PMH flooding effect as recognized at the time. Connections to the tank were made with seal welds that would prevent inleakage of water. The nozzles on which pumps P47A&B were mounted were provided with gaskets at their flanges to prevent in-leakage of water. The fill pipe connection was provided with a threaded cap. The vent flame-arrestor provided a direct opening for water intrusion due to the effects of the PMH. This vent was mounted above the expected PMH flood wave runup level eliminating the potential for water entry path during PMH flooding via that pathway. NU has prepared calculation 98-ENG-02567C2 - Revison 0 titled "Diesel Oil Storage Tank PMH Flood Evaluation of Outer Steel Wall" which evaluates the Diesel Oil Storage Tanks capability to accommodate the effects of the PMH's hydrostatic loading and soil loading. The results of the attached evaluation concludes that the tank is capable of accommodating these loadings.

Further evidence of consideration of PMH induced water intrusion to the Diesel Oil Storage Tank is presented in questions as requested in AEC letter, Mr. Karl R. Goller, PWR Branch No. 3, Directorate of Licensing to Mr. Donald C. Switzer, President, The Millstone Point Company, dated December 29, 1972. Question 8.20 asked among other questions to "Also describe measures taken to prevent and detect the degradation of the fuel supply by water resulting from the effects of natural phenomena (storms, flood, hurricane), condensation, and/or poor oil supply." The response to this question was as follows:

(1) There is a provision for a sampling connection on the diesel oil storage tank. Samples of the diesel oil will be taken and tested at regular intervals to detect any degradation of the oil in the tank.

(2) In order to prevent any effects of natural phenomena, the vent flame arrestor on the diesel oil storage tank has been installed well above flood level wave runup elevation.

NU has concluded that the design of the Diesel Oil Storage Tank for PMH induced flood effects meets the unit's Licensing Basis and Design Basis.

The availability of both Emergency Diesel Generators is required up to and above the Elevation 22 foot flood level. Additionally, the ability to protect a Service Water Pump Motor (one function of which is to cool a diesel generator) and the diesel generators during the period when water level is above Elevation 22 feet is a design requirement. The following provides "defense-in-depth" evidence that, if the emergency diesel generators were lost to a PMH flood induced scenario like this one postulated by Parsons in this DR, the capability to maintain the plant in a safe shutdown condition would remain.

As described in FSAR Section 2.5.4.2.1, plant personnel can maintain the plant in a safe shutdown condition through the Probable Maximum Hurricane (PMH) when the primary objective is the removal of decay heat. The FSAR describes the incorporation of a steam-driven pump and manually-positionable components into the Millstone Unit No. 2 plant design, which provide for decay heat removal without dependence on emergency power from either the offsite supplies or the diesels.
The Condensate Storage Tank provides inventory for a minimum period of 10 hours. This is followed by the transfer of a reserve supply for the auxiliary feedwater system from the fire water storage tanks using the associated diesel driven fire pump. As a result, the 10 hours can be significantly extended. The fire water storage tanks are supplied by the city water system which is expected to remain pressurized by the domestic water supply's diesel-driven pumps, thereby providing a virtually unlimited supply of water. The Primary Water Storage Tank capacity following restoration of power to the primary water transfer pumps would also be available if required. NU notes that this method of decay heat removal is credited in the units license for those floods resulting in maximum flood levels in excess of 22' MSL; however, we further note that this method will, in practical terms, satisfy the decay heat removal requirement for flood resulting in water elevations of any level lower than that presented by the PMH scenario. We do stress once again, however, that the unit's design and license bases do not credit this method except for the greater than 22' flood level scenario.

NU has concluded that the design and license bases associated with this scenario are satisfied with the current configuration of the fuel tanks. We have further determined that it is prudent to incorporate procedure steps that will result in the operators disabling Fuel Oil Transfer Pumps P47A&B immediately prior to the expected arrival of a PMH induced flood event. Power would not be restored until some time after the flood waters recede, and the fuel oil contained in the tank has been sampled and determined to be of the required integrity. Millstone Station has the onsite capability to complete the appropriate set of fuel oil tests to support the determination of acceptability of this supply. The safety related and seismic dedicated Diesel Oil Supply Tanks for each of the diesel generators have sufficient stored oil to support the operation of each of these units for a minimum of two (2) days. This is sufficient time during which an alternative supply can be secured in the event that fuel stored in the underground storage tank has been determined to be unusable.

- Extended Full Power Operation Followed by a Unit Manual or Automatic Trip Due a Seismic Event Without a LOCA:

The diesel oil storage tank T-47A is a non safety-related, non-seismic underground tank containing fuel oil that is tested regularly. If a seismic event occurs, the diesel oil in the diesel oil storage tank can not be relied upon as a qualified source of fuel oil without prior testing of that fuel following the event, and potentially, the utilization of an alternative fuel oil forwarding system.

Even though this fuel oil source cannot be specifically credited to be available following a seismic event, the possibility exists that the following worst case scenario could occur:

1) Diesel Oil Storage Tank T47A remains generally intact and pumps P47A&B remain capable of transferring fuel to the diesel generator day tanks.
2) Diesel oil transfer piping remains intact and Pumps P47A&B remain energized and functional.
3) Groundwater enters the degraded Diesel fuel oil storage tank following the seismic event. It is postulated that water laden fuel could potentially be transferred to the Diesel Generator day tanks.

The groundwater table levels in the vicinity of the underground tank following the seismic event may or may not be above the bottom of the tank. If the water table level is below the bottom of the tank, no water intrusion into the tank would be expected. This scenario could result in diesel oil flowing out from the tank to the surrounding soil. Surrounding backfill could possibly be introduced to the Diesel Oil Storage Tank inventory at the connections at the top of the tank. In-place strainers between the Diesel Oil Storage Tank T47A and Diesel Oil Supply Tanks T48A&B would remove this sediment, and, in the process, potentially clog the strainers resulting in the termination of the transfer of fuel. The Diesel Oil Supply Tanks would continue to supply the diesels for a minimum of approximately two days each at full power. Operation of both units at full power for an extended period of time is highly unlikely since there is no LOCA ongoing; however, the Diesel Oil Supply Tanks can be replenished as necessary from offsite or other onsite supplies.

The following considerations apply if the groundwater table level is at a level which is above the bottom of the diesel oil storage tank:

<u>Diesel Oil Storage Tank integrity is breached above water table level at the connections</u> - This scenario would not result in water intrusion since the water table level will, in the worst case, be significantly lower. Backfill could possibly be introduced to the Diesel Oil Storage Tank inventory. Again, as discussed above, in-place strainers between the Diesel Oil Storage Tank T-47A and Diesel day tanks T48A&B would remove this sediment. If the sediment eventually clogs the strainers, the supply of fuel oil from Tank T47 would be terminated. The dedicated Diesel Oil Supply Tanks' fuel oil integrity would be maintained. Actions to replenish the diesel fuel oil to the Diesel Oil Supply Tanks would be taken, as appropriate.

Diesel Oil Storage Tank integrity is breached below water table level - Technical Evaluation M2-EV-98-0083, Revision 0, titled *Structural Integrity of Diesel Generator Fuel Oil Storage Tank Under Earthquake Loads,* provides a basis for concluding that the underground tank proper would survive the seismic event and maintain it's integrity. This attached evaluation, completed using GIP approved techniques, concluded that any failure of the tank is likely to occur at the connections to the tank at its top. Therefore, there would not be in-leakage of groundwater since in the worst case, it is significantly below the top of the tank.

While an acceptable design basis is provided for this condition, NU has determined that it is prudent to incorporate procedure steps that will result in the operators disabling Fuel Oil Transfer Pumps P47A&B immediately following the occurrence of a seismic event. Power would not be restored until some time after the seismic event, when the fuel oil contained in the tank has been sampled and determined to be of the required integrity.

The above, when combined with

- the approximate 1150 gallon "margin" that exists in the diesel oil storage tank to accommodate minor water intrusion,
- the "margin" that also exists in the Diesel Oil Supply Tanks T48A&B, and,
  actions that would likely occur as a result of recommendations made to remove power from the pumps by the Technical Support Team which would be assembled in the Emergency Operations Facility, provides reasonable assurance that the transfer of groundwater from the Diesel Oil Storage Tank to the Diesel Oil Supply Tanks and then, to the Emergency Diesel Generators would not have occurred, historically. Given the relatively lightly loaded diesel generators under the postulated scenarios, the fuel consumption rate will be significantly reduced resulting in additional time for the unit operators or those in the EOF to analyze those systems important to the maintenance of safe shutdown. Past Simulated Emergency Response Drills at NU have demonstrated a high regard and degree of attention to the integrity of those systems necessary to maintain a supply of AC power.

NU concludes that, for the seismic event case, the transfer of water-laden fuel to the diesel generator day tanks would not occur due to the maintained structural integrity of that portion of the underground tank system essential to the maintenance of near leak-tightness. Further, there is sufficient time available that, should some amount of water be introduced into the tank, the appropriate expertise would take actions to recommend that the tank be isolated from the dedicated Diesel Oil Supply Tanks.

The Design Basis Scenarios discussed above bound all other cases, including those that could occur with the unit previously shut down.

We note that Diesel Oil Storage Tank (T47A), including transfer pumps (P47A&B), and associated piping have, since unit startup, been designated as non-Category I systems at Millstone Units No. 2. Diesel oil has been identified as being automatically transferred from the underground diesel oil storage tank to the diesel oil supply tanks.

NU concludes that Issue 1 of this DR does not represent a discrepant condition. Therefore, Significance Levels do not apply. However, as a direct result of Parsons' identification of those issues discussed in this DR, NU is taking actions to provide even greater assurance that the underground fuel oil storage tank, its appurtenances and the manner in which the system is operated will not challenge the basis for inclusion of redundancy and independence in the design of the onsite electrical power supplies; i.e., the diesel generators.

Item 2 Disposition:
Tank Elevation Discrepancies

The elevation discrepancies reported in the documents listed below will be investigated. Design documents will be revised, as appropriate, to correct the discrepancies.

Source Document	Tank Bottom Elevation (MSL)	Pump Mounting Plate Elev. (MSL)
SK-M-305, 7604-M-75	1'-0"	21'-6"
25203-28406-29	2'-0"	Not Shown
Calculation Y-T	0'-0"	22'-0"
25203-29032	Distance from bottom of tank to pump mounting plate = 20'-6"	
FSAR 2.5.4.2.5	Invert Elevation 1'-8"	

Field walkdowns have been performed and dimensions were taken to determine the elevation of the tank bottom. This elevation was determined to be Elevation (+)2'-7". This places the Pump Mounting Plate at Elevation (+)23'-1" and the flame arrestor on top of the vent pipe above Elevation (+)25'-0".

NU concludes that the drawing errors depicting the actual tank bottom elevation constitutes a Significance Level 4 discrepancy.

Conclusion:
NU has concluded that the issues reported in DR-0312 has identified a CONFIRMED SIGNIFICANCE LEVEL 4 Condition that requires correction.

Item 1 - Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply Tanks
Based on the above, NU has concluded that the license and design bases for MP 2's emergency onsite power supplies including fuel supplies are met. However, Northeast Utilities is amending procedures such that there is a greater degree of assurance that electrical power will be removed from the P47A&B transfer pumps prior to the transfer of potential water-laden fuel, should these pumps remain operable for any of the evaluated scenarios.

Item 2 - Tank Elevation Discrepancies
Based on the above, Northeast Utilities concludes that a Level 4 Discrepancy does exists. Design documents will be revised, as appropriate, to correct the discrepancies.

COMMENT ON NNECo PROPOSED CORRECTIVE ACTION

Specific Comments:

Acceptable Leakage Rate:

Under Disposition subheading, "Extended Full Power Operation Followed By A Loss Of Normal Power, With Or Without A LOCA," an allowable leakage rate was discussed. The maximum leak rate was calculated in which accumulated water would not reach the level of the pump suction between the monthly sampling intervals. The calculated rate was 1.5 gallons per hour and was "judged to be a conservatively high flow rate following the breaching of the tank due to an age-related, corrosion induced failure."

Parsons does not agree that this leak rate is conservative. For discussion purposes, the orifice diameter required to allow a leak of 1.5 gallons per hour was calculated assuming a vertical, sharp-edged circular orifice with an external water head of 2 feet. The required orifice diameter for that leak rate is one millimeter. This is a very small perforation. Alternately, a 1/4 inch diameter orifice under a 3-inch head of water will allow 97 gallons per hour into the tank. For a tank with a diameter of 10 feet and length of 44 feet a one millimeter diameter perforation is not judged to be a conservatively large leak.

Corrosion-induced failure due to external or internal degradation mechanisms could occur anytime and hasn't been sufficiently addressed. Examples of such mechanisms are external corrosion due to coating aging failure/holidays or higher than normal local electrolytic corrosive cells. Internal corrosion due to microbiological induced corrosion (mic) of the uncoated interior also requires consideration.

As stated by NNECo, the groundwater elevations are not monitored in the tank area so the average and seasonal groundwater elevations are not known. A loose grade connection could leak under rainfall runoff build-up of several inches on the concrete slab over the tank. Also, asphalt paving is not impervious. Non-flood water sources could come from several paths, none of which can be discounted without a means to monitor/measure.

Calculation 98-ENG-02567C2 Implications:

Under Disposition subheading "Extended Full Power Operation Followed By Unit Shutdown In Accordance With The TS Prior To Arrival Of A Probable Maximum Hurricane (PMH) And Associated Design Basis Flood Levels," the new calculation 98-ENG-02567C2 was discussed. The tank was shown to withstand the loading resulting from flooding above grade levels. The analysis used the new tank wall thickness of 3/8 inch. The maximum calculated Actual /Allowable stresses were shown to vary from 92.9 to 95.6 percent (tables on page 7 of 50). These stresses are based on the unverified assumption that the tank retains its original wall thickness of 3/8 inch. Without the benefit of tank wall thickness measurements, we cannot agree that the tank will resist the forces from flooding.

Even with cathodic protection, corrosion can't be discounted. Internal tank inspections will not discover external tank corrosion. The effectiveness of the cathodic protection system's actual protection of the tank cannot be proven by operational testing of the cathodic protection system itself. The proof of protection would be tank wall thickness measurements. Consider what the Actual /Allowable stress ratios would be if the corroded tank wall was actually 1/4 inch instead of the original 3/8 inch.

Regardless, NNECo's proposed revision to procedures disabling the fuel oil transfer pumps prior to arrival of PMH induced flooding will prevent problems of water transfer from tank failure in this case. Parsons considers disabling of the automatic fuel oil transfer interlock to maintain the licensing basis for "independent and separate" to be a significance level 3 discrepancy.

General Comments:

The NNECo Disposition proposed procedural revisions that would minimize the risk association with loss of onsite power due to flooding or seismic events. These are low probability, extreme events. Parsons believes that there is a greater risk from corrosion-induced leakage which could occur anytime and we feel that it wasn't sufficiently addressed. The fact remains that the tank, which is a non-safety component, is still connected, by automatically controlled makeup pumps, to both of the Emergency Diesel Generator trains. The proposed disposition still violates the "independent and separate" requirements of the licensing documents.

The disposition states that the tank is scheduled for replacement in the year 2002. This concern, therefore, has a finite life span. However, during the time period from 1998 to 2002 the plant is exposed to significant (and increasing) risk considering of the age of the tank and cumulative effects of corrosion which might be occurring.

Conclusion:

Item 1:

We have reviewed the NNECo Disposition and find that Item 1 remains discrepant. In the absence of a wall thickness survey and a means to detect inleakage of water between monthly sampling, and the fact that during non emergency (flood/seismic) conditions, the pumps remain on automatic level control, we maintain that this condition is discrepant to Significance Level 1. The reliability of the both EDGs could be degraded by a non-safety component.

Item 2:

This item will be considered closed after the revised documents or Change Notices have been reviewed.

Prepared: M.J. Akins — 06/17/98
Group Lead — Date

Reviewed: E.A. Blocher — 06/17/98
Deputy Project Director — Date

Approved: D.L. Curry — 06/17/98
Project Director — Date

Forwarded to NNECo, NEAC, and NRC: 06/19/98 and 8/3/98 **Posted to WWW:** 06/21/98
Date — Date

FINAL RESOLUTION
Open: Item 1 unresolved. Item 2 remains open pending review of drawing and calculation changes. Note: DR-0721 also discusses FSAR statements about diesel oil storage tank withstanding flooding.

E.A. Blocher — 31JUL98

Deputy Project Director — **Date**

PARSONS POWER GROUP INC.
ICAVP MILLSTONE UNIT 2
DISCREPANCY REPORT

2675 Morgantown Road, Reading, PA 19607
(610) 855-2000 • FAX: (610) 855-2509

DR NUMBER: DR-0312
DR TITLE: Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply Tanks
REVISION: 2
ISSUE DATE: 1/27/98
ORIGINATING GROUP: Tier 1
SIGNIFICANCE LEVEL: 1

DISCREPANCY

References:

1.	AOP 2560	Storms, High Winds, and High Tides
2.	FSAR 8.3	Emergency Generators
3.	OP 2346B	Diesel Fuel Oil System
4.	SP 2672	Sampling and Inventory of Diesel Oil Storage Tank, T47A
5.	25203-29032	Diesel Oil Storage Tank T-47A
6.	7604-M-125	Miscellaneous Shop Assembled Tanks
7.	ARP 2590F	Emergency Operating Procedures and Guidelines, Alarm Response for Control Room Panel C-08
8.	Figure 7.3	"10CFR50.59 Safety Evaluation Screening", prepared to support PDCR 2-108-92, dated 8/27/97.
9.	MP2-DG	DBDPackage - Diesel Generator
10.	NRC Letter	Docket/License: 50-336/DPR-65
11.	OP 2346A	Emergency Diesel Generators
12.	SP 2613E	Diesel Generator Fuel Oil Sampling
13.	FSAR 4.2.2	Codes Adhered To
14.	MP 2721J	Periodic Inspection of Unit 2 Tanks
15.	91-BOP-813-ES, Rev. 3, MP2 EDG Operating Time with 24,000 Gallons of Diesel Fuel Oil Available at a Continuous Rated Load of 2750 kW Fuel Consumption	
16.	IPEEE	December 29, 1995, MP2, Response to Generic Letter 88-20, Supplements 4 and 5, Individual Plant Examination for External Events - Summary Report

Background:

Diesel Oil Storage Tank T47A is a 25,000-gallon underground, horizontal cylindrical tank. The tank is single-wall, carbon steel coated with "bitumastic mill undercoat" (exterior) and no interior coating. The tank was installed around 1972. A cathodic protection system (rectifier PO29A, zinc anodes, and test station) was added after October 1974.

Transfer Pumps P-47A and P-47B are installed in individual 24-inch diameter steel riser pipes connected to nozzles on the top of the tank. Bottom of tank = 1'-0" (plus or minus) depending upon which drawing

is used. Top of tank = 11' (plus or minus). Grade = 14'-8". Top of pump manways is 22' (plus or minus). Other connections extending to or above grade are fill, sample, vent, and level pipes. See Ref. 5.

The storage tank is not seismically qualified nor flood-protected. A sufficient quantity of oil is contained in the Diesel Oil Supply Tanks to operate the diesel(s) for approximately 7 days. Each Supply Tank (13,500-gallon nominal capacity) must contain 12,000 gallons. See Ref. 2. Pump(s) P-47A and P-47B "start(s) automatically when the respective level decreases below 95% and stops when tank level increases above 95%." See OP-2346B. (Setpoint Change #2-88-022, in process, changed minimum level to 93%.)

"Two EDGs operate for 8 hours, then one EDG operates for the remaining length of time. Fuel consumption is 3.6 gpm for each EDG at 2750 KW. During a LOCA with a LNP (loss of normal power) the two day tanks (Supply Tanks) are cross-connected." Ref. 15, dated April 1997. (The current license states one EDG for one hour instead of 8 hours with the other EDG continuous). The supply tanks are cross-connected via valve 2-FO-83, "Fuel Oil Supply Header Cross-tie".

Discrepancy:

Item 1:

Failure Mode

Water entering the underground Diesel Oil Storage Tank (T47A) will be automatically pumped into the Diesel Oil Supply Tanks T48A and T48B.

With water entry into the Diesel Oil Storage Tank from a single failure, during a LOCA in an LNP, it would take less than 3 hours to pump 6 inches of water into each Supply Tank. The fuel supply pipes are 6 inches above the bottom of the supply tanks. Water will shut down both EDGs a short time later. (With the currently licensed scenario i.e. one EDG for one hour, it would take up to six hours, assuming the tanks contribute equally, for the continuously running diesel to shut down. At that time the second EDG would not restart or if it starts it would not run for an extended length of time.)

If only one EDG were to started, it would run for 3 hours before automatically shutting down. At that time the other EDG would be started. It too would run for 3 hours before automatically shutting down.

Water Sources

Water sources are surface runoff, groundwater (normal or elevated), or flood water. Probable Maximum Precipitation can cause surface flooding between 15.5 to 16.2 feet MSL (mean sea level), Ref. 16. Normal groundwater level is elevation 5 feet MSL (halfway up the tank). The containment, turbine, and auxiliary buildings are protected from flooding. The design flood produces water levels up to elevation 18.1 feet MSL, stillwater and 25.2 feet MSL, wave runup, Ref. 16 for PMH (Probable Maximum Hurricane). According to reference 1, the EDGs will be operated during flooding up to and above a water level of elevation 22'.

Water Entry Point

We could not find documents that showed the Grade connections (fill, sampling) to be watertight under floodwater static head (approximately 7 feet). In addition, we could not find documentation to show that the Pump manways or vent pipe could not be damaged by floating debris during flooding. We could not find information concerning tank leakage under static head of flood water, ponded rainfall runoff, or groundwater. The Tank is single-wall steel and Refs. 8 and 9 imply that the tank may already leak. "The storage tank low level setpoint was lowered to reduce leaks," Ref. 8, and "In 1987, the concern for leaky storage tanks was raised," Ref. 9, page 3.4-1-17. For the purposes of clarifying this discussion we have assumed the vent pipe is damaged by floating debris during flooding, breaking a pipe weld, and providing an opening into the tank through which water can enter.

Detection of Water in Storage Tank

SP 2672 requires the storage tank T47A inventory to be checked weekly and fuel quality testing monthly. Water infiltration can occur between inventory checks or during site flooding. "A quarterly pumping of approx. 10 gallons of diesel fuel from the bottom of the storage tank to remove any moisture accumulation is being accomplished at present " (by AWO see Ref. 10). "Underground Tank Volumetric Test" is performed, frequency not given (see Ref. 14). "DIESEL OIL STOR TANK LVL, LI-7004" (C-06) has setpoint of 20%. "IF level is low, NOTIFY Operations Technician to order fuel " (see Ref. 7).

Water Pumped to Supply Tanks by Transfer Pumps

Diesel Oil Supply Tanks are automatically maintained level between 93% and 95 % full by automatic level control operation by the oil in the tanks. AOP 2560 does not address the shutdown of transfer pumps P-47A and P-47B during/ or after flooding. The Transfer Pumps take suction at approximately 11 inches above the bottom of the Storage Tank. There is no continuous monitoring for water in the Diesel Oil Storage Tank. The only reason we could find for the Transfer Pumps to be removed from automatic operation is in response to high level alarm (97%) at windows B32 and B33 on Control Room Panel C-08. In this case the pump supply breakers are opened to prevent tank overflow, Ref. 7.

Item 2:

Tank Elevation Discrepancies

Elevation of Diesel Oil Storage Tank T47A is recorded at three different elevations. The elevations are shown below:

Source Document	Tank Bottom Elevation (MSL)	Pump Mounting Plate Elev. (MSL)
SK-M-305, 7604-M-75	1'-0"	21'-6"
25203-28406-29	2'-0"	Not Shown
Calculation Y-T	0'-0"	22'-0"
25203-29032	Distance from bottom of tank to pump mounting plate = 20'-6"	

Significance Level:

"To provide a reliable onsite source of auxiliary power if the preferred source is lost, the unit has two onsite emergency generators. They are redundant, independent and separate, and are used for no purpose other than that described." FSAR 8.3.1.1. Automatic pumping from tank T47A removes the "independent and separate" provisions required by the licensing basis documents for this system. The Diesel Oil Supply Tanks are not "redundant" when operated as they are currently. A single failure (water in tank T47A) will cause loss of both EDGs.

Since both EDGs would shut down this is a **Level 1** discrepancy. The tank elevation discrepancies are **Level 4**.

Jon A. Winterhalter — Tier 1 — 1/27/98
Originator — Group — Date

EVALUATION		
☒ BASIS VALID	☐ BASIS INVALID - CLOSED	☐ PREVIOUSLY IDENTIFIED BY NNECo - CLOSED
Basis valid.		

M.J. Akins — 01/28/98
Group Lead — Date

REVIEW AND APPROVAL

Reviewed: E.A. Blocher — 01/28/98
Deputy Project Director — Date

Approved: D.L. Curry — 01/30/98
Project Director — Date

Forwarded to NNECo, NEAC, and NRC: 01/30/98 Date — Posted to WWW: 02/08/98 Date

SUMMARY OF NNECo PROPOSED CORRECTIVE ACTION

Response received from NNECo on 05/06/98

Disposition:

Item 1 Disposition:

Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply

NU has concluded that the condition described as Item 1 in Discrepancy Report DR-0312 does not represent a discrepant condition. NU has evaluated each of the design basis scenarios that NU has concluded could be at issue relative to the diesel generators and the potential for failure of the units due to water intrusion into the underground Diesel Oil Storage Tank. We note that in each instance, the license and design bases are met. There are, however, procedural improvements that can and are currently being incorporated as a result of the evaluations associated with this DR. These changes, which are a direct result of NU's evaluation of the discrepancies identified by Parsons in this discrepancy report, decrease the likelihood that the diesel generators could be adversely impacted by any postulated failures associated with the evaluated scenarios. Our review went beyond the specific set of conditions identified by Parsons, to consider the potential for a seismic event damaging the underground storage tank without failure to the fuel transfer system, and the subsequent transfer of water-laden fuel to the Diesel Oil Supply Tanks. A seismic evaluation of the underground storage tank utilizing Generic Implementation Procedure (GIP) techniques for seismic evaluation of equipment in operating plants (developed for resolution of USI A-46 Program) has been completed. That evaluation concludes that the tank proper will survive the seismic event, but that the connections to the tank at the top of the tank may be degraded. Further discussion as to the impact of this degradation is presented in the detailed write-up that follows. The procedural improvements noted above also enhance Millstone 2's response to the seismic event, providing positive assurance that neither of the diesels would be adversely impacted.

A brief discussion of pertinent issues relating to Parsons' assumptions utilized in describing the physical fuel oil storage system and failure assumptions is in order, prior to NU's detailed discussion, as follows:

- Parsons notes that the underground storage tank is not flood-protected -- We note that, as discussed in detail later, the tank was designed to maintain leak tightness for the maximum water levels associated with the Probable Maximum Hurricane (PMH). This is evidenced by the placement of the single open-to-atmosphere connection to the tank; i.e., the vent pipe with flame arrestor, which is at approximate elevation (+)25'-0", a point which is higher than the maximum wave runup level. The issue of floating debris and the potential impact of that debris will be discussed in detail in the body of our response. We do agree that, from a vulnerability to floating debris standpoint, the vent appears to be the weakest link in the tank and related piping system.

- Parsons notes that the two Diesel Oil Supply Tanks are cross-connected -- The two dedicated Diesel Oil Supply Tanks are cross-connectable, but are not normally cross-connected.

Since there is confusion noted as to MP 2's design basis for the length of run time for both diesels following a LNP, we note that the current license basis run time for the two units is 24 hours. Refer to Amendment No. 212 to Facility Operating License No. DPR-65 dated January 23, 1998. Subsequent to that time, one unit would be secured as deemed appropriate by the operators and those in the Emergency Onsite Facility.

- Parsons notes the issue of "water entry into the Diesel Oil Storage Tank from a single failure", on page 2 of the DR. NU notes that, without a mechanism that differs from the day-to-day chronic age-related degradation of the tank present, we consider the tank a passive device, which failure does not need to be postulated in the short

term and which can be deemed incredible in both the long and short terms due to the lack of moving parts and critical seal or gasketing assemblies. By a mechanism, we refer to phenomena such as a seismic event. Thus, for a LOCA with a LNP, there is no mechanism since external events, including seismic, are not postulated to occur concurrent with the LOCA.

• Parsons notes that normal groundwater level is at 5 feet MSL in the vicinity of the underground tank -- We note that that level corresponds to a site average and was used in the buoyancy calculation for the tank (Bechtel Calculation Y-T, Revision 0 titled "Diesel Oil Storage Tank Foundation"), but that the original core borings that were taken in the three locations closest to the tank show the highest recorded groundwater level was at Elevation (+) 0 feet.

• Parsons notes the conflicting information as to the elevation of the bottom of the Tank -- We agree that there are errors in our documentation of this elevation, and confirm that the actual elevation is Elevation (+)2'-7".

• Parsons notes that the design basis flood produces levels of stillwater of (+)18.1 feet MSL and wave runup of (+)25.2 feet MSL. -- We correct the wave runup at to be (+)18.9 feet at the east side of the facility where the underground tank is located. (Refer to FSAR Table 2.5-1)

• Parsons notes that the tank "may already leak" and cites two references supporting this conclusion -- We note that this is not the case, and that the confusion on this issue is the result of statements identified by Parsons in Reference 8. The Diesel Oil Storage Tank low level setpoint was actually lowered to reduce the quantity of fuel stored on site. This was done to minimize oxidation and microbial growth affecting the entire stored fuel supply in the Diesel Oil Storage Tank. As stated in attached Memo MP-10401, dated 5/21/87 titled NOA 9213 - "Diesel Generator Fails Test Because of Degraded Fuel" (CR-0487-004) "By allowing this tank to be consumed to a lower level, it would allow a fresher supply of oil to be available for transfer to the day tanks".

Our evaluation follows:

• Extended Full Power Operation Followed By A Loss Of Normal Power, With Or Without A LOCA:

The water sources that need to be considered for this design basis scenario include surface runoff and/or groundwater intrusion into the Diesel Oil Storage Tank. The water intrusion paths into the tank would be the result of a long term, non-acute mechanistic degradation of the underground storage tank and/or its appurtenances.

Surveillances are performed on the contents of Diesel Oil Storage Tank T47A to ensure that diesel fuel samples drawn from the bottom of the tank contain less than 0.05% water. Procedure SP 2865, Revision 0, "Sampling and Analysis of Diesel Oil Storage Tank" (Attached) provides instructions to obtain a sample from the bottom of Tank T47A for analysis to determine the degree to which water may have accumulated and to monitor color. At least once every 31 days a sample is taken and analyzed to ensure that less than 0.05% of water is present in the sample. This surveillance is applicable during all modes of operation when fuel oil is in the diesel oil storage tank. Additionally, Procedure SP2613E, Revision 6, Ch 1-3, "Diesel Generator Fuel Oil Sampling" (Attached) provides for sampling of the Diesel Oil Storage Tank T47A for off-site analysis. This is completed at least once every 92 days to meet Technical Specification Surveillance Requirements 4.8.1.1.2.b for Tank T47A. Sampling is also performed following any deliveries of fuel oil to Tank T47A. This surveillance is performed during all Operational Modes. No evidence of water intrusion into the Diesel Oil Storage Tank has ever been identified.

As stated above, water intrusion paths into Diesel Oil Storage Tank T47A for this design basis scenario would be as a result of long term, non-acute mechanistic degradation of the tank. This type of damage would be caused by corrosion of the tank and/or its appurtenances (fill pipe, pump stands, vents, sampling connections, etc.). A cathodic protection system was installed in 1974 to prevent such corrosion from occurring. Cathodic protection systems are designed to prevent tanks from corroding by reversing the naturally occurring electrolytic cell produced current at the interface of the tank exterior and surrounding back-fill that can degrade tank walls. An impressed current protection system is used to protect the diesel oil storage tank. This impressed current protection system introduces an electric current into the ground through a series of anodes that are not attached to the tank. Since the electric current flowing from these anodes to the tank and its appurtenances is greater than the corrosive current attempting to flow from the tank and its appurtenances, the anodes are corroded rather than the tank. The diesel oil storage tank cathodic protection system is shown on Northeast Utilities Drawing 25203-35028 titled, "Cathodic Protection Off-Gas Pipe, Diesel Oil & Fuel Oil Tanks, TBCCW & RBCCW Ht. Exc.". Procedure MP2720A3, Rev. 2 Ch. 1 titled "Cathodic Protection Maintenance" (Attached) specifies the monthly maintaining and testing of the cathodic protection system. The Diesel Oil Storage Tank, rectifier P029A output voltage, current, and reference cell voltage are recorded monthly by the Technical Services Department, Corrosion Control Section.

The tank was procured under Bechtel Specification 7604-M-125 titled "Specification of Miscellaneous Shop Assembled Tanks for the Millstone Point Company, Millstone Nuclear Power Station Unit No. 2". To further reduce the potential for corrosion, the exterior of the tank was subjected to a commercial sandblast and painted with a coat of bitumastic mill undercoat. The interior of the tank was hand tooled clean in accordance with SPEC-SSPC-SP2-63 and coated with diesel oil. Applicable codes and specifications used in the procurement of the tank included NFPA No. 30 and Underwriters Laboratories No. 58 - Standards for Underground Tanks for Flammable Liquids.

Upon the unlikely event that water would enter the Diesel Oil Storage Tank, it would not be immediately pumped to the Diesel Oil Supply Tanks when the transfer pumps automatically start. Pumps P47A&B suction is taken approximately 11 inches off the tank bottom. Any water entering the tank would settle to the tank bottom and sump. The bottom eleven (11) inches of tank elevation below the pump suction point will accommodate the accumulation of approximately 1150 gallons of water prior to any water being transferred to the Diesel Oil Supply Tanks. In order to have 1150 gallons or more accumulate between the water testing surveillances identified in SP 2865, an in-leakage rate averaging approximately 1.5 gallons per hour over the course of the full 31 days would have to occur. This is judged to be a conservatively high flow rate following the breaching of the tank due to a age-related corrosion induced failure.

The breaching of the tank due to corrosion would have to occur concurrently with a source of either runoff or groundwater being present which could enter the tank. Surface runoff that could enter the tank would be kept to a minimum in the area of the Diesel Oil Storage Tank due to grade being covered directly above the tank with a concrete pad and curbing system. Areas around the concrete above the tank are covered with a layer of asphalt.

Ground water levels vary greatly depending on circumstances such as seasonal variations or heavy rainfall. Monitoring of the groundwater level in the vicinity of the Diesel Oil Storage Tank is not performed. Further investigation of the water level of Elevation (+) 5.0 feet identified in Calculation Y-T, Revision 0 titled "Diesel Oil Storage Tank Foundation", shows that this groundwater level was probably used based on information that was provided in Amendment No. 1 to the License Application dated 10/27/69. A blanket statement for the entire site is presented in Amendment No. 1, Section 6.0 stating "The actual water table is probably at approximate elevation (+) 5.0". Actual boring logs closest to the location of the Diesel Oil Storage Tank were retrieved from records. The "Boring Location Plan" is shown on NU Drawing 25203-10005, Revision 0 and the "Boring Logs" are presented on NU Drawing 25203-10006, Revision 0. A review of the two referenced drawings shows that borings 2-DH-1, 2-DH-2, and 2-DH-9 are closest to the location of the Diesel Oil Storage Tank.

The approximate groundwater elevations at these locations which were taken in October, 1966 were as follows:

Boring Number	Groundwater Level
2-DH-1	(-) 7 feet
2-DH-2	(-) 4 feet
2-DH-9	(+) 0 feet

The following must be noted when reviewing the reported groundwater levels:

- Reading were taken over 30 years ago.
- Changes to the site have occurred since these readings were taken including the construction of both Millstone Units 2 and 3.
- All three readings would result in the groundwater table being below the bottom of the diesel oil storage tank by a minimum of two (2) feet and seven (7) inches.

No leakage of either water into the diesel oil storage tank or oil out of the tank has ever been identified. Due additionally to the ramifications of a leak of diesel oil to the environment, the tank is subjected to a volumetric test every three years to ensure its integrity. The most recent volumetric testing of Tank T47A was performed on 8/8/96 by Pennoni Associates Inc. EnvironTEL Division. The test results were satisfactory indicating no leakage into or out of Tank T47A. A visual inspection of the tank interior is completed every ten (10) years. Access to the underground tank is made via the 24 inch pump stand nozzles. Finally, we note that this tank is scheduled for replacement with a vaulted unit meeting current environmental standards in 2002 in accordance with State of Connecticut rules covering underground fuel oil storage tanks.

Original Bechtel Calculation Y-T, Revision 0, titled "Diesel Oil Storage Tank Foundation" provided for an anchorage system of the Diesel Oil Storage Tank T47A to its foundation under the worst case condition of the tank being fully submerged and empty with a saturated backfill. This design ensures no gross failure of Tank T47A due to buoyancy effects will occur. This calculation conservatively assumed ground water level to be at the top of the tank and also included a sketch indicating a water level which is the site average. We believe that this sketch is the basis for Parson's noted reference for the Elevation (+) 5.0 foot groundwater level versus the boring results in the vicinity of the tank noted above.

Based on the above discussion, NU concludes that for the unit trip from full power, with or without a LOCA case, the existing fuel forwarding system design does not present the potential for loss of either of the two (2) diesel generators.

• Extended Full Power Operation Followed By Unit Shutdown In Accordance With The TS Prior To Arrival Of A Probable Maximum Hurricane (PMH) And Associated Design Basis Flood Levels:

NU agrees with the Parson's observation that, given the maximum water level that could be experienced under PMH conditions, there could be water leakage into the underground storage tank by way of the externally exposed connections to the tank being damaged by floating debris. While these connections are protected to a degree from floating debris, that protection does not extend to the elevation that would be required to protect these connections in the worst case high water level event. As stated above, procedural improvements being made by NU, which are a direct result of this Parsons identified scenario, will be incorporated to eliminate any potential that the diesel generators could be adversely impacted.

It is apparent that design and installation documentation for the Diesel Oil Storage Tank did consider the PMH flooding effect as recognized at the time. Connections to the tank were made with seal welds that would prevent inleakage of water. The nozzles on which pumps P47A&B were mounted were provided with gaskets at their flanges to prevent in-leakage of water. The fill pipe connection was provided with a threaded cap. The vent flame-arrestor provided a direct opening for water intrusion due to the effects of the PMH. This vent was mounted above the expected PMH flood wave runup level eliminating the potential for water entry path during PMH flooding via that pathway. NU has prepared calculation 98-ENG-02567C2 - Revison 0 titled "Diesel Oil Storage Tank PMH Flood Evaluation of Outer Steel Wall" which evaluates the Diesel Oil Storage Tanks capability to accommodate the effects of the PMH's hydrostatic loading and soil loading. The results of the attached evaluation concludes that the tank is capable of accommodating these loadings.

Further evidence of consideration of PMH induced water intrusion to the Diesel Oil Storage Tank is presented in questions as requested in AEC letter, Mr. Karl R. Goller PWR Branch No. 3, Directorate of Licensing to Mr. Donald C. Switzer, President, The Millstone Point Company, dated December 29, 1972. Question 8.20 asked among other questions to "Also describe measures taken to prevent and detect the degradation of the fuel supply by water resulting from the effects of natural phenomena (storms, flood, hurricane), condensation, and/or poor oil supply." The response to this question was as follows:

(1) There is a provision for a sampling connection on the diesel oil storage tank. Samples of the diesel oil will be taken and tested at regular intervals to detect any degradation of the oil in the tank.

(2) In order to prevent any effects of natural phenomena, the vent flame arrestor on the diesel oil storage tank has been installed well above flood level wave runup elevation.

NU has concluded that the design of the Diesel Oil Storage Tank for PMH induced flood effects meets the unit's Licensing Basis and Design Basis.

The availability of both Emergency Diesel Generators is required up to and above the Elevation 22 foot flood level. Additionally, the ability to protect a Service Water Pump Motor (one function of which is to cool a diesel generator) and the diesel generators during the period when water level is above Elevation 22 feet is a design requirement. The following provides "defense-in-depth" evidence that, if the emergency diesel generators were lost to a PMH flood induced scenario like this one postulated by Parsons in this DR, the capability to maintain the plant in a safe shutdown condition would remain.

As described in FSAR Section 2.5.4.2.1, plant personnel can maintain the plant in a safe shutdown condition through the Probable Maximum Hurricane (PMH) when the primary objective is the removal of decay heat. The FSAR describes the incorporation of a steam-driven pump and manually-positionable components into the Millstone Unit No. 2 plant design, which provide for decay heat removal without dependence on emergency power from either the offsite supplies or the diesels.
The Condensate Storage Tank provides inventory for a minimum period of 10 hours. This is followed by the transfer of a reserve supply for the auxiliary feedwater system from the fire water storage tanks using the associated diesel driven fire pump. As a result, the 10 hours can be significantly extended. The fire water storage tanks are supplied by the city water system which is expected to remain pressurized by the domestic water supply's diesel-driven pumps, thereby providing a virtually unlimited supply of water. The Primary Water Storage Tank capacity following restoration of power to the primary water transfer pumps would also be available if required. NU notes that this method of decay heat removal is credited in the units license for those floods resulting in maximum flood levels in excess of 22' MSL; however, we further note that this method will, in practical terms, satisfy the decay heat removal requirement for flood resulting in water elevations of any level lower than that presented by the PMH scenario. We do stress once again, however, that the unit's design and license bases do not credit this method except for the greater than 22' flood level scenario.

NU has concluded that the design and license bases associated with this scenario are satisfied with the current configuration of the fuel tanks. We have further determined that it is prudent to incorporate procedure steps that will result in the operators disabling Fuel Oil Transfer Pumps P47A&B immediately prior to the expected arrival of a PMH induced flood event. Power would not be restored until some time after the flood waters recede, and the fuel oil contained in the tank has been sampled and determined to be of the required integrity. Millstone Station has the onsite capability to complete the appropriate set of fuel oil tests to support the determination of acceptability of this supply. The safety related and seismic dedicated Diesel Oil Supply Tanks for each of the diesel generators have sufficient stored oil to support the operation of each of these units for a minimum of two (2) days. This is sufficient time during which an alternative supply can be secured in the event that fuel stored in the underground storage tank has been determined to be unusable.

- Extended Full Power Operation Followed by a Unit Manual or Automatic Trip Due a Seismic Event Without a LOCA:

The diesel oil storage tank T-47A is a non safety-related, non-seismic underground tank containing fuel oil that is tested regularly. If a seismic event occurs, the diesel oil in the diesel oil storage tank can not be relied upon as a qualified source of fuel oil without prior testing of that fuel following the event, and potentially, the utilization of an alternative fuel oil forwarding system.

Even though this fuel oil source cannot be specifically credited to be available following a seismic event, the possibility exists that the following worst case scenario could occur:

1) Diesel Oil Storage Tank T47A remains generally intact and pumps P47A&B remain capable of transferring fuel to the diesel generator day tanks.
2) Diesel oil transfer piping remains intact and Pumps P47A&B remain energized and functional.
3) Groundwater enters the degraded Diesel fuel oil storage tank following the seismic event. It is postulated that water laden fuel could potentially be transferred to the Diesel Generator day tanks.

The groundwater table levels in the vicinity of the underground tank following the seismic event may or may not be above the bottom of the tank. If the water table level is below the bottom of the tank, no water intrusion into the tank would be expected. This scenario could result in diesel oil flowing out from the tank to the surrounding soil. Surrounding backfill could possibly be introduced to the Diesel Oil Storage Tank inventory at the connections at the top of the tank. In-place strainers between the Diesel Oil Storage Tank T47A and Diesel Oil Supply Tanks T48A&B would remove this sediment, and, in the process, potentially clog the strainers resulting in the termination of the transfer of fuel. The Diesel Oil Supply Tanks would continue to supply the diesels for a minimum of approximately two days each at full power. Operation of both units at full power for an extended period of time is highly unlikely since there is no LOCA ongoing; however, the Diesel Oil Supply Tanks can be replenished as necessary from offsite or other onsite supplies.

The following considerations apply if the groundwater table level is at a level which is above the bottom of the diesel oil storage tank:

Diesel Oil Storage Tank integrity is breached above water table level at the connections - This scenario would not result in water intrusion since the water table level will, in the worst case, be significantly lower. Backfill could possibly be introduced to the Diesel Oil Storage Tank inventory. Again, as discussed above, in-place strainers between the Diesel Oil Storage Tank T-47A and Diesel day tanks T48A&B would remove this sediment. If the sediment eventually clogs the strainers, the supply of fuel oil from Tank T47 would be terminated. The dedicated Diesel Oil Supply Tanks' fuel oil integrity would be maintained. Actions to replenish the diesel fuel oil to the Diesel Oil Supply Tanks would be taken, as appropriate.

Diesel Oil Storage Tank integrity is breached below water table level - Technical Evaluation M2-EV-98-0083, Revision 0, titled *Structural Integrity of Diesel Generator Fuel Oil Storage Tank Under Earthquake Loads*, provides a basis for concluding that the underground tank proper would survive the seismic event and maintain it's integrity. This attached evaluation, completed using GIP approved techniques, concluded that any failure of the tank is likely to occur at the connections to the tank at its top. Therefore, there would not be in-leakage of groundwater since in the worst case, it is significantly below the top of the tank.

While an acceptable design basis is provided for this condition, NU has determined that it is prudent to incorporate procedure steps that will result in the operators disabling Fuel Oil Transfer Pumps P47A&B immediately following the occurrence of a seismic event. Power would not be restored until some time after the seismic event, when the fuel oil contained in the tank has been sampled and determined to be of the required integrity.

The above, when combined with

- the approximate 1150 gallon "margin" that exists in the diesel oil storage tank to accommodate minor water intrusion,
- the "margin" that also exists in the Diesel Oil Supply Tanks T48A&B, and,
  actions that would likely occur as a result of recommendations made to remove power from the pumps by the Technical Support Team which would be assembled in the Emergency Operations Facility, provides reasonable assurance that the transfer of groundwater from the Diesel Oil Storage Tank to the Diesel Oil Supply Tanks and then, to the Emergency Diesel Generators would not have occurred, historically. Given the relatively lightly loaded diesel generators under the postulated scenarios, the fuel consumption rate will be significantly reduced resulting in additional time for the unit operators or those in the EOF to analyze those systems important to the maintenance of safe shutdown. Past Simulated Emergency Response Drills at NU have demonstrated a high regard and degree of attention to the integrity of those systems necessary to maintain a supply of AC power.

NU concludes that, for the seismic event case, the transfer of water-laden fuel to the diesel generator day tanks would not occur due to the maintained structural integrity of that portion of the underground tank system essential to the maintenance of near leak-tightness. Further, there is sufficient time available that, should some amount of water be introduced into the tank, the appropriate expertise would take actions to recommend that the tank be isolated from the dedicated Diesel Oil Supply Tanks.

The Design Basis Scenarios discussed above bound all other cases, including those that could occur with the unit previously shut down.

We note that Diesel Oil Storage Tank (T47A), including transfer pumps (P47A&B), and associated piping have, since unit startup, been designated as non-Category I systems at Millstone Units No. 2. Diesel oil has been identified as being automatically transferred from the underground diesel oil storage tank to the diesel oil supply tanks.

NU concludes that Issue 1 of this DR does not represent a discrepant condition. Therefore, Significance Levels do not apply. However, as a direct result of Parsons' identification of those issues discussed in this DR, NU is taking actions to provide even greater assurance that the underground fuel oil storage tank, its appurtenances and the manner in which the system is operated will not challenge the basis for inclusion of redundancy and independence in the design of the onsite electrical power supplies; i.e., the diesel generators.

Item 2 Disposition:
Tank Elevation Discrepancies

The elevation discrepancies reported in the documents listed below will be investigated. Design documents will be revised, as appropriate, to correct the discrepancies.

Source Document	Tank Bottom Elevation (MSL)	Pump Mounting Plate Elev. (MSL)
SK-M-305, 7604-M-75	1'-0"	21'-6"
25203-28406-29	2'-0"	Not Shown
Calculation Y-T	0'-0"	22'-0"
25203-29032	Distance from bottom of tank to pump mounting plate = 20'-6"	
FSAR 2.5.4.2.5	Invert Elevation 1'-8"	

Field walkdowns have been performed and dimensions were taken to determine the elevation of the tank bottom. This elevation was determined to be Elevation (+)2'-7". This places the Pump Mounting Plate at Elevation (+)23'-1" and the flame arrestor on top of the vent pipe above Elevation (+)25'-0".

NU concludes that the drawing errors depicting the actual tank bottom elevation constitutes a Significance Level 4 discrepancy.

Conclusion:
NU has concluded that the issues reported in DR-0312 has identified a CONFIRMED SIGNIFICANCE LEVEL 4 Condition that requires correction.

Item 1 - Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply Tanks
Based on the above, NU has concluded that the license and design bases for MP 2's emergency onsite power supplies including fuel supplies are met. However, Northeast Utilities is amending procedures such that there is a greater degree of assurance that electrical power will be removed from the P47A&B transfer pumps prior to the transfer of potential water-laden fuel, should these pumps remain operable for any of the evaluated scenarios.

Item 2 - Tank Elevation Discrepancies
Based on the above, Northeast Utilities concludes that a Level 4 Discrepancy does exists. Design documents will be revised, as appropriate, to correct the discrepancies.

COMMENT ON NNECo PROPOSED CORRECTIVE ACTION

Specific Comments:

Acceptable Leakage Rate:

Under Disposition subheading, "Extended Full Power Operation Followed By A Loss Of Normal Power, With Or Without A LOCA," an allowable leakage rate was discussed. The maximum leak rate was calculated in which accumulated water would not reach the level of the pump suction between the monthly sampling intervals. The calculated rate was 1.5 gallons per hour and was "judged to be a conservatively high flow rate following the breaching of the tank due to an age-related, corrosion induced failure."

Parsons does not agree that this leak rate is conservative. For discussion purposes, the orifice diameter required to allow a leak of 1.5 gallons per hour was calculated assuming a vertical, sharp-edged circular orifice with an external water head of 2 feet. The required orifice diameter for that leak rate is one millimeter. This is a very small perforation. Alternately, a 1/4 inch diameter orifice under a 3-inch head of water will allow 97 gallons per hour into the tank. For a tank with a diameter of 10 feet and length of 44 feet a one millimeter diameter perforation is not judged to be a conservatively large leak.

Corrosion-induced failure due to external or internal degradation mechanisms could occur anytime and hasn't been sufficiently addressed. Examples of such mechanisms are external corrosion due to coating aging failure/holidays or higher than normal local electrolytic corrosive cells. Internal corrosion due to microbiological induced corrosion (mic) of the uncoated interior also requires consideration.

As stated by NNECo, the groundwater elevations are not monitored in the tank area so the average and seasonal groundwater elevations are not known. A loose grade connection could leak under rainfall runoff build-up of several inches on the concrete slab over the tank. Also, asphalt paving is not impervious. Non-flood water sources could come from several paths, none of which can be discounted without a means to monitor/measure.

Calculation 98-ENG-02567C2 Implications:

Under Disposition subheading "Extended Full Power Operation Followed By Unit Shutdown In Accordance With The TS Prior To Arrival Of A Probable Maximum Hurricane (PMH) And Associated Design Basis Flood Levels," the new calculation 98-ENG-02567C2 was discussed. The tank was shown to withstand the loading resulting from flooding above grade levels. The analysis used the new tank wall thickness of 3/8 inch. The maximum calculated Actual /Allowable stresses were shown to vary from 92.9 to 95.6 percent (tables on page 7 of 50). These stresses are based on the unverified assumption that the tank retains its original wall thickness of 3/8 inch. Without the benefit of tank wall thickness measurements, we cannot agree that the tank will resist the forces from flooding.

Even with cathodic protection, corrosion can't be discounted. Internal tank inspections will not discover external tank corrosion. The effectiveness of the cathodic protection system's actual protection of the tank cannot be proven by operational testing of the cathodic protection system itself. The proof of protection would be tank wall thickness measurements. Consider what the Actual /Allowable stress ratios would be if the corroded tank wall was actually 1/4 inch instead of the original 3/8 inch.

Regardless, NNECo's proposed revision to procedures disabling the fuel oil transfer pumps prior to arrival of PMH induced flooding will prevent problems of water transfer from tank failure in this case. Parsons considers disabling of the automatic fuel oil transfer interlock to maintain the licensing basis for "independent and separate" to be a significance level 3 discrepancy.

General Comments:

The NNECo Disposition proposed procedural revisions that would minimize the risk association with loss of onsite power due to flooding or seismic events. These are low probability, extreme events. Parsons believes that there is a greater risk from corrosion-induced leakage which could occur anytime and we feel that it wasn't sufficiently addressed. The fact remains that the tank, which is a non-safety component, is still connected, by automatically controlled makeup pumps, to both of the Emergency Diesel Generator trains. The proposed disposition still violates the "independent and separate" requirements of the licensing documents.

The disposition states that the tank is scheduled for replacement in the year 2002. This concern, therefore, has a finite life span. However, during the time period from 1998 to 2002 the plant is exposed to significant (and increasing) risk considering of the age of the tank and cumulative effects of corrosion which might be occurring.

Conclusions:

Item 1:

We have reviewed the NNECo Disposition and find that Item 1 remains discrepant. In the absence of a wall thickness survey and a means to detect inleakage of water between monthly sampling, and the fact that during non emergency (flood/seismic) conditions, the pumps remain on automatic level control, we maintain that this condition is discrepant to Significance Level 1. The reliability of the both EDGs could be degraded by a non-safety component.

Item 2:

This item will be considered closed after the revised documents or Change Notices have been revi[illegible].

Prepared: M.J. Akins — Group Lead — 6/17/98 — Date

Reviewed: E.A. Blocher — Deputy Project Director — 6-17-98 — Date

Approved: D.L. Curry — Project Director — 6-17-98 — Date

Forwarded to NNECo, NEAC, and NRC: 6-14-98 — Date **Posted to WWW:** _____ — Date

FINAL RESOLUTION
Open: Item 1 requires NNECo follow-up to address inleakage concerns. Item 2 remains open pending review of drawing and calculation changes.

Eric A Bloch
E.A. Blocher
Deputy Project Director

19JUN98
Date

PARSONS POWER GROUP INC.
ICAVP MILLSTONE UNIT 2
DISCREPANCY REPORT

2675 Morgantown Road, Reading, PA 19607
(610) 855-2000 • FAX: (610) 855-2509

DR NUMBER: DR-0312
DR TITLE: Water in Diesel Oil Storage Tank (T47A) Could Enter Diesel Oil Supply Tanks
REVISION: PRELIMINARY
ISSUE DATE: 1/27/98
ORIGINATING GROUP: Tier 1
SIGNIFICANCE LEVEL: 1

DISCREPANCY

References:

1.	AOP 2560	Storms, High Winds, and High Tides
2.	FSAR 8.3	Emergency Generators
3.	OP 2346B	Diesel Fuel Oil System
4.	SP 2672	Sampling and Inventory of Diesel Oil Storage Tank, T47A
5.	25203-29032	Diesel Oil Storage Tank T-47A
6.	7604-M-125	Miscellaneous Shop Assembled Tanks
7.	ARP 2590F	Emergency Operating Procedures and Guidelines, Alarm Response for Control Room Panel C-08
8.	Figure 7.3	"10CFR50.59 Safety Evaluation Screening", prepared to support PDCR 2-108-92, dated 8/27/97.
9.	MP2-DG	DBDPackage - Diesel Generator
10.	NRC Letter	Docket/License: 50-336/DPR-65
11.	OP 2346A	Emergency Diesel Generators
12.	SP 2613E	Diesel Generator Fuel Oil Sampling
13.	FSAR 4.2.2	Codes Adhered To
14.	MP 2721J	Periodic Inspection of Unit 2 Tanks
15.	91-BOP-813-ES, Rev. 3,	MP2 EDG Operating Time with 24,000 Gallons of Diesel Fuel Oil Available at a Continuous Rated Load of 2750 kW Fuel Consumption
16.	IPEEE	December 29, 1995, MP2, Response to Generic Letter 88-20, Supplements 4 and 5, Individual Plant Examination for External Events - Summary Report

Background:

Diesel Oil Storage Tank T47A is a 25,000-gallon underground, horizontal cylindrical tank. The tank is single-wall, carbon steel coated with "bitumastic mill undercoat" (exterior) and no interior coating. The tank was installed around 1972. A cathodic protection system (rectifier PO29A, zinc anodes, and test station) was added after October 1974.

Transfer Pumps P-47A and P-47B are installed in individual 24-inch diameter steel riser pipes connected to nozzles on the top of the tank. Bottom of tank = 1'-0" (plus or minus) depending upon which drawing

is used. Top of tank = 11' (plus or minus). Grade = 14'-8". Top of pump manways is 22' (plus or minus). Other connections extending to or above grade are fill, sample, vent, and level pipes. See Ref. 5.

The storage tank is not seismically qualified nor flood-protected. A sufficient quantity of oil is contained in the Diesel Oil Supply Tanks to operate the diesel(s) for approximately 7 days. Each Supply Tank (13,500-gallon nominal capacity) must contain 12,000 gallons. See Ref. 2. Pump(s) P-47A and P-47B "start(s) automatically when the respective level decreases below 95% and stops when tank level increases above 95%." See OP-2346B. (Setpoint Change #2-88-022, in process, changed minimum level to 93%.)

"Two EDGs operate for 8 hours, then one EDG operates for the remaining length of time. Fuel consumption is 3.6 gpm for each EDG at 2750 KW. During a LOCA with a LNP (loss of normal power) the two day tanks (Supply Tanks) are cross-connected." Ref. 15, dated April 1997. (The current license states one EDG for one hour instead of 8 hours with the other EDG continuous) The supply tanks are cross-connected via valve 2-FO-83, "Fuel Oil Supply Header Cross-tie".

Discrepancy:

Item 1:

Failure Mode

Water entering the underground Diesel Oil Storage Tank (T47A) will be automatically pumped into the Diesel Oil Supply Tanks T48A and T48B.

With water entry into the Diesel Oil Storage Tank from a single failure, during a LOCA in an LNP, it would take less than 3 hours to pump 6 inches of water into each Supply Tank. The fuel supply pipes are 6 inches above the bottom of the supply tanks. Water will shut down both EDGs a short time later. (With the currently licensed scenario i.e. one EDG for one hour, it would take up to six hours, assuming the tanks contribute equally, for the continuously running diesel to shut down. At that time the second EDG would not restart or if it starts it would not run for an extended length of time.)

If only one EDG were to started, it would run for 3 hours before automatically shutting down. At that time the other EDG would be started. It too would run for 3 hours before automatically shutting down.

Water Sources

Water sources are surface runoff, groundwater (normal or elevated), or flood water. Probable Maximum Precipitation can cause surface flooding between 15.5 to 16.2 feet MSL (mean sea level), Ref. 16. Normal groundwater level is elevation 5 feet MSL (halfway up the tank). The containment, turbine, and auxiliary buildings are protected from flooding. The design flood produces water levels up to elevation 18.1 feet MSL, stillwater and 25.2 feet MSL, wave runup, Ref. 16 for PMH (Probable Maximum Hurricane). According to reference 1, the EDGs will be operated during flooding up to and above a water level of elevation 22'.

Water Entry Point

We could not find documents that showed the Grade connections (fill, sampling) to be watertight under floodwater static head (approximately 7 feet). In addition, we could not find documentation to show that the Pump manways or vent pipe could not be damaged by floating debris during flooding. We could not find information concerning tank leakage under static head of flood water, ponded rainfall runoff, or groundwater. The Tank is single-wall steel and Refs. 8 and 9 imply that the tank may already leak. "The storage tank low level setpoint was lowered to reduce leaks," Ref. 8, and "In 1987, the concern for leaky storage tanks was raised," Ref. 9, page 3.4-1-17. For the purposes of clarifying this discussion we have assumed the vent pipe is damaged by floating debris during flooding, breaking a pipe weld, and providing an opening into the tank through which water can enter.

Detection of Water in Storage Tank

SP 2672 requires the storage tank T47A inventory to be checked weekly and fuel quality testing monthly. Water infiltration can occur between inventory checks or during site flooding. "A quarterly pumping of approx. 10 gallons of diesel fuel from the bottom of the storage tank to remove any moisture accumulation is being accomplished at present " (by AWO see Ref. 10). "Underground Tank Volumetric Test" is performed, frequency not given (see Ref. 14). "DIESEL OIL STOR TANK LVL, LI-7004" (C-06) has setpoint of 20%. "IF level is low, NOTIFY Operations Technician to order fuel " (see Ref. 7).

Water Pumped to Supply Tanks by Transfer Pumps

Diesel Oil Supply Tanks are automatically maintained level between 93% and 95 % full by automatic level control operation by the oil in the tanks. AOP 2560 does not address the shutdown of transfer pumps P-47A and P-47B during/ or after flooding. The Transfer Pumps take suction at approximately 11 inches above the bottom of the Storage Tank. There is no continuous monitoring for water in the Diesel Oil Storage Tank. The only reason we could find for the Transfer Pumps to be removed from automatic operation is in response to high level alarm (97%) at windows B32 and B33 on Control Room Panel C-08. In this case the pump supply breakers are opened to prevent tank overflow, Ref. 7.

Item 2:

Tank Elevation Discrepancies

Elevation of Diesel Oil Storage Tank T47A is recorded at three different elevations. The elevations are shown below:

Source Document	Tank Bottom Elevation (MSL)	Pump Mounting Plate Elev. (MSL)
SK-M-305, 7604-M-75	1'-0"	21'-6"
25203-28406-29	2'-0"	Not Shown
Calculation Y-T	0'-0"	22'-0"
25203-29032	Distance from bottom of tank to pump mounting plate = 20'-6"	

Significance Level:

"To provide a reliable onsite source of auxiliary power if the preferred source is lost, the unit has two onsite emergency generators. They are redundant, independent and separate, and are used for no purpose other than that described." FSAR 8.3.1.1. Automatic pumping from tank T47A removes the "independent and separate" provisions required by the licensing basis documents for this system. The Diesel Oil Supply Tanks are not "redundant" when operated as they are currently. A single failure (water in tank T47A) will cause loss of both EDGs.

Since both EDGs would shut down this is a **Level 1** discrepancy. The tank elevation discrepancies are **Level 4**.

Jon A. Winterhalter	J A Winterhalter	**Tier 1**	**1/27/98**
Originator		**Group**	**Date**

EVALUATION		
☒ **BASIS VALID**	☐ **BASIS INVALID - CLOSED**	☐ **PREVIOUSLY IDENTIFIED BY NNECo - CLOSED**

M.J. Akins	M J Akins	28 Jan 98
Group Lead		**Date**

REVIEW AND APPROVAL

Reviewed:	Eric A Blocher		28 JAN 98
	E.A. Blocher		
	Deputy Project Director		**Date**
Approved:	D L Curry		1/30/98
	D.L. Curry		
	Project Director		**Date**