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SUBJECT: Provides followup notification & addl info re deficiency in high energy line break analysis performed for plant on 730907 by Bechtel. Safety evaluation re impact of postulated feedwater line break in turbine bldg encl.

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April 9, 1986

Director
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555

MONTICELLO NUCLEAR GENERATING PLANT
DOCKET NO. 50-263 LICENSE NO. DPR-22

Failure to Provide High Energy Line Break Protection for the Turbine Building Pipe Chase

The purpose of this letter is to provide followup notification and additional information related to the recent discovery of a deficiency in the high energy line break (HELB) analysis performed for the Monticello Nuclear Generating Plant and submitted for NRC Staff review on September 7, 1973. This deficiency was reported to the Monticello NRC Resident Inspector and NRC Region III personnel on April 4, 1986 and was the subject of a telephone conference call with NRC Office of Nuclear Reactor Regulation personnel on April 5, 1986.

Background Information

In 1973, at the request of the Commission, a HELB analysis was performed for the Monticello plant by the Bechtel Power Corporation. In this analysis, worst case break locations were chosen by inspection. The basis for selection is the potential for damage to structure and safety related equipment. Only these worst case break locations were analyzed for pipe whip, jet impingement, and compartment pressurization. It was assumed that these analyses would represent bounding cases. In the feedwater system, bounding breaks were selected near the feedwater pumps and in the condenser rooms. No analyses were performed in the turbine building pipe chase.

Later, in response to IE Bulletin 80-11, concrete block walls associated with safety related equipment were analyzed for all postulated loads. To protect block walls in the turbine building pipe chase, jet impingement shields were installed around the feedwater suction lines.

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In late February, 1986 this apparent discrepancy in the treatment of feedwater line high energy breaks was noted by engineers on the plant technical staff and an investigation was begun. Bechtel was contacted and asked to review their project records to determine the reason for this discrepancy. On March 13, 1986 Bechtel responded that the turbine building pipe chase break location was not considered in the 1973 analysis because of the analytical approach described above.

Following a meeting with Bechtel on March 25, 1986 it was determined that there was a need to quantify the effects of a feedwater line break in the turbine building pipe chase. The primary concern is that a break in this room could damage Division I cables within the room and cause failure of block walls which could damage adjacent Division II motor control centers (Figure 1). Impell Corporation was contacted to perform the HELB analysis for the room.

On April 4, 1986 Impell reported the results of their analysis. A guillotine break of one of the lines in the room would result in failure of the north wall. The NRC Resident Inspector and NRC Region III and NRR management were contacted. Subsequent fracture mechanics analysis by Impell Corporation, with the support of NUTECH, Engineers Incorporated, indicated that such a line failure is extremely unlikely. Fracture mechanics analysis indicated that if a flaw were to exist in this piping, a stable detectable crack would develop under all postulated loading conditions in both suction and discharge lines. This crack would be detected and the plant safely shutdown prior to any equipment damage.

Plan for Resolution of Problem

The plant is scheduled to shutdown for a planned refueling outage beginning on April 30, 1986. Prior to restart from this outage, modifications will be made to the turbine building pipe chase to mitigate the effects of a HELB in that room.

The 1973 Bechtel Analysis will be reviewed to determine if additional break locations exist which should have been considered. The results of this evaluation and a plan and schedule for resolving any additional deficiencies will be submitted to the Commission when the evaluation is completed

prior to restart from 1986 refueling outage. If additional major modifications are needed to meet the requirements of the Commission, and a justification for continued plant operation acceptable to the Commission is developed, we would propose completing this work during operation following restart or during a subsequent refueling outage. At this time, however, we do not believe that additional deficiencies will be found in the 1973 analysis which require extensive plant modifications.

Justification for Continued Operation

Operation of the Monticello plant for the short period of time until the beginning of the 1986 refueling outage on April 30, 1986 has been evaluated and a safety evaluation report prepared and reviewed by the Monticello plant Operations Committee. This report will also be reviewed by the Monticello Safety Audit Committee. Extracts from this report describing this evaluation are attached for the information of the Commission.

Based on the evaluation that has been presented, we have concluded that operation of the Monticello plant may safely continue until the 1986 refueling outage when HELB mitigation modifications to the turbine building pipe chase can be completed.

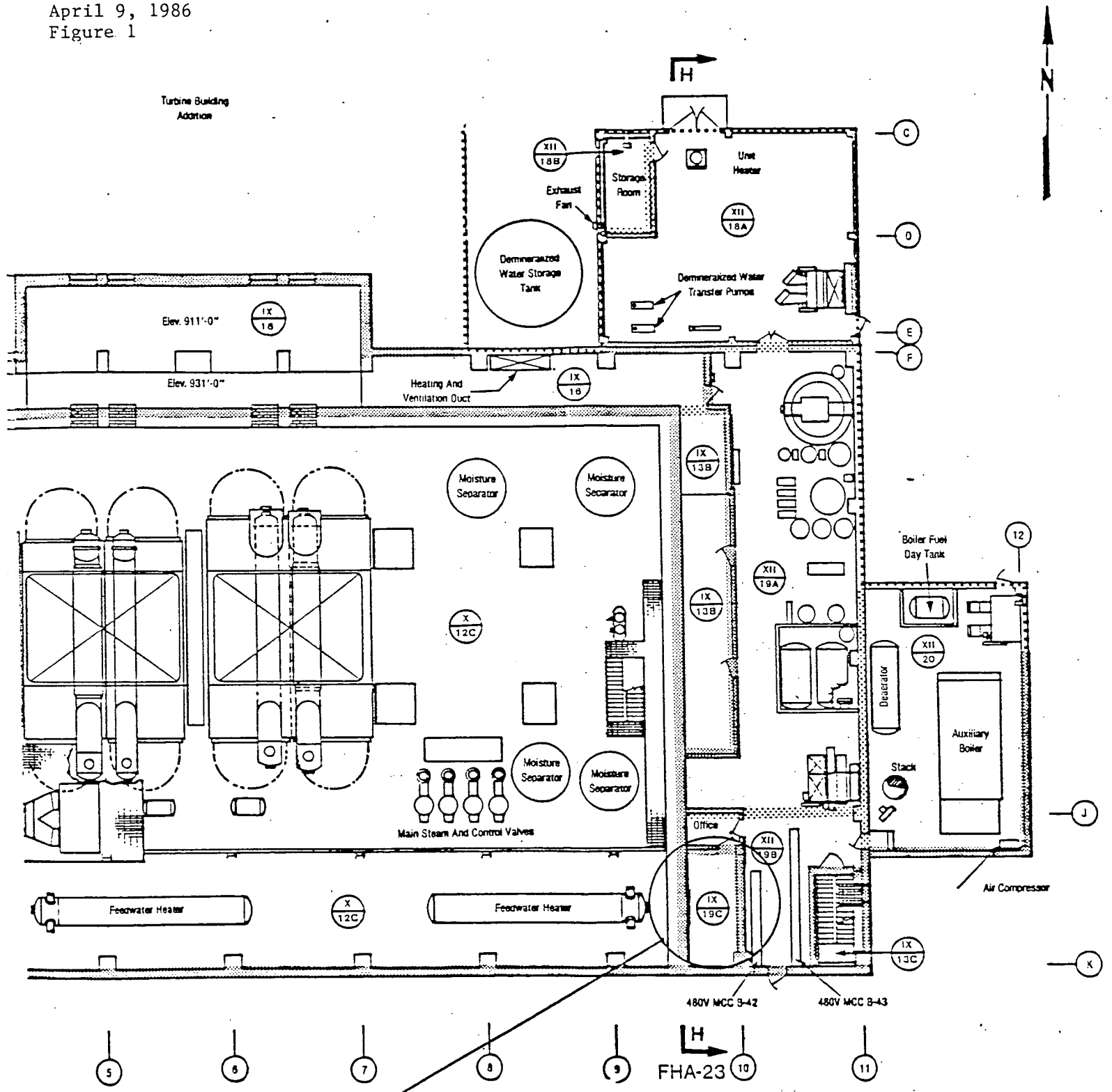
We will continue to keep NRC Office of Nuclear Regulation and Region III personnel fully informed on this matter. Please contact us if you have any questions related to the information we have provided.

David Musolf
Manager Nuclear Support Services

c: NRR Project Manager, NRC
Resident Inspector, NRC
Regional Administrator, Region III, NRC
G Charnoff

Attachments

Director of NRR
April 9, 1986
Figure 1



Affected area -
Turbine Bldg
Pipe Chase

SCALE: 0' 2' 4' 8'

Also see USAR Figure 12.2-8a.

REV. NO.	DATE	DESCRIPTION	PREP BY	REV. BY	APPR BY
0	9/1/25	ORIGINAL	AG	[illegible]	[illegible]

NORTHERN STATES POWER COMPANY
MONTICELLO NUCLEAR GENERATING PLANT

PLAN VIEW - TURBINE BUILDING ELEV. 931'-0"

DWG. NO. FHA-9

Scale: [illegible] Sht. 1 of 1

Director of NRR
April 9, 1986
Attachment

SRI No. 86014

SRI REVIEW AND APPROVAL FORM

TITLE: High Energy Line Break Analysis Deficiencies & Associated Potential Impacts on Plant Operation

1. Approved by PSERP or Designee: [signature] Date: 4-8-86
2. Prepared by: Erin Murray Date: 4-8-86
3. Reviewed by: M. Hammer Date: 4/8/86
4. Reviewed by: Ken Kuhnes Date: 4/9/86
   Supt., Security & Services
5. Operations Committee Review: Meeting No. 1413 Date: 4-9-86
6. Change to USAR or Subsequent Submittal: Yes ✓ No ___
   Re: 50:59(b)
   a. SAC Review Completed: _____ Date: _____
   b. 50:59 Summary Report Submittal to NSS: _____ Date: _____
7. License Amendment or Unreviewed Safety Question: Yes ___ No ✓ (If Yes, NRC Authorization is required)
   Re: 50:59(c)
   a. SAC Review Completed: _____ Date: _____
   b. Amendment Request Transmitted: _____ Date: _____
   c. Authorization Letter Received: _____ Date: _____
8. SRI Approval
   a. Responsible Individual [signature] Date: 4-9-86
   b. Supt., Security and Services Ken Kuhnes for [signature] Date: 4/9-86
9. SRI Completed
   a. Responsible Individual _____ Date: _____
   b. Supt., Security and Services _____ Date: _____

INSTRUCTIONS (Ref: 4 ACD-7.3)

1. Prepare descriptions for items checked "Yes" on Page 2 of Form 3004 and attach to Form 3004 for OC review.

WP/kk

DESCRIPTION & SAFETY EVALUATION

Background

During recent review of the High Energy Line Break (HELB) analysis report, prepared by Bechtel Corporation in the 1972-1973 timeframe, it was discovered that certain deficiencies existed with regard to selection of line break locations. In particular, it was found that the analysis did not consider a feedwater pump suction or discharge line break within the room adjacent to the plant attendant's office in the turbine building. A line break within this room should have been considered, since it could potentially damage both divisions of equipment essential for safe shutdown of the plant.

Impell analysis indicates that compartment pressurization loads due to a broken line within the room will result in the failure of the north block wall (wall adjacent to plant attendant's office). Bechtel analysis indicates that jet impingement loads would also cause failure of this wall. This could, therefore, result in the loss of the essential motor control centers (MCCs) outside the room and cables running through the room from the other division of essential MCCs beneath it.

Justification for Continued Operation

Continued operation of the plant with this potential for damage to both divisions of safe shutdown equipment for the next 3 to 4 weeks of this cycle is justified based on the fact that any cracks in the lines that could lead to a full break will be detected in the leaking stage. Impell Corporation has performed a "leak before break" analysis (Attachment #1) for the piping in this room. The fracture mechanics part of this analysis indicates that these lines would develop stable, detectable cracks rather than suddenly breaking in guillotine fashion for all normal operating and upset conditions. Two phase fluid flow calculations indicate leakage on the order of 0.5 gpm is expected from any cracks that might develop and would be easily detected by inspections every 4 hours, even though all the lines are insulated. The thermal-hydraulics part of the Impell analysis indicates that, even with leakage on the order of 10 gpm, temperatures and pressures within the room would have no adverse effects on safety-related equipment for a period of at least 8 hours after initiation of the leak.

Additional piping analysis by Nutech indicates that the highest stress locations for these lines are located outside the room and, therefore, the piping would be more likely to develop leaks or break in the areas already analyzed for these conditions.

Immediate Protective Measures

An Ops Memo has been issued directing operations personnel to inspect the piping within the room for signs of leakage approximately every 4 hours. If any leakage is detected, the operators will immediately initiate an expedited plant shutdown, per Volume F Memo #700 (Attachment #2).

Long-Term Corrective Action & NRC Commitments

The following corrective actions are NRC commitments.

1) Modify the room and/or the high energy line piping systems running through it, such that for all possible HELBs damage to both divisions of safe shutdown equipment does not occur. Must be completed prior to startup from the upcoming refueling outage.

2) Although cursory review indicates no other similar problems exist, conduct a thorough review of the original HELB analysis. Must be completed prior to startup from the upcoming refueling outage.

3) Make any modifications required as a result of the review of the HELB analysis.

Conclusion

This SRI documents the fact that a potential high energy line break, which could result in loss of both divisions of safety-related, safe shutdown equipment, was not adequately addressed in the HELB study submitted to the NRC in 1973. It also documents that the leak before break analysis performed and protective measures implemented adequately reduce the potential for such an accident, such that it can be concluded that this situation does not reduce the margin of safety defined in the bases for any technical specification and it does not represent an unreviewed safety question as defined in 10CFR50.59.

Prepared by Tim Murray Date 4-9-86