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REGION III

REPORT NO. 50-263/95011

FACILITY
Monticello Nuclear Stat on
License No. DPR-22

LICENSEE
Northern States Power Ccmpany
414 Nicollet Mall
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DATES
October 16 through November 3, 1995

INSPECTORS

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APPROVED BY

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11/22/95
Date

AREAS INSPECTED

A special inspection of a mispositioning of a drywell spray manual valve event. An evaluation of operations and safety assessment and quality verification was also performed.

RESULTS

Performance within the area of OPERATIONS after discovery of the mispositioned valve was good. Operations management responded aggressively when the mispositioned valved was identified. The decision to halt significant on-line maintenance was conservative. However, the "B" drywell spray system was inoperable for about 1 year due to personnel error and weak procedures.

Performance within the area of SAFETY ASSESSMENT AND QUALITY VERIFICATION pertaining to the discovery of the mispositioned valve was good. The licensee's initial corrective actions were appropriate, and the licensee's investigation team was aggressive. However, the licensee's investigations for two previous similar events were ineffective and did not effectively address the root causes.

Summary of Open Items

Apparent Violations: Three identified in Sections 1.2, 1.3, and 1.5.

INSPECTION DETAILS

1.0 OPERATIONS

NRC Inspection Procedure 71707 was used in the performance of an inspection of ongoing plant operations. Three Apparent Violations were identified regarding failure to follow technical specifications and procedures.

1.1 Summary of Events

On October 12, 1995, a plant equipment operator found the loop "B" residual heat removal (RHR) drywell spray manual isolation valve (RHR 74-2) unlocked CLOSED with an equipment isolation tag, #94-80312, hanging on the valve handwheel. The closure of this valve rendered the "B" drywell spray system inoperable. The licensee immediately restored the valve to the normally locked open position and made the required 1-hour 10 CFR 50.72 notification to the NRC for operating the plant outside the design basis.

The isolation tag #94-80312 was originally hung during the Fall 1994 refueling outage. In October 1994, the licensee performed system prestart checklists in support of an anticipated reactor startup. Final closeout of maintenance activities included temporary lead shield removal and RHR system pressure testing. A brief summary of activities and approximate times included:

September 19, 1994:	The RHR 74-2 valve was closed in support of installation of temporary lead shielding. Card 1 (tag) of isolation worksheet #94-80312 was hung on the valve.
October 17: (8:00 pm):	The tag was removed per the temporary lift process. The valve remained closed due to other outstanding isolation tags.
October 17: (9:15 pm):	Operators removed the last isolation tag and the valve was restored to the normal locked open position.
October 18: (midnight):	The isolation tag #94-80312 was rehung and the valve positioned closed. This was documented on the temporary removal table of the isolation worksheet.
(Discrepancy):	However, the signatures verifying this action were lined out by a shift supervisor with an added comment that the valve was open. No date or justification was provided. No independent verification was performed to confirm the valve was open.

October 19:	An operator verified the RHR 74-2 valve was locked open as documented on the master RHR system prestart checklist. The operator performed the verification using a working copy of the procedure and later transposed this information to the master checklist.
(Discrepancy):	There was no indication on the master checklist that isolation tag #94-80312 was on the valve.
October 21 (mid morning)	An independent verifier confirmed the valve was locked open as documented on the master RHR system prestart checklist. Again, the information was transposed from a working copy to the master checklist.
October 21:	The work package associated with isolation tag 94-80312 was closed. This required review by a shift supervisor. It is likely that the shift supervisor edited the temporary removal table for isolation #94-80312 during this review.

The valve position as documented on the temporary removal table and system prestart checklist conflicted. The licensee's investigation team could not identify additional documentation to show other RHR 74-2 valve manipulations. Although the exact date of when the isolation tag was rehung and the valve positioned closed was unknown, it was reasonable to conclude the valve was closed sometime between midnight October 18 and 21, 1994.

1.2 Technical Specification Requirements for One Train Operability Not Met

Technical Specification (TS) 3.5.C.1 required the drywell spray subsystem to be operable for all periods in which the reactor water temperature was greater than 212°F with irradiated fuel in the reactor vessel. One containment spray subsystem was allowed inoperable for a 7-day period. If these requirements were not met, TS 3.5.C.5 required an orderly shutdown of the reactor and reactor water temperature reduced to less than 212°F within 24 hours. The "B" drywell spray subsystem was not operable when required between:

- October 23, (7:44 pm) to December 17, 1994 (4:00 pm)
- December 21, 1994, (3:30 am) to October 12, 1995 (11:20 am)

Failure to maintain the "B" train of drywell spray operable during the required periods between October 23, 1994, and October 12, 1995, is an Apparent Violation (50-263-95011-01).

1.3 Review of "A" Train RHR Work Showed Both Drywell Spray Subsystems Were Inoperable

The inspector reviewed work history and determined the "A" train of drywell spray was inoperable for short periods of time. Specifically, at 9:55 am on October 3, 1995, the licensee declared the "A" drywell spray system inoperable to perform on-line maintenance. The inspector reviewed the work scope and identified four work activities which made the drywell spray subsystem inoperable. These included:

Work Request #

9501383 9501390	The power supply breakers for pumps #11 and #13 were racked out and the respective control room control switches were placed in pull-to-lock for about 25 hours between October 3 and 4.
9501334	Preventive maintenance activity was conducted on a shutdown cooling suction valve. With the valve closed, RHR suction was isolated from the torus valve (RHR MO-1986) for about 11-1/2 hours between October 3 and 4.
9501338	This activity isolated the RHR MO-1986 and the supply valve from the condensate storage tank (RHR 18-1) for about 11 hours on October 3.
9501352	This surveillance activity affected the containment spray inboard, outboard, and manual isolation valves and rendered the system inoperable for about 5 hours on October 3.

The inspector concluded that the above work was performed concurrently. However, work activities 9501383 and 9501390 were significant because a post maintenance test was not completed and the train was not declared operable until 5:53 pm on October 5, 1995. Therefore, the "A" RHR drywell system was inoperable for a continuous 56-hour period. Accordingly, both trains were inoperable, thus the containment spray function was inoperable for 56 hours.

Technical Specification 3.5.C.1 also required both containment spray/cooling subsystems be operable whenever irradiated fuel was in the reactor vessel and reactor water temperature was greater than 212°F. If this requirement was not met, TS 3.5.C.5 required an orderly shutdown of the reactor and reactor water temperature reduced to less than 212°F within 24 hours. Failure to maintain both containment spray subsystems operable is an Apparent Violation (50-263-95011-02).

The "A" drywell spray system was also inoperable during monthly emergency diesel generator surveillances and when various support systems were out for maintenance activities. This additional time amounted to about 65 hours with no individual segment exceeding 24 hours.

1.4 Safety Significance for Inoperable Drywell Spray Was Minimal

The drywell spray system as described in the Update Final Safety Analysis 6.2.3.2.3 is designed to reduce containment pressure by condensing steam. The system is manually placed in service by manipulating several motor operated valves from the control room once the core cooling function of RHR is satisfied. In the analysis for the small break LOCA, no credit was taken for this action. Containment pressure is reduced after 10 minutes by operators initiation of the auto-depressurization system (ADS).

1.4.1 Mispositioned Drywell Spray Valve Had Minimal Safety Significance From an Emergency Operating Procedures and Mark I Analysis Perspective

The emergency operating procedures (EOP) direct the operators to start drywell spray if containment pressure reach 12 psig. The sprays are initiated to prevent a phenomenon called "chugging." "Chugging" is defined as a cyclic condensation of steam at the downcomer openings of the drywell vents. Collapsing steam bubbles and subsequent filling of the voids with suppression pool water would cause stresses at the junction of the downcomers and vent header. "Chugging" could cause fatigue failure and result in a direct flow path between the drywell and torus airspace bypassing the suppression pool.

When containment pressure reaches 12 psig, operators could divert flow from the RHR system to the drywell spray system only if core cooling is not needed. If pressure is above a predetermined limit, the operators are instructed to use drywell spray regardless of the core cooling needs. The ADS system is used to depressurize the vessel once this containment pressure limit is reached.

If a small break LOCA occurs with both drywell spray systems inoperable, the operators should initiate ADS about 17 minutes into the event. Analysis shows that the "chugging" phenomenon starts 5 minutes into the event and ends 10 minutes after ADS initiation. Therefore, without drywell spray, the "chugging" phenomenon will be present for about 22 minutes.

The original Mark I analysis assumes that 10 minutes into the accident scenario, operators will depressurize the vessel using ADS. The analysis assumes that the "chugging" phenomenon will stop 10 minutes after ADS initiates; therefore present for about 15 minutes. The analysis concludes that no damage will occur to the downcomers due to the stresses induced by "chugging," for less then 10 minutes.

With both trains of drywell spray inoperable, the "chugging" phenomenon could continue for about 7 minutes longer than the original Mark I analysis. Using data from the Mark I analysis, the licensee postulated that the stresses experienced during the additional 7 minutes would not result in a downcomer failure. Therefore, the licensee concluded that the mispositioned drywell spray valve had minimal safety significance.

1.4.2 Loss of Drywell Spray Was Insignificant From an Individual Plant Evaluation (IPE) Perspective

Loss of both drywell spray subsystems did not change the core damage frequency or probability of containment failure. The drywell spray subsystem was not designed to inject cooling water into the reactor core; therefore, the IPE analysis did not credit that system for preventing core damage. In addition, the IPE analysis assumed the torus spray subsystem had the greatest impact on preventing containment failure; therefore, no credit was given for the drywell spray subsystems. Therefore, failure of both drywell spray subsystems would not increase the probability of a containment failure. However, in accident scenarios involving core damage and containment failure, the loss of both drywell subsystems spray did affect the severity of the radioactive release. Previously assumed small releases would be recategorized to large releases because the scrubbing effect from the water mist would significantly decrease without drywell sprays. From a IPE perspective, the loss of drywell spray was insignificant because only 0.07 percent of the core damage sequences were affected.

1.5 Several Opportunities to Identify Problem Were Missed Due to Vulnerabilities in Procedures and Failure to Follow Procedures

The licensee had three mechanisms to ensure proper system alignments: system prestart valve checklists, equipment isolation process, and locked valve alignment checklist. In this event, all three barriers failed to prevent the mispositioning.

Vulnerabilities existed when all multiple mechanisms were performed concurrently. For example, locked valve alignment checklist (1401-1) did not require operations personnel to perform an additional verification of valve positions if other checklists were performed recently. The licensee would review the completed system checklists and transpose this information to the locked valve alignment checklist. No physical checks were performed. The purpose of 1401-1 was bypassed.

1.5.1 The Licensee's System Prestart Valve Checklist Was Not Effective in Ensuring System Operability

Operators performed the checklist using a working copy of the procedure and later transposed this information to the master copy. The RHR 74-2 valve position documented on the isolation worksheet conflicted with the recorded position on the master system checklist. The licensee's investigation team could not identify documentation to show additional RHR 74-2 valve manipulations. Since the valve was found closed, the inspector concluded that on October 19 and October 21, 1994, plant operators failed to verify the RHR 74-2 valve was locked open in accordance with Residual Heat Removal System Prestart Valve Checklist 2154-12. Failure to follow checklist 2154-12 is contrary to 10 CFR 50, Appendix B, Criterion V and is an example of an Apparent Violation (50-263-95011-03a).

1.5.2 The Temporary Lift Process Did Not Provide Adequate Control for Plant System Configuration

A shift supervisor permanently cleared a temporary lift by crossing out the signatures on the reinstalled section of the temporary removal table and adding a comment that the valve was open. No date or justification for this action was provided. Administrative Work Instruction, 4 AWI-04.04.01, "Equipment Isolation," required the shift supervisor to direct independent verification and documentation of positioning and relocking of locked equipment to its operating status when performing a permanent clear of safety tags. The required independent verification was not performed to confirm the RHR 74-2 valve was locked open. Failure to follow 4 AWI-04.04.01 is contrary to 10 CFR 50, Appendix B, Criterion V and is another example of an Apparent Violation (50-263-95011-03b).

1.5.3 Operators Were in the Vicinity of the RHR 74-2 Valve on at Least Four Occasions and Did Not Detect Valve Mispositioning

During quarterly RHR testing, operators manipulated locked valves physically located just above this manual valve but did not notice the tag or lock hanging from the valve. The licensee stated that poor lighting in the room and the desire to leave a high radiation area may have precluded earlier detection.

2.0 SAFETY ASSESSMENT AND QUALITY VERIFICATION

NRC Inspection Procedure 37551 and 71707 were used to perform an onsite inspection of the safety assessment function.

2.1 Immediate Corrective Actions Were Appropriate

The licensee immediately locked open the RHR 74-2 valve and initiated the following corrective actions:

- Operations personnel verified valve alignments to ensure a generic problem did not exist with the valve checklist process. All valves outside of the drywell including those in high radiation areas were verified in the correct position. These systems included standby gas treatment, standby liquid control, high pressure coolant injection, core spray, residual heat removal, reactor core isolation cooling, fuel oil, emergency diesel generator, emergency service water, and emergency diesel generator air start. No discrepancies were noted during this effort.

- Engineering personnel reviewed plant drawings and system performance tests to confirm that key manual valves located in the drywell were correctly positioned.

- The licensee halted all planned on-line maintenance activities which involved multiple isolations or temporary lifts until a root cause was determined.

- The licensee also established a team to review the circumstances of the event. The licensee's investigation was ongoing at the end of the inspection period.

The inspector determined the licensee's actions were appropriate and timely.

2.2 Actions from Previous Events Failed to Identify the Mispositioning

The mispositioning of RHR 74-2 demonstrated a weakness in the licensee's process to ensure systems were aligned properly after refueling outages. As discussed in paragraph 1.5, several mechanisms failed to identify the valving discrepancy. Also, two similar events occurred in 1995:

- As discussed in Inspection Report (50-263-95005) the licensee identified three valves on the H_2O_2 analyzer were mispositioned closed. The licensee determined that this condition existed since March 15 when maintenance work was completed on the post accident sampling system. Operators removed isolation tags but did not reposition the valves as required. The operators believed a system engineer would return the valves to normal after testing was completed. The corrective actions included training to reenforce management's expectations on restoration of equipment and performing the checklist for accessible valves. The RHR 74-2 was considered inaccessible.

- On January 12, 1995, an operator identified that a drywell oxygen analyzer sample line drain valve was mispositioned open. The licensee determined the valve had been mispositioned since October 21, 1994, after completion of the system leakage check procedure 1209. The prestart system checklist and locked valve alignment checklist performed on October 22, 1994, both showed the valve was locked closed. Again, the as found valve position conflicted with the as left documented position. The licensee also had two additional opportunities to identify this mispositioning. This locked valve alignment checklist was the identical procedure used for RHR alignment event. The licensee did not determine the root cause and corrective actions prior to the RHR 74-2 valve event.

These events were of minor significance but showed procedure adherence and policy weaknesses.

2.3 Previous Audits Showed No Trends

The inspector reviewed quality assurance (QA) audits and surveillances generated in 1994 and 1995. No negative trends were found in procedure adherence or the equipment isolation process. The QA auditors identified some documentation problems unrelated to this event.

3.0 PERSONS CONTACTED AND MANAGEMENT MEETINGS

The inspectors contacted various licensee operatio..s, maintenance, engineering, and plant support personnel throughout the inspection period. Senior personnel are listed below.

At the conclusion of the inspection on November 3, 1995, the inspectors met with licensee representatives (denoted by *) and summarized the scope and findings of the inspection activities. The licensee did not identify any of the documents or processes reviewed by the inspectors as proprietary.

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