NPS

SEVERITY LEVEL
A. ☐ 3 working days
B. ☐ 10 calendar days
C. ☒ 30 calendar days
D. ☐ Other

CONDITION REPORT

DUE: 7-11-03 Date

CR NO. 03-1330

PTN ☒ PSL ☐ JB ☐

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CR Administrator

ORIGINATOR

1. SYSTEM #/NAME 041/RCS UNIT 00
COMPONENT ID 3/4P200A,B,C
COMPONENT NAME RCP Seal Injection/Cooling
LOCATION (BLDG/ELEV) Containment
DISCOVERY DATE/TIME 6/10/03 /1500
EVENT DATE/TIME 6/10/03 /1500
CR ORIGINATOR A. S. Dunstan
DEPT/PHONE Eng /6004

2. (ATTACH ADDITIONAL PAGES AS NECESSARY)

PROBLEM (WHAT HAPPENED, HOW WAS THE ISSUE DISCOVERED, WHAT ACTIVITIES, PROCESSES AND PROCEDURES WERE INVOLVED, PHYSICAL CONDITION EXISTING AT THE ISSUE LOCATION, WHY IS THIS ISSUE OR EVENT A CONCERN, HAVE YOU SEEN THIS ISSUE OCCUR BEFORE)

During review of PCM 03-042, it was noted that SBO coping assumes RCP seal degrade from cooling via RCS fluid and results in a 25 gpm/pump inventory loss. Seal degradation is based on the assumption that seal injection is not restored within the first 10 minutes of the SBO event. This concept ensued from Revision 1C of the ERGs in 1997 where Westinghouse recommended coping via seal cooling with RCS cooldown in lieu of the previous approach to re-establish seal injection within 10 minutes.

It was recognized that this reversal in SBO philosophy could affect assumptions used in the Safe Shutdown (SSD) Analysis for Appendix R fire scenarios. Specifically, the timeframe for performing SSD manual actions (see Procedures 0-ONOP-105 and 0-ONOP-016.10) is based on an assumption made during initial SSD development (circa 1984) that RCP seal cooling must be re-established, either by CCW or seal injection, within 20 minutes under LOOP conditions. As there are differences as well as similarities, the Appendix R scenarios should be reviewed to determine if the SBO assumptions for seal cooling apply and, if so, to prescribe corrective actions, if appropriate.

ORIGINATOR

REGULATION OR REQUIREMENT IMPACTED Capability to achieve and maintain safe shutdown in event of Appendix R fire without exceeding radiological release limits.

PGM CLOSEOUT

IMMEDIATE CORRECTIVE ACTION TAKEN, ADDITIONAL CORRECTIVE ACTIONS COMPLETED Initiated CR and performed operability assessment, finding no operability concerns.

NOTIFICATIONS Supervisor

3. ORIGINATOR REQUESTS COPY OF CLOSED CONDITION REPORT ☒ YES ☐ NO

SUPERVISOR NOTIFICATION: J. LaDuca / [signature] (PRINT / SIGNATURE) ☐ N/A

NPS

4. OPERABILITY/REPORTABILITY DETERMINATION:

OUTAGE RELATED? ☐ YES ☒ NO

MODE HOLD? ☐ YES ☒ NO

FOR ENTRY INTO MODE _____

☐ A. OPERABILITY ASSESSMENT REQUIRED (3 WORK DAYS)
☐ B. POTENTIALLY REPORTABLE (ATTACH ENS WORKSHEET, IF USED)
☒ C. NO OPERABILITY CONCERN/NOT REPORTABLE
☐ D. OTHER _____

COMMENTS: _____

NPS/VPNE J. Perkins / [signature] (PRINT / SIGNATURE) DATE/TIME 6-12-03/0120

PGM

5. CONDITION REPORT ASSIGNED TO: ENG

COMMENTS: _____

☐ Significance Level 1 - Root Cause Analysis
☑ Significance Level 2 - Apparent Cause
☐ Significance Level 3 - Correction Only
☑ PGM Closeout
☐ Trend Only
☐ Potential Human Performance Issue
Affected Dept. _____

PGM/VPNE [signature] DATE 6/12/03

VICE PRES., NUCLEAR ENGINEERING

CRs ARE QA RECORDS WHEN CLOSED. PLEASE ENSURE ALL RESPONSES AND ATTACHMENTS ARE LEGIBLE

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HH-2

6. FUNCTIONAL FAILURE: ☐ YES ☒ NO BY: A. S. Dunstan / [signature] (PRINT / SIGNATURE) N/A

7. INVESTIGATION: ANALYSIS, CORRECTIVE ACTIONS, GENERIC IMPLICATIONS, DISPOSITION DETAILS, WORK INSTRUCTIONS (ATTACH ADDITIONAL PAGES AS NECESSARY)

See Pages 4 - 8

ASSIGNEE

CAUSE CODES: 1) J-1 2) _____ 3) _____ HU ERROR AFFECTS OTHER DEPT ☐ YES ☒ NO

AFFECTED DEPARTMENT _____

8. DOCUMENTATION INITIATED: None (N/A if not applicable)

PWO n/a

PMAI See Page 7

RTS/PCR n/a

EVALUATION REQUIRED FOR:

EQ	☐ YES	☒ NO
10CFR50.59	☐ YES	☒ NO
10CFR21	☐ YES	☒ NO
ASME SECTION XI	☐ YES	☒ NO

9. NONCONFORMING/DEGRADED PLANT CONDITION DISPOSITION: N/A ☒ REWORK ☐ REPAIR ☐ USE-AS-IS ☐ OTHER ☐ _____

REVIEW / APPROVAL

10. DISPOSITION SIGNATURES: (N/A if not applicable)

PREPARER Bharat Thaker / Bharat Thaker. / 7393 (PRINT / SIGNATURE / DEPT. PHONE) DATE 7/10/03.

OTHER DEPT. HEAD CONCUR n/a / _____ (PRINT / SIGNATURE) DATE _____

ANII/SEC XI REVIEWER n/a / _____ (PRINT / SIGNATURE) DATE _____

PNSC/FRG REVIEW ☐ YES ☒ NO

FRG/PNSC REVIEW (if required in Block 10) MTG# _____ CHAIRMAN _____ DATE _____

NUCLEAR NETWORK ☐ YES ☒ NO MODE RESTRICTION RELEASED ☐ YES ☐ NO ☒ N/A

DEPARTMENT HEAD V. Herrin / [signature] (PRINT / SIGNATURE) DATE 7/10/03

APPROVAL:

VP/PGM/MGR [signature] DATE 7/18/03

REVIEW / APPROVAL

ADMIN

EVENT CODES: 1) D4 2) _____ 3) _____ EXPLAIN OTHER: _____

ADMIN

CRs ARE QA RECORDS WHEN CLOSED. PLEASE ENSURE ALL RESPONSES AND ATTACHMENTS ARE LEGIBLE

CONDITION REPORT REVIEW CHECKLIST

This checklist is provided as an aid in dispositioning and reviewing Condition Reports. Personnel preparing the CR disposition should review the checklist to ensure that CR program requirements are met. Personnel performing the independent review shall verify that required CR disposition attributes have been addressed by completing the applicable portions of the checklist. CRs that have not addressed all program requirements shall be corrected prior to closeout.

ALL CONDITION REPORTS:			
ENSURE THAT:	YES	NO	N/A
All blocks and spaces are filled in	☑	☐	☐
All pages identify the CR and page number (consecutively)	☑	☐	☐
The disposition addresses the identified condition	☑	☐	☐
The disposition addresses requirements specified in Block 5	☑	☐	☐
Concurrence has been obtained by all affected departments (note: Planning concurrence required for open WO used to track corrective action)	☐	☐	☑
Cause codes are appropriate for Significance Level 1 and 2 CRs	☑	☐	☐
Open corrective actions are tracked by PMAI, RTS or WO and traceable to the CR 03-1306	☑	☐	☐
Work Orders properly reference the CR and are attached	☐	☐	☑
50.59 screening has been completed for NCR use-as-is or repair dispositions	☐	☐	☑
ISI/IST/ANII review have been obtained if required	☐	☐	☑
Corrective Actions are timely based upon the significance of the event	☑	☐	☐

SIGNIFICANCE LEVEL 1 CONDITION REPORTS:			
ENSURE THAT:	YES	NO	N/A
Root Cause Analysis completed in accordance with procedure requirements	☐	☐	☑
If RCA not completed, then PMAI assigned for completion (example: a detailed metallurgical analysis is necessary to determine root cause)	☐	☐	☐
The problem is clearly stated (Problem Statement)	☐	☐	☑
The data and evidence considered is identified	☐	☐	☑
Industry Operating Experience is appropriately considered	☐	☐	☑
Potential failure modes are identified, if applicable	☐	☐	☑
Tools and techniques used are appropriately selected and identified	☐	☐	☑
Root cause and contributing causes are identified and appear appropriate	☐	☐	☑
Corrective actions address the root cause and contributing causes	☐	☐	☑
Corrective Action(s) to Prevent Recurrence (CAPRs) are clearly designated as such	☐	☐	☑
Corrective actions are timely AND COMPLETE	☐	☐	☑
Generic implications are addressed, and corrective actions assigned as appropriate	☐	☐	☑
Extent of Condition is addressed, and corrective actions assigned as appropriate	☐	☐	☑
Potential repeat occurrence is addressed, and corrective actions assigned for identified issues	☐	☐	☑
Monitoring and follow-up is addressed to ensure that corrective actions are effective	☐	☐	☑
Root cause analysis is performed by qualified individuals (Ref: RCA Training Matrix)	☐	☐	☑
For equipment failures, a review of PM's or run to failure is documented	☐	☐	☑

SIGNIFICANCE LEVEL 2 CONDITION REPORTS:			
ENSURE THAT:	YES	NO	N/A
The disposition addresses the problem identified in Block 2	☑	☐	☐
The apparent cause of the problem is clearly identified	☑	☐	☐
Corrective actions address the cause and minimize recurrence	☑	☐	☐
Extent of Condition is addressed, and corrective actions assigned as appropriate	☑	☐	☐
Potential repeat occurrence is addressed, and corrective actions assigned for identified issues	☑	☐	☐
For equipment failures, a review of PM's or run to failure is documented	☐	☐	☑

SIGNIFICANCE LEVEL 3 CONDITION REPORTS:			
ENSURE THAT:	YES	NO	N/A
Corrective actions adequately address the immediate concern	☐	☐	☑

Review performed by: [signature] Ext 6004 Date: 7/10/03

Print/Signature

Operability Assessment

Problem Statement:

The safe shutdown (SSD) assumptions for Appendix R scenarios should be reviewed to determine if SBO assumptions for seal cooling apply and, if so, to prescribe corrective actions, if appropriate.

Analysis:

The capability to achieve and maintain a safe shutdown condition under postulated Appendix R fire scenarios is a quality-related function. No safety-related functions are affected. Therefore, this ***CR is classified as QR.***

With exception of having a concurrent LOOP and the need for RCP seal cooling, the rules, premise and assumptions for Appendix R are vastly different from those for SBO. For Appendix R, any equipment or circuit protected from exposure fire may be credited to support SSD, including EDGs. Therefore, only the functions and actions associated with RCP seal cooling need be considered for assessing Appendix R SSD capability.

RCP seal cooling performs an Appendix R SSD function in maintaining RCS inventory to support cooldown and decay heat removal. Seal cooling can be performed by CCW to the thermal barrier or by seal injection. In most fire scenarios, both functions would likely be available, although either one or the other is sufficient.

At normal 100%-power operation, both thermal barrier cooling and seal injection flow paths are open. As MOVs, they would remain open upon LOOP to support SSD. The only reason for valve closure would be per operator action or as a result of fire-induced spurious actuation. Inappropriate operator action is not postulated under Appendix R SSD scenarios and, therefore, is not credible. Furthermore, only one spurious actuation is postulated at time, which provides substantial assurance that at least one of the RCP seal cooling functions is available.

License Conditions 3D require the capability to achieve and maintain SSD conditions in event of fire. With assurance that RCP seal cooling can be performed under postulated Appendix R scenarios, there are ***no operability concerns.***

Nonconformance Evaluation:

The Safe Shutdown Analysis (5610-M-722) and implementing procedures (0-ONOP-105 and 0-ONOP-016.10) are consistent in requiring that RCPs be tripped immediately (within 3 minutes) upon loss of cooling indication (see RCP trip criteria per 3/4-ONOP-041.1) and to restore either thermal barrier or seal injection flow within 20 minutes. This is consistent with design and design basis requirements. Therefore, ***no nonconformance exists.***

Corrective Action(s):

Corrective actions will be developed per final disposition.

Final Disposition

Problem Statement:
PCM 03-042 evaluates a new approach to the RCP seal cooling by RCS process fluid leak-off in lieu of restoring the RCP seal injection within the first 10 minutes following a station blackout (SBO) scenario. The new approach is based on the revised Emergency Response Guidelines (ERG), Revision 1C, to cope with increased leakage from degraded seals rather than restore seal cooling if seal cooling can not be restored quickly. As coping is not permitted for Appendix R this Condition Report was written to determine if seal cooling is restored, the time periods when the seal cooling is restored and to prescribe corrective actions, if required.

Analysis (Background/Investigation):
PCM 03-042 provides discussions on the previous approach to restore RCP seal injection within the first 10 minutes following a SBO scenario and a new approach to allow the RCS process fluids leak-off. For a loss of offsite power only scenario (without SBO) the seal injection is restored within a short time since the power systems and a charging pump are restored quickly. However, for the SBO scenario the seal injection can not be restored within a similar short time as above since power system is to be reconfigured by realigning the busses.

The SBO scenario assumes loss of offsite power and a concurrent loss of onsite AC power on one Unit. A time period (less than 10 minutes) is required to restore the AC power and to restart a charging pump at which time the seal injection can be restored. As such the seal cooling may be delayed up to 10 minutes. A delayed restoration of the seal cooling could exacerbate the seal leak due to thermal shock to the seals. As such the revised ERG recommends to cope with the increased leakage from degraded seals rather than restore seal cooling and risk exacerbating the seal leak.

The Appendix R scenario also assumes (as in SBO) loss of offsite power (LOOP). In addition, the Appendix R scenario postulates fire in a single fire area concurrent with the LOOP. The AC power could be restored relatively quickly since a major reconfiguration of the power systems is not required as in the SBO scenario. As such the Appendix R scenario in many cases is similar to the loss of offsite power only scenario (non-SBO) that may be experienced by the plant. As a result, the RCP seal cooling in an Appendix R scenario may be restored within the normal short time delays assumed for non-SBO LOOP scenario.

Further, prior to the postulated Appendix R fire scenario, both the thermal barrier cooling and seal injection flow paths are open. The valves in the flow path would remain open upon LOOP and one or both cooling paths may be restored quickly. The only reason for a valve to close would be a result of spurious actuation due to adverse fire effects. One spurious actuation is postulated at a time, which provides substantial assurance that at least one of the two RCP seal cooling paths will remain functional until operator verification is made to assure that the protected path is functional.

Appendix R analysis primarily takes credits for the RCP thermal barrier cooling by the CCW. The analysis takes credit for the RCP seal injection as means of alternate cooling in those fire

areas where the thermal barrier cooling is not assured available. At least one of the above two methods of cooling is assured available free of fire damage or protected. The Appendix R analysis provides actions to verify that the protected path is functional.

The postulated fire in a single fire area could render any plant components inoperable. As such the Appendix R analysis ensures availability of the thermal barrier cooling or seal injection, or both where possible, or protects the necessary components, cables and functions. Since a postulated fire affects different components, different methods are used to cool the RCP shaft seals. A sample review of the Appendix R analysis was performed for select fire areas to identify when the RCP seal injection or CCW to thermal barrier was restored. The review identified the following:

Fire Area E/40, Unit 3 Piping & Valve Room

- Valves MOV-3-626, 716A & 716B associated with CCW flow to the thermal barriers are located in the fire area, and as such, the thermal barrier cooling is lost.
- Charging pumps are not tripped by an operator action.
- The control circuits of Charging Pump 3B or 3C are not in the fire area. RCP seal injection may be available.
- RCP seal injection from Charging Pump 3B or 3C is verified (no time is specified).
- Charging/seal injection flow balance is restored within 1 hour.
- CCW to the thermal barrier is restored within 24 hours.

Fire Area T/63, Unit 3 MCC 3B Room

- Valves MOV-3-626 & 716B associated with CCW flow to the thermal barriers are powered from MCC 3B, which is located in the fire area. MOV-3-626 & 716B fail as-is in the open position due to power failure. However, these valves could spuriously close due to adverse fire affects. As such, the thermal barrier cooling may be lost.
- Charging Pump 3A is protected. This pump is tripped by an operator action.
- The control circuits of Charging Pump 3C are not in the fire area. RCP seal injection may be available.
- CCW flow to the thermal barrier is verified within 20 minutes.
- Charging/seal injection flow balance is restored within 1 hour by starting Charging Pump 3A.

Fire Area W/70, Unit 3 4160V Switchgear 3B Room

- Valves MOV-3-626 & 716B associated with CCW flow to the thermal barriers are powered from MCC 3B, which will loose power. MOV-3-626 & 716B fail as-is in the open position due to power failure. As such, the thermal barrier cooling should remain available.
- Charging Pump 3A is protected. This pump is tripped by an operator action.
- CCW flow to the thermal barrier is verified within 20 minutes.
- Charging is restored within 1 hour by starting Charging Pump 3A.

A review of the above cases reveals that the RCP shaft seal cooling may remain available by either thermal barrier cooling or by seal injection. The protected cooling function chosen is dependent on the availability of equipment free of the postulated fire damage. The protected

cooling is verified functional at varying times. In Fire Area E/40 the RCP seal injection and in Fire Area W/70 the CCW flow to the thermal barrier may be restored within the normal restoration times as in the LOOP only scenarios. Restoration of seal injection and the CCW flow to the thermal barriers is verified, or restored if needed, within 20 minutes. In Fire area T/63 seal injection may be restored within the normal restoration times as in the LOOP only scenarios. The CCW flow to the thermal barrier is verified, or restored if needed, within 20 minutes.

As such a detailed review of the balance fire areas is required to identify different methods used for restoring the RCP shaft cooling and provide revised guidelines, as need to prioritize restoration.

Apparent Cause:
The Appendix R analysis primarily took credit for restoring the CCW flow to the thermal barriers. The RCP seal injection was only credited if the thermal barrier cooling could not be assured available. This concept of the RCP shaft cooling was consistent with the methods used for non-Appendix R scenarios for loss of offsite power or loss of the RCP seal injection. The new approach to seal cooling through the RCS process fluids leak-off if the seal injection can not be restored relatively quickly is based on the revised ERG for SBO scenario. The guidelines of the revised ERG have been evaluated in PCM 03-042 and necessary revisions to documents recommended. The PCM, however, does not analyze applicability of the revised ERG to the Appendix R analysis. This CR provides a review and determines that the recommendations of the revised ERG should be considered for the Appendix R analysis.

Extent of Condition:
The new guidelines of the revised ERG have been evaluated for the SBO scenario in PCM 03-042. This CR evaluates applicability of the guidelines for the Appendix R scenario. The corrective actions assure that the issue is addressed for all applicable fire areas.

Nonconformance Evaluation:
The nonconformance evaluation was previously provided on Page 4 of this CR.

Potential Repeat Occurrence/Event Review:
There is no repeat condition associated with the condition identified in the CR.

Corrective Action(s):
Engineering will review all fire areas in the Appendix R analysis and provide a revision to the analysis as needed. This corrective action will be performed as part of the SSA reviews per CR 03-1306 corrective actions. No separate PMAI is required.

Prepared By: Bharat Thaker. Date: 7/10/03.
(Bharat Thaker)

Reviewed By: [signature] Date: 7/10/03
(Allen Dunstan)

Approved By: [signature] Date: 7/10/03