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SUBJECT: LER 97-002-01:on 970407,determined potential inoperability of EDG svc water cooling outlet valve during control room fire.Caused by error in original design.Entered LCO 3.3.7.4 Action B & revised N2-OP-78.W/970609 ltr.

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June 9, 1997
NMP2L 1708

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

RE: Docket No. 50-410
LER 97-02
Supplement 1

Gentlemen:

In accordance with 10CFR50.73 (a)(2)(i)(B) and 10CFR50.73 (a)(2)(ii)(B), we are submitting LER 97-02, Supplement 1 "Potential Inoperability of Emergency Diesel Generator Service Water Cooling Outlet Valves During a Control Room Fire."

Very truly yours,

John T. Conway

John T. Conway
Plant Manager - NMP2

JTC/GJG/cmk
Attachment

xc: Mr. H. J. Miller, Regional Administrator, Region I
Mr. B. S. Norris, Senior Resident Inspector
Records Management

1/1 IE22

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Nine Mile Point Unit 2	5 0 0 0 4 1 0	1 OF 7

TITLE (4)
Potential Inoperability of Emergency Diesel Generator Service Water Cooling Outlet Valves During a Control Room Fire

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
04	07	97	97	002	01	05	07	97	N/A	05000
									N/A	05000

OPERATING MODE (9)	1

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check one or more of the following)* (11)

POWER LEVEL (10)				
100	☐ 20.402(b)	☐ 20.405(c)	☐ 50.73(a)(2)(iv)	☐ 73.71(b)
	☐ 20.405(a)(1)(i)	☐ 50.36(c)(1)	☐ 50.73(a)(2)(v)	☐ 73.71(c)
	☐ 20.405(a)(1)(ii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(vii)	☐ OTHER *(Specify in Abstract below and in Text, NRC Form 366A)*
	☐ 20.405(a)(1)(iii)	☒ 50.73(a)(2)(i)	☐ 50.73(a)(2)(viii)(A)	
	☐ 20.405(a)(1)(iv)	☒ 50.73(a)(2)(ii)	☐ 50.73(a)(2)(viii)(B)	
	☐ 20.405(a)(1)(v)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
R. J. Dean, Engineering Manager NMP2	(315) 349-4240

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
☒ YES *(If yes, complete EXPECTED SUBMISSION DATE)*	☐ NO		10	30	97

ABSTRACT *(Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines)* (16)

On April 7, 1997, NMPC determined that portions of the control circuits for the Division I and II Emergency Diesel Generators (EDG) cooling water outlet valves were not isolated from the control room as described in NMP2 USAR Section 9B.8.2.3. Assuming a control room fire with no other compensatory actions, it could be postulated that either one or both of the EDGs could have been disabled due to a control circuit short which would have disabled the Remote Shutdown Panel (RSP) controls for these valves. As a result of our corrective actions, NMPC identified on May 8, 1997, additional deficiencies in the design of the circuits for 2RHS*MOV4A and 2RHS*MOV4B, minimum flow valves for RHR Pump 1A and 1B and in the evaluation of emergency lighting requirements to achieve cold shutdown.

The cause of this deviation is an error in the original design and implementation of modifications outlined in the NMP2 USAR Section 9B.8.2.3 with respect to EDG cooling water outlet valves and the RHR minimum flow valves. This also resulted in not meeting the requirements of 10CFR50 Appendix R, Section III.J.

NMP2 Technical Specification LCO 3.3.7.4 Action b was entered until modifications to the EDG cooling water valve circuits were completed. N2-OP-78 has been revised to direct action to provide an alternate means of minimum flow protection for the RHR pumps. Additionally, required emergency lights have been or will be installed in areas requiring manual actions to achieve cold shutdown, including access and egress pathways.

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

I. DESCRIPTION OF EVENT

On April 7, 1997, in the course of evaluating an industry event from Arkansas Nuclear regarding operation of EDGs without cooling, NMPC identified that portions of the control circuits for the Division I and II Emergency Diesel Generator (EDG) service water cooling outlet valves (2SWP*MOV66A and 2SWP*MOV66B) were outside the design basis as described in the Updated Safety Analysis Report (USAR). Section 9B.8.2.3, Solutions to Control/Relay Room Fire, describes the modifications which were made to maintain availability and controllability of systems required for safe shutdown and to prevent spurious maloperations. The following modifications were required:

1. Manual control switches on the Remote Shutdown Panel (RSP).

2. Disconnect switches outside the main control room or relay room to prevent spurious maloperations.

3. Permissives/interlocks from the main control room/relay rooms under RSP operating mode.

4. Additional protection for control power supplies to circuits on the RSP.

On April 7, 1997, it was discovered that circuits existed for 2SWP*MOV66A and 2SWP*MOV66B which were not isolated from the control room. Therefore, the potential existed for a loss of control for these valves from the RSPs in the event of a control room fire. This condition existed from the initial operation of NMP2 until April 12, 1997, when the circuits were modified.

On May 8, 1997, while performing initial confirmatory evaluations of the NMP2 design to verify that the systems required to achieve safe shutdown during a control room fire in accordance with 10CFR50 Appendix A, Criterion 3, the Independent Safety Engineering Group (ISEG) identified that the valve position indication circuits for 2RHS*MOV4A and 2RHS*MOV4B (pump minimum flow valves) are not isolated from the main control room in the event of a fire. Therefore, the potential existed that operators would not have known the position of these valves. Operating Procedure N2-OP-78, Control Room Evacuation, also required that the valves be closed manually to initiate Shutdown Cooling (SDC). It was subsequently discovered, however, that there were no local eight hour capacity emergency lights in the vicinity or along access/egress routes for either 2RHS*MOV4A or 2RHS*MOV4B and other valves required for shutdown cooling, as required by 10CFR50 Appendix R, Section III.J.

II. CAUSE OF EVENT

The cause of this event has been determined to be a personnel error by the architect/engineer for NMP2 when the modifications described in Section 9B.8.2.3, were designed in 1984 prior to the NRC issuance of the NMP2 Operating License in 1986. In addition, the procedures to implement those modifications were not adequately evaluated.

III. ANALYSIS OF EVENT

This event is being reported in accordance with 10CFR50.73 (a)(2)(i)(B), "any operation or condition prohibited by the plant's Technical Specifications," and 10CFR50.73 (a)(2)(ii)(B), "any event or condition that resulted in a nuclear power plant being in a condition that was outside the design basis of the plant."

In the event of a control room fire, the potential existed that the control circuits which were not isolated from the control room could have disabled 2SWP*MOV66A and 2SWP*MOV66B by disabling the controls from the RSP. Assuming that the control circuits failed with the valves in the closed position (i.e., their normal standby position), one or both of the EDGs could have been disabled due to inadequate cooling water flow, if corrective actions were not taken to restore flow.

A preliminary evaluation has been performed which indicates that the EDGs will run for approximately 10 minutes when loaded to the level postulated for this event. In accordance with procedure N2-SOP-78, "Control Room Evacuation," operators verify that 2SWP*MOV66A and/or 2SWP*MOV66B open if one or both of the EDGs have started after the RSPs have been manned. In addition, the Switchgear Rounds Operator is directed to verify that 2SWP*MOV66A and/or 2SWP*MOV66B are open, if one or both of the EDGs is running. NMPC believes, that based upon the procedure direction and proximity of operators to the RSP, that actions could have been taken to open 2SWP*MOV66A or 2SWP*MOV66B sufficiently in time to prevent failure due to overheating. This belief is based upon the assumption that an exposure fire in the control room will result in an operator announcing a fire and initiating a station alarm which requires operators to immediately respond to the control room. Therefore, the actions to implement N2-SOP-78 would be initiated from the control room. The ability to implement the actions of N2-SOP-78 within the necessary time frame (10 minutes) with the stated initial assumptions has been validated by simulation. Therefore, at least one EDG would have remained in service. NMPC will perform a more rigorous evaluation of the EDG loading and the flow response of valves 2SWP*MOV66A and 2SWP*MOV66B as a function of valve opening. This evaluation will be completed by October 30, 1997.

As discussed in Section 9B.8.2 of the NMP2 USAR, an exposure fire in the main control room involving in situ or transient combustibles is not a credible event since the main control room is continuously manned and the main control room is provided with ionization-type smoke detectors. Therefore, the assumption that a control room fire will result in a fire announcement and the initiation of a station alarm and operator response to the control room is valid.

Since manual action was expected to be taken to open the valves, NMPC believes that the control circuit deficiency did not adversely affect the ability of operators to safely shut down the plant from the RSP. However, the evaluation described above will be completed to confirm EDG loading and flow response of the affected valves.

III. ANALYSIS OF EVENT (cont'd)

The three modes of operation of the Residual Heat Removal (RHS) System required from the RSP are suppression pool cooling, pseudo LPCI and shutdown cooling. Following is a discussion of each of these modes of operation; the impact of the pump minimum flow valve position being open or closed without position indication and the compensatory actions available to operators which could be taken to mitigate the condition.

Suppression Pool Cooling

Prior to the identification of these design deficiencies, N2-OP-78 directed operators to throttle 2RHS*FV38A(B) to achieve a flow of approximately 7400 gpm. If the pump minimum flow valve (2RHS*MOV4A(B)) had failed open, approximately 1400 gpm would be diverted to the suppression pool. Since the flow transmitter which provides indication at the RSP is downstream of the minimum flow line, flow indication would have been approximately 1400 gpm less than total demand on the associated pump. The procedural direction could have resulted in a total demand on the RHR pump of 8800 gpm compared to a pump runout value of 8200 gpm. Therefore, the operators would not have been able to achieve the specified flow. Based upon the above, the maximum achievable flow rate down stream of the minimum flow line would have been approximately 6800 gpm. It is believed that this symptom of not achieving the procedurally directed flow of approximately 7400 gpm would have led the operators to determine that the minimum flow valve was open, and actions would have been taken to manually close the minimum flow valve or throttle closed 2RHS*FV38A(B) to prevent pump run out. Based upon the minimal time expected in a run out condition, no negative impact on pump performance would be expected.

With the minimum flow valve failed in the open position, if flow through the RHR heat exchanger were reduced to approximately 6000 gpm, the heat exchangers would provide less cooling capability than at rated flow of 7400 gpm. Nuclear Engineering has evaluated the heat additions to the suppression pool for the required scenarios resulting from a control room fire and determined that this reduced cooling capability accommodates those additions while maintaining the suppression pool temperature well within its design limits. Therefore, this condition will not adversely impact suppression pool cooling acceptance criteria due to the reduced flow rate.

If the pump minimum flow valve is failed closed, the return valve, 2RHS*FV38A(B), can be throttled open from the RSP to provide a minimum flow flowpath. Procedure N2-OP-78 has provided this direction to throttle 2RHS*FV38A(B) after pump start since its inception, though not explicitly for minimum flow protection. Based upon the sequence of the procedure steps, the pump would not be run for more than a very short period of time without minimum flow protection. The

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III. ANALYSIS OF EVENT (cont'd)

minimal time which the pump may have been run without minimum flow protection would not be expected to adversely impact pump performance.

Pseudo LPCI

Prior to the identification of these design deficiencies, N2-OP-78 required operators to confirm that the minimum flow valve was open prior to starting the RHR pump. Therefore, if the valve was failed closed, one of three actions are likely to have been initiated. The first action would have been to open 2RHS*FV38A(B) from the RSP to establish a flow path. The second action would have been to depressurize the reactor as required by procedure using safety relief valves (SRV) to a pressure below the shutoff head of the RHR pump prior to starting the pump. Either of these actions are reasonable actions which would be expected based upon operator training and knowledge. However, a third action would have been to start the pump with the system pressure exceeding the shutoff head of the pump. Depressurization of the reactor would have occurred within 10 minutes of pump start. It is engineering's judgement that short term pump reliability in that time period is not expected to be impacted.

After pseudo LPCI initiation, N2-OP-78 required that operators confirm that the minimum flow valve is closed when RHR flow exceeded 2000 gpm. Although eight hour battery pack lights were not installed in these areas, essential lighting as described in the NMP2 USAR section 9.5.3, which is supplied from Uninterruptible Power Supplies (UPS), is installed in the vicinity. Upon a loss of offsite power, the UPS is supplied by station 125 VDC batteries which have a capacity to supply essential lighting for up to two hours. Essential lighting supplemented with hand held lights would have permitted completion of the required actions. However, even if the action could not have been taken, the pump could have performed in a similar fashion to that of the failed open minimum flow valve in the Suppression Pool cooling mode, described above.

With the minimum flow valve failed in the open position, and assuming a reduced flow rate of 6000 gpm to the reactor vessel, a preliminary engineering evaluation has been performed which indicates that the RHR injection flow of 6000 gpm is sufficient to maintain coolant inventory above the top of the active fuel, satisfying applicable acceptance criteria. A compensatory action for this failure could have been manually closing the minimum flow valve.

III. ANALYSIS OF EVENT (cont'd)

Shutdown Cooling (SDC)

If the minimum flow valve is open prior to initiating SDC, N2-OP-78 requires manually closing the valve. In addition, manual operator actions are required to initiate service water to the RHR pump seal coolers, and open system flush valves if RHR 'A' loop is required for SDC. Although eight hour battery pack lights were not installed in these areas, hand held lights are available to operators to access the area and close the valve prior to initiating SDC. Failure of the minimum flow valve in the closed position is not a concern since the valve is required to be closed for SDC operation.

As discussed above, these design deficiencies would not have prevented any of the three modes of operation of RHR from accomplishing required functions. The procedural requirement to close the minimum flow valves and manipulate other valves could have been accomplished with portable hand held lights for the initiation of SDC. For the Suppression Pool Cooling and Pseudo LPCI modes of operation alternate means of minimum flow protection are available and sufficient flow would be provided if the minimum flow valve was failed open. Therefore, this deficiency did not have an adverse impact on public or plant personnel safety.

IV. CORRECTIVE ACTIONS

1. NMP2 Technical Specification LCO 3.3.7.4 Action b, which requires restoration in 7 days, was immediately entered.

2. Modifications have been made to isolate the subject control circuits for 2SWP*MOV66A and 2SWP*MOV66B from the control room in conformance with USAR Section 9B.8.2.3. Technical Specification LCO 3.3.7.4 was exited on April 12, 1997.

3. Operating Procedure N2-OP-78 has been revised to provide direction to throttle open 2RHS*MOV38A(B) immediately following RHR pump start to provide a minimum flow path, and to limit flow to 6000 gpm in the suppression pool cooling and pseudo LPCI modes of operations, if the minimum flow valves cannot be confirmed closed.

4. Eight hour capacity battery powered emergency lights are being installed as a temporary modification in the required locations. This action will be completed by June 30, 1997. If required, a permanent modification will be completed by December 31, 1997.

IV. CORRECTIVE ACTIONS (cont'd)

5. NMPC will perform a confirmatory evaluation of plant design to verify that the systems required to achieve safe shutdown during a control room exposure fire are in accordance with the requirements of 10CFR50, Appendix A, Criterion 3 by December 31, 1997.

V. ADDITIONAL INFORMATION

A. Failed components: none.

B. Previous similar events: LER 96-15, Supplement 1, "Appendix R Fire Induced Hot Shorts in Remote Shutdown System Valves." This LER reported the potential failure of residual heat removal (RHS) valves and Reactor Core Isolation Cooling (RCIC) valves due to hot shorts. One corrective action in the LER was to complete a review of Appendix R safe shutdown valves required for remote shutdown. That review concluded that although other valves are susceptible to the postulated damage, the achievement of safe shutdown in accordance with the requirements of 10CFR50, Appendix R and as described in NMP2 USAR Appendix 9B is not adversely affected. This action only evaluated impact to safe shutdown due to valve maloperation (assumed to occur). It did not include a detailed evaluation of control circuits, since there was no indication that control circuits were not in compliance with USAR Section 9B.8.2.3.

C. Identification of components referred to in this LER:

COMPONENT	IEEE 803 EIIS FUNCTION	IEEE 805 SYSTEM ID
Emergency Diesel Generator	DG	NA
Outlet Valve	V	LB