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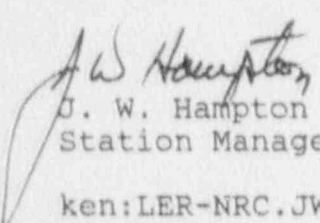
Subject: Catawba Nuclear Station
Docket No. 50-414
LER 414/91-01

Gentlemen:

Attached is Licensee Event Report 414/91-01, concerning FEEDWATER ISOLATION ON HI HI STEAM GENERATOR LEVEL DUE TO INAPPROPRIATE ACTION.

This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,


J. W. Hampton
Station Manager

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Catawba Nuclear Station, Unit 2 DOCKET NUMBER (2) 050000414 PAGE 3
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TITLE (4) Feedwater Isolation on Hi Hi Steam Generator Level Due to Inappropriate Action

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
01	08	91	91	001	000	02	05	91	N/A
								DOCKET NUMBER(S)	
								050000	

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

OPERATING MODE (9) 3	20.402(b)	20.405(e)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 0	20.406(a)(1)(i)	50.36(e)(1)	<input type="checkbox"/>	50.73(a)(2)(v)	73.71(e)
	20.406(a)(1)(ii)	50.36(e)(2)	<input type="checkbox"/>	50.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text NRC Form 366A)
	20.406(a)(1)(iii)	50.73(a)(2)(i)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)	
	20.406(a)(1)(iv)	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(viii)(B)	
	20.406(a)(1)(v)	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME C. L. Hartzell, Compliance Manager TELEPHONE NUMBER 803 831-3665

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

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

On January 8, 1991, a Feedwater Isolation signal occurred at 0207:33 hours as Unit 2 Steam Generator 'A' level increased to the Hi Hi level setpoint. Unit 2 was in Mode 3 at the time of the incident with the Auxiliary Feedwater (CA) System supplying water to the Steam Generators (S/Gs) under manual flow control. The feedwater isolation signal initiated the appropriate system response by tripping the Train B Main Feedwater (CF) pump which was operating in the recirculation mode and closing the appropriate containment isolation valves with the exception of valve 2CA186, S/G B tempering flow to CA nozzle, which had been closed prior to the incident. The Operator at the Controls (OATC) was distracted from the control boards by other Control Room activities while the S/G 2A Level Deviation Alarm was in alarm. This incident is attributed to Inappropriate Action due to the operator not restoring the S/G 2A water level to the normal level to clear the S/G 2A Level Deviation Alarm. The corrective actions included resetting the CA auto start signal, restoring normal S/G water levels, verifying S/G 2B was isolated, and manually closing 2CA188, S/G D tempering flow to CA nozzle. Investigation of the misaligned valve (2CA-186) is planned.

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

BACKGROUND

The Condensate [EII:SD] (CM) System delivers condensate (water) from the main turbine condenser hotwell to the Main Feedwater [EII:SJ] (CF) System. The condensate is heated, cleaned, and the pressure is increased in the CM System prior to reaching the suction of the CF Pumps [EII:P]. The CF Pumps normally deliver the condensate through two stages of high pressure heaters, and the heated water is delivered to the Steam Generators [EII:HX] (S/G) through an automatic S/G level control valve [EII:V].

The Auxiliary Feedwater [EII:BA] (CA) System assures sufficient feedwater to supply the Steam Generators for decay heat removal in the event of loss of normal feedwater. The CA System is designed to automatically start two motor [EII:MO] driven CA pumps on the loss of both CF pumps, fully opens the Flow Control Valves (2CA36, 40, 44, 48, 52, 56, 60, 64) to supply flow to the S/Gs, and isolate the Steam Generator Blowdown System [EII:WI] (BB) System and the Nuclear Sampling [EII:KN] (NM) System valves associated with the four Steam Generators. The CA System does not have automatic Steam Generator level control.

An interlock is provided to ensure that feedwater is isolated to a S/G when an acceptable level is exceeded. The interlock (P-14 signal) provides a feedwater isolation signal tripping the CF pumps and closing the CF Flow Control Valves (2CF28, 37, 46, 55), CF Bypass Control Valves (2CF30, 39, 48, 57), CF Containment Isolation Valves (2CF33, 42, 51, 60), CF Containment Isolation Bypass Valves (2CF87, 88, 89, 90), the CF Tempering flow Isolation Valves (2CA185, 186, 187, 188), and the CF Bypass to CA Nozzle Valves (2CA149, 150, 151, 152). In addition, upon a feedwater isolation, two motor driven CA pumps automatically start as described above due to tripping of both CF pumps.

EVENT DESCRIPTION

On the morning of January 8, 1991, Unit 2 was in Mode 3, Hot Standby, due to the U-bolt inspection of the Ice Condenser [EII:BC] (NF) System. The Main Feedwater (CF) System had been manually isolated for feedwater flow venturi cleaning. The Auxiliary Feedwater (CA) System was in manual control to provide water to the Steam Generators through the CA flow control valves. At approximately 0200 hours, S/G 2A received the Level Deviation Alarm. The Nuclear Control Operator (NCO) attempted to clear the alarm by reducing the water flow. The CA control valve position controllers are located on a separate panel approximately 8 feet from the panel which contains S/G level indications and CF controls. The NCO wanted to avoid a rapid decrease in the S/G 2A level to avoid a temperature transient in the Reactor Coolant [EII:AB] (NC) System, so he made a slight decrease in the S/G flow by throttling valve 2CA60, the CA to S/G 2A flow control valve. The S/G 2A level decreased slightly but was still above the Level Deviation

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TEXT (If more space is required, use additional NRC Form 306A's) (17)

Alarm and remained there. The NCO was also adjusting the flow to the other S/Gs as well by throttling the CA flow control valves. At approximately 0205 hours, the NCO adjusted the controller (2CA60) again to decrease the S/G 2A level but the Level Deviation Alarm did not clear.

During the flow adjustments to control the S/G levels, a K-MAC (vendor) person entered the Control Room and began vacuuming. He was vacuuming around a console (MC-1) and the OATC table. The NCO moved several times to allow him to vacuum and to monitor him in case he accidentally operated a switch [EIIIS:XIS]. Immediately following the person vacuuming, an operator entered the Control Room with a Removal and Restoration of Equipment (R&R) paperwork which requires late entry in the log. The log entry time was 0206 hours.

At 0207:33 hours, a feedwater isolation on P-14 from S/G 2A occurred. Pump 2B tripped which had been operating in the recirculation mode. (2A pump was already tripped.) The CA System auto start signal was initiated. The motor driven CA pumps (A&B) were already operating.

From 0207:33 hours through 0207:42 hours, the required containment [EIIIS:NH] isolation valves closed on the Steam Generator Blowdown System and the Nuclear Sampling System in response to the CA auto start signal. The response to the feedwater isolation signal was as expected with three exceptions.

The status lights for B&D Steam Generator CF Cont Isol Vlvs Clsd did not illuminate. NCOs verified that all valves in S/G 2B required to be closed on a CF isolation signal were closed, including 2CA186. The normal position for 2CA186 is open to allow CF tempering flow to the S/G B CA nozzle to prevent a thermal shock to the nozzle. At the time of the event, the failure of the light to illuminate for D Steam Generator CF Cont Isol Vlvs was attributed to the failure to close of 2CA188, S/G D tempering flow to CA nozzle.

The NCO immediately reset the CA auto start signal to restore the S/G levels to normal. The CA auto start signal caused the flow control valves to open fully. Thus, the flow control valves had to be throttled closed to reduce feedwater flow to control the S/G levels.

At 0245:02 hours, the Reactor main trip breakers [EIIIS:BRK] were cycled in order to clear the feedwater isolation signal.

At 0246:07 hours, the NCO used the control board switch to "close" 2CA188 and received the expected closed indication.

At 0250 hours, the BB system was aligned for prewarming and returned to normal alignment at 0310 hours.

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TEXT (If more space is required, use additional NRC Form 366A's) (57)

At 0306 hours, the NRC was notified of the Engineered Safeguards Feature (ESF) actuation per RP/O/B/5000/13, NRC Notification Requirements. Work request 479150PS was issued for valve 2CA188. Work request 479160PS was issued for the 'B' S/G CF Cont Isol Vlv Cld status light.

At 0322 hours, the NM system was returned to normal alignment.

At 0510 hours, 2CA186 was opened to provide S/G B tempering flow to the CA nozzle upon normal CF system operation.

CONCLUSION

This incident was attributed to Inappropriate Action, the proper response was identified but not in time, because the NCO did not prevent the S/G level increase from exceeding the Hi Hi level setpoint. The distractions in the Control Room, as previously mentioned, contributed to the NCO failing to properly control the S/G level.

Contributing factors for this event were the lack of an automatic S/G level control for the CA system and the location of the CA controllers [E11S:XC] and the S/G level indications.

As a result of this event, improved CA flow control capability will be provided, the cost/benefit of providing automatic S/G level control will be evaluated, and an evaluation to rearrange the NCO tables in the Control Room so that the NCO is facing the control boards is planned.

The NCO's inexperience in controlling the S/G levels in this unusual condition, i.e. Unit 2 in Mode 3 and CA supplying water to the S/Gs, is also a contributing factor. At the time of the incident, this was the first time the NCO had controlled the S/G levels in this condition in the plant. Thus, the NCO was not nearly as familiar with the necessary adjustments to the CA flow control valves (2CA⁰, 56, 44, 40) to control S/G levels as the CF flow control valves (2CF28, 37, 46, 55).

At the time of the event, Operations personnel thought that the failure of 2CA188 to close was corrected by attempting to manually close the valve. Work request 479150PS was issued to investigate and repair the valve. Upon completion of the work request, 479150PS, it was determined that the valve actually closed and that the limit switches provided faulty indication. The problem was corrected by adjusting the closed limit switch.

The mispositioned valve, 2CA186, was determined to have been closed on January 7, 1991, at 0420 hours, per the computer printout. The reason for the closing of 2CA186 could not be determined. The valve was in the fail safe condition since the valve fails closed. The valve being closed prevented the tempering

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

flow to the S/G B CA nozzle. At the time of the incident, CA was providing S/G makeup through the CA nozzles. Thus, there was no thermal shock to the CA nozzle as a result of the auto CA start. The investigation is continuing as to why 2CA186 was closed on January 7.

The status light for B S/G CF containment isolation valves closed was investigated and work request 47916OPS was written to correct the problem. Work request 47916OPS was voided because the problem was determined to be with the contacts on the limit switches of 2CF39. Work request 11936IAE was issued to investigate and repair this problem. A contact was adjusted to repair this problem. The contact malfunction prevented the signal from the electrical cabinet to the valve lineup status indication, i.e., B S/G CF containment isolation valves closed. 2CF39 was closed for the CF flow venturi cleaning.

There have been no previous events during the past 24 months initiating a CF isolation actuation due to distractions preventing the NCO from properly controlling the S/G water level (inappropriate action). LERs 414/89-013 and 414/89-015 described previous CF isolation events although these events were attributed to, (1) inadequate procedural precautions and (2) equipment malfunction and an inappropriate action involving equipment alignment. For this reason, this CF isolation actuation is not considered a recurring problem.

As a result of this event, Operations Procedures, OP/(1)2/A/6250/02, Auxiliary Feedwater System, Manual Operation of the Motor Driven Auxiliary Feedwater Pumps When Aligned for Standby Readiness, Enclosure 4.3, will be evaluated to add using a temporary S/G hi level alarm on the computer if the computer and data point are in service.

Operations Management Procedure (OMP) 2-17, Control Room and Unit Supervisor Logbook, will be changed to allow the NCO responsible for the Balance of the Plant (BOP) activities to make logbook entries. Furthermore, Operations plans to emphasize during shift meetings to always achieve your expected or desired results prior to diverting your attention to other matters.

CORRECTIVE ACTION

IMMEDIATE

- 1) The NCO reset the CA auto start signal for control of the CA flow control valves to reduce the flow to the S/Gs.
- 2) The NCO personnel investigated the status of the B S/G containment isolation valves since the light did not illuminate for the B S/G CF Cont Isol Vlvs Clsd.

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TEXT (If more space is required, use additional NRC Form 368A's) (17)

SUBSEQUENT

- 1) Operations personnel manually "closed" 2CA188 and issued Work request 47915OPS. A problem with the valve's limit switches was corrected.
- 2) Operations personnel restarted the Condensate and Feedwater system per OP/2/A/6250/01, Condensate and Feedwater Hot Restart, Enclosure 4.7.
- 3) Operations notified the NRC of the CF isolation (ESF) actuation to comply with RP/0/B/5000/13, NRC Notification Requirements.
- 4) Operations issued a work request, 47916OPS, to correct the problem with the status light.
- 5) Operations personnel opened valve 2CA186 at 0510 hours.

PLANNED

- 1) Provide improved CA flow control capability and evaluate the cost/benefit of providing automatic S/G level control.
- 2) Evaluate adding to the Operations Procedures, OP/(1)2/A/6250/02, Auxiliary Feedwater System, Manual Operation of the Motor Driven Auxiliary Feedwater Pumps When Aligned for Standby Readiness, Enclosure 4.3, using a temporary S/G hi level alarm on the computer if the computer and data point are in service.
- 3) Evaluate the arrangement of the NCO tables in the Control Room so that the NCO is facing the control boards.
- 4) Change Operations Management Procedure (OMP) 2-17, Control Room and Unit Supervisor Logbook, to allow the NCO responsible for the Balance of Plant (BOP) activities to make logbook entries. Allowing the BOP to complete logbook entries would reduce the amount of distractions in which the OATC incurs.
- 5) Emphasize during shift meetings to always achieve your expected or desired results prior to diverting your attention to other matters.

SAFETY ANALYSIS

The response to the S/G 2A Hi Hi level was as designed with the exception of the 2CA186 misalignment prior to the event, the failure of the status light to indicate S/G B containment isolation valves closed, and the faulty indication of 2CA188.

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

The misalignment of 2CA186 to the closed position had no impact on this event due to CA providing S/G makeup through the CA nozzles. Thus, the tempering CF flow to S/G B CA nozzle was not required.

At <15% power, main feedwater flow is normally supplied through the auxiliary nozzle. Tempering flow is not required to the nozzle under these conditions.

At >15% power, the main feedwater bypass flow provides cooling to the CA nozzles in addition to the tempering flow. If both the tempering flow and the bypass flow were lost, the CA nozzle could dry out, and if feedwater flow reestablished, the CA nozzle would experience a thermal stress cycle.

The worst case scenario would be where the thermal stress resulted in brittle fracture of the CA nozzle. This would result in an unisolatable break in the secondary side of the S/G. This type accident is bounded by FSAR 15.2.8. The potential NC System cooldown (by excessive energy discharge through the break) is bounded by FSAR 15.1.5. The potential NC System heatup (because of the loss of feedwater and thus, heat removal capability) is bounded by FSAR 15.2.8.

Thus, this event is bounded by the accident analysis in the FSAR.

The failure of the status light for B S/G containment isolation valves closed did not impact this event since the Operations personnel were able to verify that the necessary containment isolation valves were closed. The faulty indication of 2CA188 had no impact on this event because the valve functioned properly.

The health and safety of the public were unaffected by this event due to the appropriate response by Operations personnel and the appropriate response by the ESF actuation system as designed.