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SUBJECT: LER 92-003-00:on 920226,discovered that mgt deficiency & inappropriate action resulted in loss of TS required temp overpressure protection.Caused by mgt deficiency.Valve 2HP-26 & 2HP-27 breakers were opened.W/920327 ltr.

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TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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DUKE POWER

March 27, 1992

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
LER 270/92-03

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 270/92-03, concerning loss of low temperature overpressure protection.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(i)(B). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

/s/ B Rausom for

J. W. Hampton
Vice President

/ftr

Attachment

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NRC FORM 366 (5-89)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit 2	0 5 0 0 0 2 7 0	1 OF 1 0

TITLE (4) Management Deficiency And Inappropriate Action Result In The Loss Of Technical Specification Required Low Temperature Overpressure Protection

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)
0 2	2 6	9 2	9 2	—	0 0 3	—	0 0	0 3	2 7	9 2		0 5 0 0 0
												0 5 0 0 0

OPERATING MODE (9): N

POWER LEVEL (10): - 0 -

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

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)	X 50.73(a)(2)(i) (B)	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
S. G. Benesole, Safety Review	AREA CODE 8 0 3 — 8 8 5 - 3 5 1 8

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)*	X NO				

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

On February 26, 1992 at 1709 hours, during startup of Unit 2 following a refueling outage and with the Reactor Coolant System at 100 degrees F and 60 psig, the requirement for deactivation of the High Pressure Injection (HPI) system to prevent a low temperature overpressure (LTOP) event was not met. This condition existed for two hours and fifty five minutes before the LTOP requirements were reestablished by deenergizing and tagging the HPI discharge valves. The HPI discharge valves were energized during the previous operating shift as part of a check valve test and remained energized when the procedural requirements for restoration were marked not applicable. Despite an adequate shift turnover and several procedural precautions, the HPI pumps were connected to their power supply and one pump started while the discharge valves remained energized. Further analysis showed that, with the HPI system energized, neither Technical Specification required LTOP train could adequately mitigate a postulated LTOP event. Root causes of Management Deficiency and Inappropriate Action were identified. Corrective actions included a proposed Technical Specification revision and individual counseling to improve personnel performance.

BACKGROUND

Low Temperature Overpressure Protection (LTOP) is designed to prevent the overpressurization and consequent brittle fracture of the reactor vessel [EIIS:VSL] when the Reactor Coolant System (RCS) [EIIS:AB] is closed and at a temperature less than 325 degrees F. The requirements are outlined in Technical Specification 3.1.2.9. Basically, two trains of LTOP are required: Train 1 consists of an operable pressurizer Power Operated Relief Valve [EIIS:V] set to relieve at its low pressure setpoint, Train 2 consists of several administrative controls and equipment required to allow ten minutes for operator action to prevent violation of nil ductility pressure-temperature limits in the RCS. Technical Specifications allow one train to be out of service for four hours.

The requirements of Train 2 are:

1) Limits on RCS pressure and pressurizer level.

2) Deactivation of both core flood tanks [EIIS:BP].

3) Deactivation of both High Pressure Injection (HPI) [EIIS:BG] trains.

4) Restrictions on RCS makeup flow.

5) Certain computer alarms must be operable.

6) Operator Aid Computer must be operable.

Two alternate methods of deactivating the HPI trains are available: a) the injection discharge valves (HP-26 and HP-27) are closed with their circuit breakers [EIIS:BRK] open and tagged open and the injection bypass valves (HP-409 and HP-410) are tagged closed, or b) the HPI pump breakers are disconnected from their power supply ("racked out.")

During plant startup, it is necessary to place one HPI pump [EIIS:P] in service while LTOP requirements are in effect. To accomplish this, the first method of closing HPI discharge valves must be in effect prior to connecting the HPI pump breaker to its power source. After the pump is started, valve travel stops must be installed on the RCS makeup valve (HP-120) to restrict makeup capacity. From the time the HPI pump breaker is connected to its power supply to the time the makeup valve travel stop is installed, a dedicated operator is assigned the duty of monitoring plant parameters to prevent a violation of LTOP requirements.

Attachment A shows a summary flow diagram of the HPI system.

EVENT DESCRIPTION

On February 25, 1992 at 2300 hours, Unit 2 was starting up following a refueling outage. Reactor Coolant System (RCS) temperature was being maintained at approximately 100 degrees F. RCS pressure was approximately 60 psig with a steam bubble formed in the pressurizer. Pressurizer level was approximately 100 inches. Low Temperature Overpressure Protection (LTOP) requirements were in effect. The Pressurizer Power Operated Relief Valve (PORV), 2RC-66, was operable, providing the first train of LTOP. The second train of LTOP was also in effect. The High Pressure Injection (HPI) deactivation requirement of the LTOP administrative controls was being provided by having all three HPI pump breakers disconnected from their power source (racked out) and all injection discharge (2HP-26 and 2HP-27) and discharge bypass valves (2HP-409 and 2HP-410) tagged closed. 2HP-26 and 2HP-27 valve breakers were opened and the appropriate equipment safety tags (white tags) were in place. The governing procedure for LTOP requirements, OP/2/A/1104/49, "Low Temperature Overpressure Protection", contains an Enclosure 4.1 which outlines the LTOP requirements for unit startup. This enclosure stated that both the HPI pump method and the HPI discharge valve method were being used to deactivate the HPI system.

At 2300 hours, changes were made in preparation to perform PT/0/A/0202/12, "Component Test of ES Channels 1 and 2." The HPI discharge valve safety tags were removed and the breakers to 2HP-26 and 2HP-27 were closed. In addition, the HPI pump breakers were racked to the TEST position. (In the test position, control power to the breaker is available, but the breaker is still not connected to its power source.) A new Enclosure 4.1 was prepared which reflected the fact that HPI was deactivated only by the HPI pumps not being connected to their power source. At approximately 0230 hours on February 26, 1992, PT/0/A/0202/12 was completed and the three HPI pumps were again completely racked out to their disconnect position. At 0300 hours, PT/2/A/251/09, "LPI/HPI Check Valve Functional Test" was initiated. This test requires opening 2HP-26, 2HP-27, 2HP-409, and 2HP-410. The test was completed at 0458 hours.

The last few steps of PT/2/A/251/09 require closing, deactivating, and tagging the HPI discharge and discharge bypass valves. However, Operations Unit 2 Supervisor A marked these steps not applicable (N/A) and they were not performed.

At approximately 0630 hours, the Operations night shift crew turned over plant operation to the day shift crew. Control Room Supervisor A (night shift) explained the status of the LTOP requirements to Control Room Supervisor B (day shift). The Control Room Supervisor Turnover Sheet (OP/2/A/1102/20, Enclosure 5.2) stated that LTOP HPI train deactivation requirements were being maintained by using the HPI pump breakers. Reactor Operator (RO) A (night shift), the operator at the controls and responsible for LTOP requirements, verbally turned over the status of LTOP requirements to his counterpart on day shift, RO B. RO C, another reactor operator on day shift, also listened to this turnover. The status of the LTOP

procedure, Enclosure 4.1, was discussed in this turnover, but the method of HPI train deactivation was not listed on the Shift Turnover Sheet (OP/2/A/1102/20, Enclosure 5.6).

At approximately 1645 hours, Unit 2 Supervisor B gave instructions to Control Room Supervisor B to have the HPI system put in service. This was a step in the unit startup procedure, OP/2/A/1102/01, "Controlling Procedure for Unit Startup", which was to be performed out of sequence. In order to perform an out of sequence step in the startup procedure, a written justification (Enclosure 4.17) must be prepared and approval obtained from the Unit Manager or Shift Supervisor. This justification and approval was obtained.

Control Room Supervisor B assigned the task of starting the HPI procedure to RO C. RO C had initiated this procedure on the previous day and had reviewed the Limits and Precautions of the procedure at that time. One of the precautions was to assure that the HPI discharge valve deactivation was in effect as an initial condition. At the time of the Limits and Precautions review, these valves were deactivated. Control Room Supervisor B, RO B, and RO C discussed the LTOP requirements necessary to put the HPI system in operation. Specifically, their conversations focused on the requirement to install travel stops on 2HP-120, the normal RCS makeup control valve, following starting of the 2A HPI pump.

As a part of the Controlling Procedure for Unit Startup, LTOP requirements are to be reviewed per OP/0/A/1104/49, prior to placing the HPI system in service. This step requires approval by the Unit Supervisor. Control Room Supervisor B instructed RO B to review this procedure. RO B reviewed the procedure and told Control Room Supervisor B that all requirements were met. Control Room Supervisor B signed the approval in the procedure.

At 1709 hours, the 2C HPI pump was racked to the connect position and a dedicated operator was established to monitor the status of LTOP parameters. At 1713 hours, the 2A HPI pump was racked to the connect position. The 2B HPI pump was out of service for seal repair and remained deenergized for the duration of this event.

At 1735 hours, step 2.41 of Enclosure 4.1 of the Controlling Procedure for Unit Startup was signed off by RO B. This step instructs the operator to verify LTOP requirements prior to starting an HPI pump.

At 1736 hours, the 2A HPI pump was started by RO C. He asked Control Room Supervisor B if prerequisites were complete and was told that they were.

By 1747 hours, the travel stops on 2HP-120 (RC Makeup Control) valve had been installed and verified operable. The requirement for a dedicated LTOP operator was discontinued at this time. During this activity, pressurizer level reached a maximum of 140 inches.

Shift turnover occurred at approximately 1830 hours, with the same personnel from the previous night shift returning. Day shift personnel informed the oncoming night shift personnel that the HPI system had been placed in service.

At approximately 1930 hours, RO A and RO D were performing a control board "walkdown." They discovered that the motor operators to 2HP-26 and 2HP-27 were energized and that there were no equipment safety tags on any of the controls. They concluded that LTOP requirements were not in effect and informed Control Room Supervisor A.

The breakers to 2HP-26 and 2HP-27 were opened at 1955 hours and equipment safety tags hung on the 2HP-26 and 2HP-27 breakers as well as the 2HP-409 and 2HP-410 handwheels by 2004 hours.

An analysis was performed by the Duke Power Safety Analysis Group following this event. It showed that, with two HPI pumps in service and a simultaneous opening of 2HP-26 and 2HP-27, the brittle fracture pressure limit could be reached within 6.8 minutes of the event initiation.

CONCLUSIONS

Low Temperature Overpressure Protection (LTOP) of the reactor vessel was not present when required for a period of two hours and fifty five minutes (from 1709 hours to 2004 hours on February 26, 1992) due to the High Pressure Injection (HPI) system being activated. An analysis by the Safety Analysis group indicates that the Pressurizer Power Operated Relief Valve (PORV) was not capable of preventing an LTOP event in this time period even though the Technical Specifications, as written, were not violated. The analysis showed that the brittle fracture pressure limit could have been exceeded within approximately 6.8 minutes by simultaneous injection through both HPI trains. The significance of this fact is that the two LTOP trains, the PORV and the administrative controls, are not independent. Inadvertent injection from either the HPI system or the core flood system was not considered a credible event at the time when the Technical Specification was written. When the HPI system is not deactivated, not only is the "administrative control" train inoperable, but the PORV becomes incapable, by itself, of preventing LTOP limits from being exceeded.

This fact is documented in the LTOP design basis, but is not adequately reflected in the wording of Technical Specification 3.1.2.9. The design documentation of LTOP also suggests that a similar situation exists with the requirement of Core Flood tank deactivation.

There are two root causes for this event. The first is Management Deficiency, Inadequate Supervision. Control Room Supervisor B did not maintain the overall view of how the requirements of LTOP were being maintained. He did not realize that HPI pump deactivation was the method of maintaining the second train of LTOP requirements and that connecting

the pump breakers to their power source would violate LTOP requirements. He delegated the responsibility of reviewing the LTOP procedure to RO B prior to energizing and starting the HPI pumps, instead of reviewing the procedure himself. Control Room Supervisor B was expected to review the LTOP procedure personally. A Limit and Precaution in the Controlling Procedure for Unit Startup explicitly states this expectation.

The reason that the HPI pumps were being used to maintain LTOP requirements was that Unit 2 Supervisor A had decided that the steps to deenergize and safety tag the HPI discharge and bypass valves at the end of the LPI/HPI Check Valve Functional Test were not applicable. Unit 2 Supervisor A stated that his decision was based on his knowledge that the HPI pump deactivation was sufficient to maintain LTOP requirements. This is a non-conservative supervisory decision. There was no reason why two methods of HPI deactivation could not have been used at that time. Furthermore, the startup sequence requires that one HPI pump be placed in service as RCS pressure is increased to allow makeup capability. Therefore, it was necessary to deactivate the HPI discharge and discharge bypass valves at some time prior to starting the HPI pumps. Keeping these valves deactivated at all times, except during testing, would have prevented the violation of LTOP requirements.

A second root cause of this event is Inappropriate Action, improperly following the correct procedure, on the part of RO B. RO B reviewed LTOP requirements as part of the Controlling Procedure for Unit Startup, but did not determine that energizing the HPI pumps would violate LTOP requirements, even though the procedure specifically stated that LTOP requirements were being maintained by deactivation of the HPI pumps.

Interviews with Control Room Supervisor B, RO B, RO C, and the Shift Supervisor all indicate that LTOP considerations were discussed several times during the course of the day on February 26, 1992. The Shift Supervisor stated that he asked the control room personnel to run a new LTOP procedure (Enclosure 3.1) any time a major change in plant status was made. This was not performed. The control room personnel were focused on the LTOP requirements which were to be initiated after the HPI pump was started: installation of travel stops on the normal HPI makeup valve (2HP-120). By focusing on this aspect of LTOP requirements, the overall picture of what was preventing an LTOP event was lost. Interviews also indicated that no undue schedule pressures existed. Shift turnover was considered adequate by all participants. Also, training in LTOP requirements had been received by both operating shifts within the previous licensed requalification training cycle.

The event is considered recurring. A violation of LTOP requirements occurred on November 11, 1989 during a plant shutdown when the 2HP-120, the normal HPI makeup valve on Unit 2, failed closed. Contrary to commitments to the NRC in effect at that time, a cooldown was performed with makeup provided by a partially opened 2HP-26 (HPI Normal Injection Valve). This was not expressly prohibited by the Technical Specifications at that time.

The root cause of the event was management deficiency, inadequate policy in communicating NRC commitments to Operations shift personnel. Technical Specifications have since been changed so that operation in this manner places the unit in a limiting condition of operation.

An event occurred on October 28, 1990 which led to a rate of power increase on Unit 2 which exceeded procedural limits. This event is reported as Station Report OS 90-10. A root cause of that event was inadequate control room supervision.

This event did not result in radioactive releases or radiation overexposures. It did not involve personnel injury.

There were no NPRDS reportable equipment failures involved in this event.

CORRECTIVE ACTIONS

Immediate

1. Valve 2HP-26 and 2HP-27 breakers were opened and safety tagged and valves 2HP-409 and 2HP-410 handwheels were safety tagged closed following discovery of the breach of Low Temperature Overpressure Protection (LTOP) requirements.

Subsequent

1. On an interim basis during the subsequent Unit 2 startup, the marking of Operations procedure steps "not applicable" required Shift Supervisor or Shift Manager permission.

Planned

1. An analysis will be performed to determine the benefits of developing a computer logic display related to shutdown activities and including LTOP requirements.

2. A change to Technical Specifications will be proposed to clarify the role of High Pressure Injection (HPI)and Core Flood deactivation in maintaining Pressurizer Power Operated Relief Valve operability with respect to LTOP requirements.

3. A personnel performance plan will be implemented to address the management deficiency identified in this report.

4. OP/1,2,3/A/1104/09, "Low Temperature Overpressure Protection", will be revised to clarify administrative rules.

5. A policy will be established to maintain HPI deactivation for LTOP requirements using deactivation of both the HPI pumps and HPI discharge valves whenever possible.

SAFETY ANALYSIS

An analysis was performed by Duke Power Safety Analysis personnel to determine the consequences of an inadvertent opening of 2HP-26 and 2HP-27 while both the 2A and 2C High Pressure Injection (HPI) pumps were operating. A plant simulation program (RETRAN Plant Simulation Computer Code) was used to perform this analysis. Results showed that, using assumptions of a Reactor Coolant System (RCS) temperature of 100 degrees F, an RCS pressure of 60 psig, an initial pressurizer level of 140 inches, and an operable pressurizer Power Operated Relief Valve (PORV) set to its low pressure setpoint, brittle fracture conditions could be reached within approximately 6.8 minutes (410 seconds) following the initiating event. The conclusions are: 1) Train 2 of Technical Specifications Low Temperature Overpressure Protection (LTOP) requirements was not operable for two hours and fifty five minutes. Four hours of inoperability are allowed by Technical Specifications. 2) The pressurizer PORV could not independently prevent an LTOP event caused by the inadvertent actuation of the HPI system under the circumstances of this event.

The initiating event, an inadvertent actuation of both trains of the HPI system is unlikely, though not impossible. The HPI system is automatically actuated by the Engineered Safeguards (ES) system. The 2A HPI pump will start and valve 2HP-26 will open on initiation of ES channel 1. The 2C HPI pump will start and valve 2HP-27 will open on initiation of ES channel 2. Channels 1 and 2 receive input from RCS pressure signals and are bypassed during startup. They are unlikely to initiate from this signal. Channels 1 and 2 will also initiate if Reactor Building pressure exceeds 3 psig on two of three pressure signals. Thus, if one Reactor Building pressure signal is in TEST and another pressure signal fails high, ES 1 and 2 will both actuate, both the 2A and 2C HPI pumps will start, and valves 2HP-26 and 2HP-27 will open. HPI pump 2B would also receive a start signal, but since it was disconnected from its power source during this event, it would not have started.

Again, the scenario above is credible, but not probable. Furthermore, an inadvertent initiation of ES results in numerous control room audible and visual alarms. Operator response to mitigate such an event is expected to be less than 6.8 minutes.

During part of the time that LTOP was not in effect, a dedicated LTOP operator, whose responsibilities included monitoring pressurizer level and RCS pressure, was assigned. This time period began with the establishment of power to the 2A HPI pump at 1709 hours and ended with the establishment of the valve 2HP-120 travel stops at 1747 hours. This dedicated LTOP

operator would also have been expected to quickly mitigate an inadvertent HPI actuation.

Based on the brief time that LTOP was inoperable, the low probability of an initiating event, and the likelihood of effective operator action to mitigate such an event, it is concluded that the health and safety of the public were not compromised by this event.

ATTACHMENT A

HIGH PRESSURE INJECTION SYSTEM