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SUBJECT: LER 91-001-00:on 910213,unplanned Reactor Protective Sys actuation.Caused by personnel error.Operator counseled. W/910314 ltr.

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DUKE POWER

March 14, 1991

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
LER 287/91-01

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 287/91-01 concerning an unplanned Reactor Protective System actuation.

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

Very truly yours,

H. B. Barron
Station Manager

RSN/ftr

Attachment

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NRC FORM 366 (6-89)

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 3	0 5 0 0 0 2 8 7	1 OF 0 7

TITLE (4) Unplanned Reactor Protective System Actuation During Unit Cooldown and Depressurization 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	DOCKET NUMBER(S)
0 2	1 3	9 1	9 1	0 0 1	0 0	0 3	1 4	9 1		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
N	- 0 -	20.402(b)	20.405(c)	X 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)	X 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)	50.72 (b)(2)(ii)
		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
	AREA CODE
Henry R. Lowery, Chairman Oconee Safety Review Group	8 0 3 8 8 5 - 3 0 3 4

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 2/13/91 at 2148 hours, Unit 3 experienced an unplanned Reactor Protective System (RPS) actuation during a unit shutdown for refueling. The Reactor was subcritical with Safety Rod Group 1 (GP1) at approximately 45% withdrawn. Three out of four Reactor Coolant Pumps (RCP) were in operation resulting in a 21 to 43 psig differential pressure between the two Reactor Coolant System (RCS) loops. The operator controlled the RCS depressurization using an inappropriate RCS pressure indicator. The operator was decreasing RCS pressure in accordance with the shutdown procedure when one RPS channel tripped unexpectedly on low RCS pressure. The operator attempted to secure depressurization and insert GP1 rods, but a second RPS Channel low pressure trip occurred, initiating an RPS actuation. An investigation discovered that the pressure of the RCS Loop with 2 RCPs operating, B Loop, was 30 to 35 psig less than A Loop; a condition due specifically to operating with 3 RCPs. The pressure instrument that the operator chose did not indicate the actual pressure in the B loop. The unit shutdown continued in accordance with the shutdown procedure. The Root Cause of this event is Inappropriate Action, action taken was incorrect because action taken was not the best alternative. The operator has been counseled in regard to this event.

BACKGROUND

The Reactor Protective System (RPS) [EIIS:JC] is a safety related system which protects the reactor core from damage by automatically deenergizing control rod drive mechanisms (CRDMs) when two of four independent input channels reach their setpoint. Among the inputs to the RPS is Reactor Coolant System (RCS)[EIIS:AC] low pressure. The low RCS pressure setpoint is procedurally set at 1810 psig. Four independent Narrow Range RCS pressure signals feed RPS: Channels A and B originate from Loop A Hot Leg, Channels C and D from Loop B Hot Leg.

The indications of RCS pressure available in the control room can be divided into Wide Range (WR) indication (0-2500 psig) and Narrow Range (NR) indication (1700-2500 psig). Each of the NR inputs to RPS can be monitored on the Operator Aid Computer (OAC)[EIIS:ID]. The Smart Automatic Signaling System (SASS) compares Channel A and Channel E NR readings to determine which signal is supplied to the NR Pressure Chart Recorder.

Three WR pressure transmitters [EIIS:XT] can be displayed on the OAC computer. WR Channels A and B originate from Loop A RCS Hot leg and Channel C originates from Loop B Hot leg. Either Channel A or B can be selected to feed the WR RCS pressure recorder. They both feed the graphic Pressure/Temperature computer displays. These indications feed Engineered Safeguard [EIIS:JE] channels.

Additional digital WR (0-3000 psig) pressure displays are available in the control room. They derive their signals from the Inadequate Core Cooling Monitor (ICCM)[EIIS:IG] which is used for post accident monitoring. The Loop A monitor originates from an impulse line on the Unit 3 A Hot leg. The Loop B monitor originates from an impulse line on a spare CRDM vent.

The CONTROLLING PROCEDURE FOR UNIT SHUTDOWN, OP/A/1102/10, describes the steps required to cooldown and depressurize the RCS. Safety Rod Group 1 [EIIS:ROD] is kept at 50% withdrawn during most of this procedure to provide 0.5% delta k/k available negative reactivity for insertion. Rods are manually inserted prior to reaching the low pressure RPS trip setpoint. The RPS is expected to trip as the RCS is depressurized to the low pressure setpoint. After RCS pressure is further reduced, the Shutdown Bypass feature of RPS allows the RPS and CRDMs to be reset and Group 1 control rods are withdrawn to 50% to continue the cooldown.

It is documented in the OPERATION AT POWER procedure, OP/A/1102/04, that when the unit is operating with three out of four Reactor Coolant Pumps (RCPs)[EIIS:P], the RCS pressure in the loop with two RCPs operating will be lower than the loop with one RCP operating. This information is taught during the Reactor and Senior Reactor Operator classes.

EVENT DESCRIPTION

Cooldown from hot shutdown conditions is normally performed using two Reactor Coolant Pumps (RCPs). However, recent shutdowns have used three RCP combinations. A Technical Specification (TS) 2.3 revision on December 15, 1989 required this change. That TS revision allowed the pump-power Reactor Protective System (RPS) trip to occur when less than three RCPs

are operating and reactor power is greater than 0.0% full power. During a shutdown of Unit 1 on April 26, 1990, a reactor trip occurred (LER 269/90-05). Subsequent investigation found that reactor power instrumentation fluctuated above the 0.0% power setpoint even when the reactor was shutdown. This, in combination with the two RCP operation, tripped the reactor.

Another proposed TS 2.3 change was submitted to the Nuclear Regulatory Commission (NRC) on 7/9/90 which changed the pump-power trip setpoint to allow two pump operation at less than 2.0% power. Until this revision was approved, the CONTROLLING PROCEDURE FOR UNIT SHUTDOWN, OP/A/1102/10, for all three units was changed to require three RCPs during cooldown. The procedure was used twice for Unit 2 shutdown without incident.

On February 13, 1991 at 2107 hours, Operations shift personnel commenced performance of Enclosure 4.2, HOT SHUTDOWN CONDITIONS TO 250F/350PSIG. The RCS was borated to provide an adequate shutdown margin. The 3A1 RCP was secured. Shortly after securing the pump, an "RCS PRESS MISMATCH HIGH" alarm at 39.41 psig was received. This was due to a difference in indicated pressure between RCS Loop A and Loop B as monitored by the NR Pressure transmitters.

Prior to commencing cooldown and depressurization of the RCS, Reactor Operator A (RO A) reviewed the procedure to determine hold points. The first hold point was at 1850 to 1820 psig to insert Safety Group 1 rods. The second hold point was at 1700 psig to bypass Engineered Safeguards.

The following pressure indications were available to RO A:

1) An Operator Aid Computer (OAC) screen with Wide Range (WR) pressure indications,
2) An OAC screen which displayed the RCS pressure/temperature relationship (Pressure indications derived from WR Pressure instruments),
3) RCS Wide Range Pressure Loop A and B digital meters,
4) RCS Narrow Range (NR) Pressure recorder.

Further NR pressure indications were available from other computer programs but were not selected for display on either of the two available OAC screens. RO A focused his attention on the digital meters for the RCS depressurization.

In accordance with step 2.3 of the controlling procedure, RO A commenced cooldown by adjusting the Turbine Bypass Valves (TBVs)[EIIS:SO]. Depressurization was begun at 2123 hours by deenergizing the pressurizer [EIIS:VSL] heaters. The pressurizer spray valve (RC-1)[EIIS:V] was placed in manual and opened with RCS pressure at 2200 psig at 21:38:52 hours. RO A checked his control of depressurization by closing the pressurizer spray valve at 21:41:13 hours. RC-1 was reopened at 21:45:30 hours to continue the pressure decrease.

During the cooldown, the Shift Manager initiated a discussion with RO A concerning the performance of the cooldown. The Shift Manager discovered nothing unusual about the cooldown and depressurization, but thought to look at the NR pressure channels since he noticed that RO A was only

monitoring WR channels. The Shift Manager attempted to observe NR pressures by accessing the Supervisors OAC monitor.

RO A was monitoring the digital meter "RCS WR PRESS LOOP B" when RPS Channel C tripped on low pressure at 21:47:46 hours. RO A observed that the digital meter was reading approximately 1850 psig and was decreasing.

RO A immediately closed RC-1 to stop the pressure decrease and began inserting Safety Rod Group 1 rods. As RO A moved to look at the NR Pressure Recorder, RPS Channel D tripped on low pressure, initiating a reactor trip signal, opening the Control Rod Drive breakers, and dropping Safety Rod Group 1 into the core from approximately 40 to 45% withdrawn at 21:48:38 hours. The post-trip response was normal. All Group 1 Control Rods inserted.

The investigation performed after the trip by the Operations shift personnel revealed that the trip was caused by the RPS channels which monitor pressure in Loop B, the loop with two operating RCPs. It was determined that there was a difference between NR RPS pressure indications of 30 to 35 psig. RO A had observed a 10 psig pressure difference between the WR digital meters. It was determined that the pressure difference between loops was caused by operating with a three RCP combination, effectively lowering pressure in the RCS loop with two RCPs operating. Following the investigation, it was decided to continue the shutdown in accordance with OP/3/A/1102/10.

CONCLUSIONS

The Root Cause of this event is classified Inappropriate Action, Improper Action; action chosen was incorrect because action taken was not the best alternative. Reactor Operator A (RO A) was monitoring the Reactor Coolant System (RCS) pressure decrease using the "RCS WR Press Loop A" and "RCS WR Press Loop B" digital meters. RO A had other, more conservative, pressure indications that should have been monitored during the cooldown. This was RO A's first attempt at cooldown and depressurization of the RCS.

In reviewing and investigating why RO A used the digital meter pressure indications versus the others, a few contributing factors were noted.

Lack of Attention to Detail:

The Operations Management Procedure states that all licensed Reactor and Senior Reactor Operators are responsible for knowing and being able to recall from memory all Technical Specification (TS) Reactor Protective System (RPS) trips and setpoints. The Technical Specification RPS Low Pressure trip is 1800 psig. During the RCS depressurization, RO A was focused on the two plateaus: 1850 to 1820 psig for inserting Safety Rod Group 1 and 1700 psig for bypassing Engineered Safeguards. Had he been cognizant of approaching the RPS Low Pressure trip setpoint, he might have been influenced as to which pressure instruments to observe. RO A has been involved in two recent events involving Inappropriate Actions.

Defective Procedure, ambiguous information:

Prior to commencing the cooldown, RO A reviewed OP/3/A/1102/10, Controlling Procedure for Unit Shutdown to determine the plateaus at which he had to stop his cooldown and depressurization to perform certain steps. The procedure directed the operator to insert Safety Rod Group 1 when RCS pressure reaches 1850 to 1820 psig. Enclosure 4.5, RCS Cooldown Limitations chart, directs the operator to monitor "Reactor Coolant Pressure (psig) 'B' Loop", a TS requirement, but did not specify which instruments, Narrow Range (NR) or Wide Range (WR).

Deficient Training, training given but not effective:

Simulator Training concerning cooldown and depressurization of the RCS was last performed during Requalification Training in 1988. The RO lesson plan made no mention as to which pressure indication, NR or WR, to use.

A contributing cause to this event was Management Deficiency, Deficient Supervision, insufficient or lack of supervision.

Operations Management Procedure 2-1, Enclosure 4.2, RESPONSIBILITIES OF THE SRO IN THE CONTROL ROOM, states that the SRO in the Control Room shall oversee the activities in the Control Room. Prior to commencing the RCS cooldown and depressurization, neither the Unit Supervisor nor the SRO in the Control Room took time to review or discuss the procedure with the RO A. And, upon securing the RCP, neither supervisor discussed the possible effects of operating in this condition with RO A. This might have been prudent especially since the procedure change incorporated an abnormal condition, cooldown with three RCPs.

The Shift Manager showed good initiative by reviewing the cooldown and depressurization of the unit with RO A, but should have advised the SRO in the Control Room to check the NR pressure channels and NR Pressure Chart Recorder when he realized that RO A was only monitoring WR pressures. The SRO in the Control Room overheard the discussion between the Shift Manager and RO A about the cooldown and depressurization and believed that this discussion covered all the significant information.

A second contributing cause to this event was Inappropriate action, lack of attention to detail, on the part of the Operations shift personnel for not investigating the RCS PRESS MISMATCH alarm.

The alarm was received approximately 15 seconds after going to 3 RCP operation and was displayed on both Operator Aid Computer Alarm Typer [EIIS:IQ] and Alarm Screen. This alarm may or may not have been acknowledged by the Operations shift personnel. If it was acknowledged, action was not taken in accordance with the PERIODIC INSTRUMENT SURVEILLANCE procedure, PT/3/A/600/01, which directs the operator to investigate for an instrument failure. Evaluating the difference between the pressure

differential of the ICCM WR Loop pressure digital meters of 10 psig and that of the RCS NR Loop pressures of 43 psig would have directed the shift personnel to monitor the most conservative indications.

Concerning root or contributing causes of events over the past two years involving the Operations personnel, there has been 11 Problem Reports written for Inappropriate Action due to improper or inadvertent action and 1 Problem Report written for Management Deficiency due to deficient supervision. A recent event involved a number of the same Operations shift personnel in which inadequate supervision and inappropriate actions were noted. As a result, all Operations shift personnel have received training that stressed "effective pre-job briefings". As noted earlier, RO A has been involved in two recent events involving Inappropriate Actions. With respect to these events, RO A has been counseled on improving his communication skills and involving other operators and supervisors in his actions. This event is considered to be part of a Recurring Problem.

There were no releases of radioactive materials, no personnel overexposures or personnel injuries associated with this event. There were no equipment malfunctions or component failures involved in the event, therefore no NPRDS reportable conditions exists. The health and safety of the public were not compromised as a result of this event.

CORRECTIVE ACTIONS

Immediate

Operations Shift personnel investigated the cause of the trip and requested a procedure change to OP/3/A/1102/10 that would direct the operator to insert Safety Rod Group 1 at approximately 1900 psig.

Subsequent

1) Operations shift personnel continued the cooldown and depressurization of the unit in accordance with the shutdown procedure.

2) RO A was counseled on his need to stay focused on the higher priority jobs.

Planned

1) OP/A/1102/10 will be changed to go to 2 RCPs at the start of a unit cooldown in order to minimize the RCS loop pressure difference.

2) OP/A/1102/10 will include a "Caution" to direct the operators to monitor RCS Narrow Range pressure points on the Operator Aid Computer since these are inputs to the Reactor Protective System.

3) OP/A/1102/10 will include a change to increase the pressure range for inserting Safety Rod Group 1.

4) RO A's Shift Supervisor will be required to monitor RO A's job performance more closely.

5) A training package will be issued to address this recent reactivity management event.

6) A Simulator exercise will be conducted with RO A, the SRO in the Control Room, the Shift Supervisor, and the Shift Manager to observe what happened and what should have happened to depressurize the RCS.

7) The Training Department will re-evaluate the lesson plan concerning cooldown and depressurization of the Reactor Coolant System to include OP/A/1102/10 changes.

SAFETY ANALYSIS

Unit 3 was subcritical and in the process of cooling down for a refueling outage. The reactor tripped, dropping the Safety Rod Group 1 rods from approximately 45% withdrawn position. The Reactor Coolant System had been borated to maintain >1% Shutdown Margin with the worst case rod fully stuck out in accordance with the shutdown procedure. Following the reactor trip, the unit was safely maintained below hot shutdown. No significant abnormalities in plant parameters were observed following the trip. There were no actuation of Engineered Safeguards systems. The pressurizer relief valves did not open. There was no abnormal Reactor Coolant System leakage identified due to this trip. There were no personnel injuries or overexposures associated with this event. The health and safety of the public were not affected as a result of this event.