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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 94-002-00:on 940226,Unit1 tripped on loss of both MFDW pumps.Root cause was inappropriate action.Integrated control sys power supply replaced &circuit tested & daisy chain associated w/circuit removed.W/940328 ltr.

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March 28, 1994

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
LER 269/94-02

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/94-02, concerning a false high steam generator level which caused loss of main feedwater and a reactor trip.

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,

J. W. Hampton
Vice President

/ftr

Attachment

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IE27

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
OCONEE NUCLEAR STATION, UNIT 1	05000 269	1 OF 7

TITLE (4) INAPPROPRIATE ACTION RESULTS IN FALSE HIGH STEAM GENERATOR LEVEL CAUSING LOSS OF MAIN FEEDWATER AND REACTOR TRIP

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
02	26	94	94	-- 02 --	00	03	28	94	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	N
POWER LEVEL (10)	100

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

	20.402(b)		20.405(c)	X	50.73(a)(2)(iv)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)
	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)

	73.71(b)
	73.71(c)
	OTHER

(Specify in Abstract below and in Text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
L. V. Wilkie, Safety Review Manager	(803) 885-3518

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
F	JA	JX	I204	Yes					

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 15 single-spaced typewritten lines) (16)

On February 26, 1994, at 0657 hours, Oconee Unit 1 tripped on loss of both Main Feedwater (MFDW) pumps, while operating at 100% Full Power. An Instrument and Electrical Supervisor (IES) was removing power from an Integrated Control System power supply that had failed and was smoking. The IES removed a neutral wire that is daisy chained with other devices. When the neutral (daisy chained) terminal was loosened, the 1B Steam Generator high level circuits were de-energized. This condition resulted in a trip of the Main Turbine/Reactor, of both MFDW pumps, and the initiation of the Emergency Feedwater system. The Unit was stabilized at Hot Shutdown conditions. The root cause of the Unit trip was Inappropriate action; Improper action (Response chosen was proper but proper execution failed because; a human factors deficiency existed). A contributing cause is Equipment Failure. Corrective actions included replacing the defective power supply and removing the daisy chain associated with this circuit.

BACKGROUND

The Integrated Control System (ICS) [EIIS:JA] provides fully automatic control of reactor power, steam generation rate, and generated load by processing selected signals of measured plant parameters.

Auctioneering modules are installed for each Feedwater Valve Differential Pressure controller circuit such that the signal selection system always rejects a failed signal from control. Manual signal selection, by the operator, is also permitted which bypasses the automatic circuits.

A high level in either steam generator will result in an automatic trip of both Main Feedwater (MFDW) pumps and the Main Turbine (MT). The loss of both MFDW pumps results in an automatic Reactor Trip when greater than 0.5% Full Power and the loss of the MT results in an automatic reactor trip when greater than 25% Full Power. The loss of both MFDW pumps also initiates the Emergency Feedwater System [EIIS:BA]. The Steam Generator high level circuits are designed fail safe; that is, on a loss of power to the circuits, an automatic trip occurs.

The original design of the ICS has the neutral wiring daisy chained from one device to another. A daisy chain is a wiring technique where parallel devices are wired by connecting from one device to another device, and from that device to the next, and so on until all devices are connected.

EVENT DESCRIPTION

On February 26, 1994, at approximately 0600 hours, a computer alarm was received in the control room for "Feedwater Valve A D/P 2 low". The auctioneering circuit of the Integrated Control System (ICS) automatically selected the alternate instrument. Instrument and Electrical Supervisor-A (IES-A) was contacted and a work request was initiated to investigate and repair the problem. A call-out was made to Instrument and Electrical Technician A (IET-A) since he was considered the most experienced technician for the ICS.

During the operations shift turnover, operations personnel detected a burning odor but could not locate the exact source. Shift supervisor (SS) A and B investigated the odor and traced it to a group of power supplies in ICS cabinet 7 located in the rear of the control room area. SS A and SS B opened both doors of the cabinet but could see no specific indications of an immediate problem.

Instrument and Electrical Supervisor B (IES-B) had reported to work for his normal shift assignment. IES-B was taking the turnover from IES-A and both went to the control room to assess "Feedwater Valve A D/P 2 low" computer alarm problem before the turnover was completed. IES-A and IES-B concluded that the computer alarm and the odor were related. At the time, it was determined there was no immediate problem with the power supply; therefore it was decided to have IET-A investigate and repair the problem when he arrived. Other than the call out to IET-A, other work items were determined to be of a higher priority.

At approximately 0630 hours, the Operations shift turnover was completed. At approximately 0645 hours, the Control Room Senior Reactor Operator made a call to IES-B to inquire about the status for fixing the problem.

Reactor Operator A was performing a normal tour of the control room area when he noticed that smoke was coming from a power supply in ICS cabinet 7. RO-A notified SS-B and called IES-B to inform him of the smoke coming from the power supply. Also, Unit Supervisor A (US-A) called IES-B and indicated that he should come to the control room. SS-B, US-A, and Spare Senior Reactor Operator (SSRO) A, went to the ICS cabinet to investigate. SSRO-A retrieved a Halon fire extinguisher and discharged it for a few seconds onto the power supply.

IES-B had been planning work for Unit 3 but he had pulled a drawing for IET-A to use when investigating the ICS power supply on Unit 1. When IES-B was notified of the situation in Unit 1, he took the drawing and a screwdriver to the Unit 1 Control Room. Time did not permit proper planning and IET-A had not yet arrived on site.

At approximately 0655 hours, IES-B arrived at the Unit 1 Control Room and was instructed by SS-B to de-energize the power supply in ICS cabinet 7. At approximately 0656 hours, IES-B removed the black (AC hot) wire that supplies power to the "Feedwater Valve A D/P 2" power supply but the smoke continued. This prompted SS-B to comment that the device must still be energized. IES-B removed the white (neutral) wire; but when the terminal screw was loosened power was lost to other circuits that share this common neutral (daisy chained). The circuits that lost power included the 1B Steam Generator operating level circuits that sent a trip signal to both Main Feedwater Pumps (MFDWP) and the Main Turbine (MT). IES-B stated that he was aware of the daisy chain wiring but, due to the urgency of the situation, he did not have time to evaluate his actions properly.

The Reactor Tripped at 0657:51:37 hours, on a MT anticipatory trip.

Several immediate automatic actions occurred. The Control Rod Drive [EIIS:AA] breakers opened, and all full length control rods were inserted into the core, shutting down the reactor. The Main Steam Relief Valves and Turbine Bypass Valves opened. Both Motor Driven Emergency Feedwater Pumps (MDEFDWP) and the Turbine Driven Emergency Feedwater Pump (TDEFDWP) started. A second High Pressure Injection (HPI) [EIIS:CB] pump automatically started at 0659 hours on low seal injection flow caused by the operator opening the 1A High Pressure Injection valve (1HP-26).

The operators also took manual action per the Emergency Operating Procedure (EOP) (EP/1/A/1800/001). They confirmed that the reactor and turbine had tripped, verified that the Emergency Feedwater Pumps had started, and monitored for proper operation of other automatic equipment. At 0702 hours they stopped the second HPI pump and closed 1HP-26. The operators shut down the TDEFDWP as directed by the Loss of Main Feedwater procedure (AP/1/A/1700/019), after confirming that both MDEFDWP's were operating and supplying the SG's.

Specific post-trip parameters remained within acceptable limits. Reactor Coolant System (RCS) [EIIS:AB] pressure increased to 2204 psig then decreased to 1822 psig and controlled at approximately 2140 psig. Pressurizer inventory remained on scale between a high of 224 inches at the time of the trip and a low of 72 inches. RCS temperatures converged smoothly to approximately 553 F. The 1A and 1B SG pressures reached a post trip high of approximately 1136 and 1128 psig respectively. This condition is being evaluated in a Problem Investigation Process report that was written on a previous trip where pressures increased above 1115 psig.

IET-A arrived on site at the time of the unit trip. After discussions with IES-B, IET-A replaced the power supply in cabinet 7, checked the circuit, and performed testing which proved satisfactory.

The Post Trip Review Procedure identified during the review of the alarm typer that the 1A MDEFDWP motor cooling water flow alarm did not clear within two seconds of the pump start. Further evaluation revealed the alarm cleared after approximately seven seconds. Performance testing was performed on the motor cooling water valve and the stroke time was one second with cooling water flow of 75 gpm, which is within the procedure acceptance criteria. A valve stroke and cooling water flow history was reviewed and the last four tests showed no deficiencies for the motor cooling water.

The failed ICS power supply was inspected and the cause of the failure was attributed to the failure of an output loading resistor.

At 1800 hours, the post trip review was completed with the action items completed and the preparations for start-up continued. The reactor was returned to criticality on February 26, 1994, at 2236 hours.

CONCLUSIONS

The root cause of this event is Inappropriate Action; Improper action (Response or action chosen was proper but proper execution failed because; a human factors deficiency existed). A contributing cause is equipment failure due to the failure of the output loading resistor in the Integrated Control System (ICS) power supply.

It is concluded that IES-B was influenced by the situation and performed work that resulted in the unit trip. If the urgency of the situation had not existed and proper planning could have been performed, the work isolating the faulty power supply should have been performed without resulting in a reactor trip. The daisy chain wiring placed an additional, unnecessary, burden on IES-B.

The design of Oconee Nuclear Station includes daisy chain wiring in circuits other than the ICS. The use of this wiring technique may represent a human factors concern during special circumstances; however, a review of work history shows that this potential concern has not been a chronic problem. It is therefore concluded that workers have correctly accounted for the existence of daisy chain wiring, and have taken appropriate actions when required. Based on this conclusion, it is not apparent that a comprehensive assessment of this wiring technique is warranted at this time.

A review of the Operating Experience of the last two years indicated that a Unit trip has occurred due to Inappropriate Action; improper or inadvertent action by Instrument and Electrical personnel. However, the event involved technicians and was attributed to a lack of attention to detail. It was also a pre-planned activity and was not an urgent situation, as was the case identified in this report. Therefore, this event is not considered recurring.

The Feedwater Valve D/P power supplies are functionally tested as a part of the circuit testing of the ICS during each refueling outage. A search of the NPRDS and Oconee's Work Management System data bases indicates that these power supplies only exist in this application. There have been two Feedwater Valve D/P power supply failures, identified in a review of the corrective work history data base, over the last ten years. The two failures identified were in 1987 and 1991. These two devices were not the same device that failed on February 26, 1994. Modifications installing the

auctioneering circuits were implemented after the original design of the ICS to prevent a single failure from resulting in a transient. It is concluded that this is not an excessive failure rate and therefore, the contributing cause is not considered recurring.

The ICS power supply is NPRDS reportable. The power supply is a ITT Barton model number 299.

There were no personnel injuries, radiation over-exposures, or releases of radioactive materials associated with this event.

CORRECTIVE ACTIONS

Immediate

1. Operations personnel took appropriate actions per the Emergency Operating Procedure to bring the unit to stable conditions.

Subsequent

1. The Integrated Control System power supply was replaced and the circuit tested.

2. The 1A Motor Driven Emergency Feedwater Pump motor cooling water valve was tested satisfactorily and a review of the previous valve tests indicated no problems.

Planned

1. Remove the daisy chain neutral wiring configuration from the Main Feedwater Valve D/P ICS power supplies on all three Oconee Units.

2. Discuss this event with Instrument and Electrical personnel, evaluate any enhancements to urgent work processes, and implement the enhancements as appropriate.

SAFETY ANALYSIS

A failure signal was introduced to the 1B Steam Generator (SG) high level circuits, by the removal of the daisy chained neutral wire, in Integrated Control System Cabinet 7. This resulted in a fail safe de-energizing of the SG high level circuits which tripped the Main Feedwater (MFDW) Pumps and the Main Turbine (MT).

Loss of MFDW is an anticipated transient and is described in Section 10.4 of the Final Safety Analysis Report. Loss of MFDW initiates a reactor trip and starts the Emergency Feedwater (EFDW) System to provide decay heat removal. In this event, all the systems and equipment operated as designed to mitigate the consequences of the loss of MFDW. The MFDW pumps and MT tripped as expected. Instrumentation detected the loss of both MFDW pumps and the MT and initiated the Reactor trip and provided the start signal to the EFDW system. All three EFDW pumps started and the unit was stabilized at hot shutdown.

There were no releases of radioactive materials, radiation over-exposures, or personnel injuries associated with this event. The health and safety of the public was not affected by this event.