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January 20, 2000

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

Subject: Oconee Nuclear Station
Docket No. 50-270
Licensee Event Report 270/99-05, Revision 0
Problem Investigation Process No.: 99-5251 & 99-5261

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 270/99-05, concerning two Unit 2 reactor trips due to the spurious closure of the turbine valves.

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,

WR McCollum / 

W. R. McCollum, Jr.

Attachment

IE22

Document Control Desk

January 20, 2000

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cc: Mr. Luis A. Reyes
Administrator, Region II
U.S. Nuclear Regulatory Commission
61 Forsyth Street, S. W., Suite 23T85
Atlanta, GA 30303

Mr. D. E. LaBarge
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

INPO Records Center
700 Galleria Parkway, NW
Atlanta, GA 30339-5957

Mr. M. C. Shannon
NRC Senior Resident Inspector
Oconee Nuclear Station

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)

FACILITY NAME (1) Oconee Nuclear Station, Unit Two		DOCKET NUMBER (2) 050-270	PAGE (3) 1 of 5
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TITLE (4)
Spurious Closure of Main Turbine Valves Results in Two Reactor Trips

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 NAME	DOCKET NUMBER(S)
12	21	99	1999	05	00	1	20	00		050

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	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)						
	<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)						
	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)						
	<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)							
	<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)							
	<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)							

LICENSEE CONTACT FOR THIS LER (12)		TELEPHONE NUMBER	
NAME L.E. Nicholson, Regulatory Compliance Manager		AREA CODE (864)	885-3292

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)											
CAUSE	SYSTEM	COMPONENT	MANUFACTURE R	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 December 21, 1999, Oconee Unit 2 was in Mode 1 at 100 percent Full Power, when at approximately 1852 hours Unit 2 tripped due to spurious closure of the Main Turbine Intercept and Control Valves. The unit post trip response was normal.

The plant tripped on a valid trip signal. The root cause investigation for the closing of the Main Turbine Intercept and Control valves found no specific problems, because of an intermittent ground. Corrective actions included replacing two suspect Power Load Unbalance (PLU) circuit cards.

On December 24, 1999, Oconee Unit 2 had returned to mode 1 at 77 percent power, when at approximately 0207 hours, Unit 2 tripped due to spurious closure of the Main Turbine Intercept and Control Valves. The unit post trip response was normal.

The root cause of the Main Turbine Intercept valves closing was an intermittent short circuit fault to the Linear Variable Differential Transformer (LVDT) signal cable for Intercept Valve 2MS-120. The corrective action was to repair the cable. This root cause was also determined to be the cause of the closure of the Main Turbine valves on December 21, 1999, causing the Unit 2 trip.

The health and safety of the public was not compromised by this event.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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EVALUATION:

BACKGROUND

This report addresses two reactor trips, which are reportable per 10CFR50.73 (a) (2) (iv) as "any event or condition that resulted in an automatic actuation of the Reactor Protective System."

The flow of main steam is from the steam generators to the High Pressure (HP) Turbine through four stop valves and four control valves. The expanded steam from the HP Turbine passes through moisture separators/reheaters and the intercept/reheat stop valves before being admitted to the three Low Pressure Turbines.

The Electro-Hydraulic Control System (EHC) is composed of two separate systems, a hydraulic system and an electrical system, working together to control and protect the Main Turbine Generator.

The Power/Load Unbalance circuit (PLU) exists in the EHC system to protect the turbine from sudden acceleration associated with loss of turbine load while turbine input is high. Turbine load is the electric generator. Turbine power is quantified by measurement of intermediate pressure, which is the steam pressure at the input of the low pressure turbine. The PLU circuit actuates when turbine power is measured to exceed turbine load by about 40 percent.

The Reactor Protective System (RPS) [EIIS:JC] is a safety related system which monitors parameters related to the safe operation of the plant. The RPS provides a two out of four logic for tripping the reactor when a predetermined set point is exceeded. One of the set points is Reactor Coolant System [EIIS:AB] High Pressure.

EVENT DESCRIPTION

On December 21, 1999, at approximately 1852 hours, while operating at 100% Full Power (mode 1), Unit 2 tripped due to the Main Turbine Intercept and Control Valves going closed. No abnormal events, testing or maintenance procedures were in progress immediately before or during the time this event occurred.

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The Main Turbine Valves (6 Intercept Valves [IV] and 4 main turbine Control Valves [CV]) went closed simultaneously, causing the RCS pressure to increase. After approximately 5 seconds the reactor tripped as designed on high RCS pressure by the Reactor Protective System (RPS). The post trip response was normal.

During the post trip investigation into the cause of the Main Turbine valve closure, factors such as turbine overspeed, loss of EHC fluid pressure, spurious actuation of the IV test circuits, and various areas of the EHC system were examined and dismissed as not supporting this trip scenario.

The investigation determined that the Power Load Unbalance (PLU) circuitry in the EHC may have caused the 4 CVs and the 6 IVs to go closed simultaneously. Included in the troubleshooting were; relay circuit faults, wiring problems and switch problems.

Although troubleshooting did not find any obvious faults, because of an intermittent ground, it was determined that the most probable cause was a spurious circuit failure in either the PLU Demodulator Card or the Voltage Comparator. Both circuit cards were replaced, calibrated, tested to eliminate this possibility, and then Unit 2 was restarted.

On December 24, 1999, at approximately 0207 hours, while at 77% Full Power (mode 1), Unit 2 again tripped, due to the Main Turbine Valves going closed. No abnormal events, testing, or maintenance procedures were in progress immediately before or during the time this event occurred.

Closing of the Main Turbine Valves caused RCS pressure to increase. In approximately 6 seconds the reactor tripped on RCS high pressure by the RPS. The post trip response was normal.

Before this event, operating personnel had observed locally and from the control room that Intercept Valve 2MS-120 was moving erratically open to close. This valve is normally full open during power operation.

Post trip investigation included a detailed evaluation of the 2MS-120 valve positioning circuits. Extensive trouble shooting was performed on the valve

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positioning circuits, as well as all related circuit cards and connections within the EHC cabinet. No related faults were found.

Cabling for 2MS-120 was inspected. There are two flex conduit connectors in the bottom of the 2MS-120 terminal box for cables going to the EHC electronic cabinets and Operator Aid Computer (OAC). Inspection of the EHC cable as it exited the conduit opening identified exposed conductors due to chafing of the cable insulation. The chafing was due to an out of position conduit bushing. A test input was applied to position 2MS-120 open, and the exposed cable was manipulated against the conduit edge. 2MS-120 was observed to move erratically, and the control room indications for 2MS-120 position and servo current matched that observed just before the unit trip.

During unit operation, vibration at the 2MS-120 terminal box caused the cable to short to the conduit fitting edge. This fault caused the valve to close, and since the fault was intermittent due to vibration, the valve movement was sporadic. Eventually, this initiated the 2MS-120 fast close circuit, which in turn caused the PLU actuation, and caused all CVs to fast close.

CAUSAL FACTORS

The root cause for this event was the out of position conduit bushing, which allowed the cable to chafe against the edge of the conduit entrance fitting. This chafing created the electrical short circuit in the LVDT control circuit.

This root cause was also determined to be the cause of the closure of the Main Turbine valves on December 21, 1999, causing the first Unit 2 trip.

CORRECTIVE ACTIONS

Immediate:

1. The faulty cable was repaired.
2. The conduit bushing was correctly positioned to prevent recurrence of the chafing problem.
3. The valve was functionally tested per approved procedures and returned to service.

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		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%;">YEAR</th> <th style="width: 25%;">SEQUENTIAL NUMBER</th> <th style="width: 25%;">REVISION NUMBER</th> </tr> <tr> <td style="text-align: center;">1999</td> <td style="text-align: center;">05</td> <td style="text-align: center;">00</td> </tr> </table>	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	1999	05	00	5 OF 5
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Subsequent:

1. Other Main Steam Stop Valves, Control Valves and Intercept Valves were inspected on Units 2 and 3 for similar problems. Two Main Steam Stop Valves on Unit 2 were found without position conduit bushings. These were rectified prior to plant restart. No problems were observed on Unit 3.

Planned:

1. Inspect Unit 1 Main Steam Stop Valves, Control Valves and Intercept Valves for similar wire chafing problems.

There are no NRC commitments contained in this LER.

SAFETY ANALYSIS

When the Main Turbine Control Valves went closed, an RCS pressure transient was induced. Within approximately five to six seconds, the reactor tripped on RCS high pressure Reactor Protective System (RPS) trip as designed. The automatic trip of the reactor terminated the transient. No safety limits were exceeded.

Post trip response was normal. No Engineered Safeguards systems or Emergency Feedwater actuations were either required or occurred.

ADDITIONAL INFORMATION

There were no releases of radioactive materials, radiation exposures in excess of limits, or personnel injuries associated with this event.

A review of reportable events indicated that no reactor trip events have occurred within the past two years due to the root causes identified in this event.