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DOCKET #  
05000269

SUBJECT: LER 89-012-00: on 890624, Keowee hydro units were emergency started due to unknown reasons.

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**DUKE POWER**

September 1, 1989

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

Subject: Oconee Nuclear Station  
Docket Nos. 50-269, -270, -287  
LER 269/89-12

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/89-12 concerning Keowee Hydro units which were emergency started due to unknown cause.

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,

M. S. Tuckman  
Station Manager

SWB/ftr

Attachment

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# LICENSEE EVENT REPORT (LER)

FACILITY NAME (1): <b>Oconee Nuclear Station, Unit 2</b>	DOCKET NUMBER (2): <b>0 5 0 0 0 2 6 9</b>	PAGE (3): <b>1 OF 0 1 7</b>
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TITLE (4)  
**Keowee Hydro Units Were Emergency Started Due to Unknown Reasons**

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)
06	24	89	89	012	00	09	01	89	Oconee, Unit 1	0 5 0 0 0 2 6 9
									Oconee, Unit 3	0 5 0 0 0 2 8 1 7

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

OPERATING MODE (9): <b>N</b>	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.408(a)	<input checked="" type="checkbox"/> 20.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
POWER LEVEL (10): <b>- 0 -</b>	<input type="checkbox"/> 20.408(a)(1)(ii)	<input type="checkbox"/> 20.38(a)(1)	<input type="checkbox"/> 20.73(a)(2)(iv)	<input type="checkbox"/> 73.71(c)
	<input type="checkbox"/> 20.408(a)(1)(iii)	<input type="checkbox"/> 20.38(a)(2)	<input type="checkbox"/> 20.73(a)(2)(v)	OTHER (Specify in Abstract below and in Test, NRC Form 305A)
<input type="checkbox"/> 20.408(a)(1)(iv)	<input type="checkbox"/> 20.73(a)(2)(ii)	<input type="checkbox"/> 20.73(a)(2)(vi)(A)		
<input type="checkbox"/> 20.408(a)(1)(v)	<input type="checkbox"/> 20.73(a)(2)(iii)	<input type="checkbox"/> 20.73(a)(2)(vi)(B)		
<input type="checkbox"/> 20.408(a)(1)(vi)	<input type="checkbox"/> 20.73(a)(2)(iv)	<input type="checkbox"/> 20.73(a)(2)(v)		

LICENSEE CONTACT FOR THIS LER (12)

NAME <b>Henry R. Lowery, Chairman Oconee Safety Review Group</b>	TELEPHONE NUMBER AREA CODE: <b>81038</b> NUMBER: <b>81851-13034</b>
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS

SUPPLEMENTAL REPORT EXPECTED (14)

<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15) MONTH:    DAY:    YEAR:
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On June 24, 1989, at 1040 hours, with Unit 2 at Cold Shutdown and making preparation for a restart from a refueling outage, both of the on-site emergency power sources (Keowee Hydro Units 1 & 2) emergency started. The emergency start was initiated from the Unit 2 Keowee Emergency Start channel B circuitry due to unknown reasons. Also, several valves of Engineered Safeguards (ES) System channel 2 repositioned to their ES position. Related activities at the time of the event initiation were functional testing of ES channels 1 and 2 and the Steam Generator Level control systems. Station Engineering evaluated the incident but could not identify any cause for the emergency start of the Keowee units or the repositioning of the ES valves. The Keowee units were secured from the emergency start and ES channels 1 and 2 were reset from test to normal operating position. Oconee Units 1 and 3 were operating at 100% Full Power. The root cause of this event is classified as Unknown.

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					02	OF 07

TEXT (7) more space is required, use additional NRC Form 366A (17)

BACKGROUND

The Keowee Emergency Power System [EIIS:EK] is designed to provide a reliable emergency on-site power source to Oconee Nuclear Station. The Keowee Emergency Power System supplies power to Oconee units upon Engineered Safeguard (ES) System [EIIS:JE] actuation, loss of on-site power, or loss of offsite power. The Keowee Emergency Power System is supplied by two hydro electric units. Power can be supplied to auxiliary power systems on any or all affected Oconee units from both Keowee Hydro units through two separate and independent routes.

The Keowee Hydro units will automatically start upon receipt of a signal from the emergency start relay which can be initiated by any of the following:

1. Operation of emergency start switches in each unit's control room.
2. Operation of emergency start key switches in the cable room.
3. Actuation of ES System channels 1 or 2.
4. Main Feeder Bus (MFB) [EIIS:EK] monitoring undervoltage signal for both Main Feeder Buses. These signals are the result of either:
  - a. Under voltage on two of three phases of both Main Feeder Buses for 20 seconds.
  - b. A loadshed signal.
5. Switchyard isolation.

The ES system is designed with three analog channels (A, B, and C) feeding two groups of four digital channels. The two digital groups are divided into even (2, 4, 6, and 8) and odd (1, 3, 5, and 7) channels. The analog channels monitor Reactor Coolant System (RCS) [EIIS:AB] pressure and reactor building [EIIS:NH] pressure. The digital channels actuate components when any two of three analog channels indicate that initiation of ES is required. One channel in each group of digital channels controls the actuation of certain ES components such that redundancy for actuation of any ES function exists. The Keowee Emergency Start channel A is connected to ES channel 1 and Keowee Emergency Start channel B is connected to ES channel 2.

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TEXT (if more space is required, use additional NRC Form 308A (1) (17))

Final Safety Analysis Report (FSAR) 7.3.1.1 states that "The loss of power to the system logic will not initiate system actuation".

All ES even channels (2, 4, 6 and 8) are powered from power panel 2DIB, breaker #25. Keowee Emergency Start channel B is powered from power panel 2DIB, breaker #2. Also, 2DIB supplies power to power panel 2KVIB through an AC inverter. The Emergency Steam Generator Level Control system is powered from power panel 2KVIB, breaker #10.

EVENT DESCRIPTION

On June 24, 1989, with Unit 2 in a refueling outage, Instrumentation and Electrical (I&E) technicians were performing tests on two different systems per Work Requests 97898C and 55465A. I&E Group A was performing a functional test of Engineered Safeguards (ES) System channels 1 and 2, while Group B was performing a test of the Emergency Steam Generator Level Control System. At the time of the incident, I&E technicians in group A, were waiting to get permission from Operations to continue the functional test on ES 1 and 2 and had both Engineered Safeguard (ES) System channels 1 and 2 in the test position.

At approximately 1040 hours breaker #10 of power panel 2KVIB was opened by personnel in technician group B to test the Steam Generator Level Control system. At approximately the same time, both Keowee Hydro units started unexpectedly from Keowee Emergency Start channel B and the following ES valves went to their ES position:

2PR-4	closed
2PR-5	closed
2PR-8	closed
2PR-10	closed

Also, Reactor Building Radiation Monitors (RIA) [EIIS:IL] 45, 47, 48, and 49 tripped due to the closing of 2PR-8 and 2PR-10 and the Reactor Building Purge [EIIS:VA] tripped due to interlocking features associated with the closing of 2PR-4 and 2PR-5.

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TEXT (if more space is required, use additional NRC Form 288A (17))

At 1046 hours, the Keowee units were manually shutdown by Operations personnel. I&E technicians reset ES channels 1 and 2 from test to normal operating position, valves 2PR-4, 5, 8, and 10 were manually reopened by remote control, and the Reactor Building Purge and reactor building RIAs were returned to service.

The Operations section prepared Work Request 21102C to investigate the emergency start of the Keowee Hydro units. As a result, at 1310 hours, conditions at the time of the Keowee emergency start were simulated. Both ES channels 1 and 2 were placed in test position and breaker number 10 of power panel 2KVIB was opened. This time Keowee Units did not start and valves 2PR-4, 5, 8, and 10 did not go to their ES position. This was the expected normal response of these ES components.

Later, on June 26, 1989, before unit start-up after refueling, Performance personnel ran procedure PT/O/A/202/12, "HPI System ES Test", to check ES components. This procedure verified that the ES components activated properly.

Maintenance Engineering section I&E personnel investigated the incident. The possibility of a voltage surge or undervoltage during operation of breaker #10 causing a response in the ES system was evaluated due to the common AC power source (KVIB) to the ES system and Steam Generator Level control system. Their investigation concluded that it would have been virtually impossible for a power surge or an undervoltage condition on power panel 2DIB and 2KVIB to cause the Keowee Hydro units emergency start and to cause valves 2PR-4, 5, 8 and 10 to reposition without also activating other ES components. Subsequently, other potential causes for the Keowee emergency start were investigated by Operations and Design Engineering. They did not find any apparent cause why the Keowee Hydro units emergency started.

When the event occurred it was initially thought to have been caused solely by the opening of the 2KVIB breaker and was not considered to be an ES actuation. However, the investigation did not show how opening the breaker could have simultaneously caused the Keowee Hydro units to emergency start and PR valves to close. The only common aspect of the controls to the actuated components was found to be in the power supply to ES channel 2 circuitry. Therefore, as a result of the investigation, it was decided on August 1, 1989, to report this event pursuant to 10CFR50.73(a) (2) (IV).

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TEXT (if more space is required, use additional NRC Form 306A (17))

CONCLUSION

The root cause of this incident is classified as Unknown. There is no indication why the Keowee Hydro units emergency started nor why Engineered Safeguard (ES) System channel 2 valves repositioned. There was no indication on the alarm typer, utility typer, or event recorder why the Keowee units started from Keowee emergency start channel B or why valves 2PR-4, 5, 8, and 10 closed. The Keowee emergency channel A and ES channel 1 were not involved in this incident. Keowee Emergency channel B is connected to ES channel 2.

Investigation concluded that none of the following five means of causing Keowee to emergency start occurred:

1. The Operator did not push start switches in the control room.
2. There was no evidence that Keowee emergency start key switches in cable room were used to start Keowee Hydro.
3. There is no sufficient evidence that ES channel 2 actuated.
4. There was no evidence of an undervoltage of both Main Feeder Buses or a loadshed.
5. There was no switchyard isolation.

In order for the event to occur from ES Channel 2 at least one of the following would have had to occur:

- A. Channel 2 had to trip:
  1. True ES Signal (which was bypassed while the unit was shutdown).
  2. Manual actuation of ES Channel Trip Switches on unit vertical board.
- B. Manual actuation of several independent ES components.
- C. Internal ES wiring/component failure of short duration.

The event cannot be positively attributed to any of the above causes. Justification for Channel 2 not being tripped is based on several devices connected to channel 2 not being activated by an ES Signal. Many ES components did not go to their ES position during the incident (for example valves 2GWD-13, 2PR-2 and 2PR-3).

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The fact that 2DIB is a common power source to both Keowee Emergency start circuitry and ES channel 2 leads to two possible theories that could explain this event. One theory is that a power spike in power panel 2DIB may have caused the Keowee units to emergency start and the valves to reposition. The second is that a power spike in the ES circuitry may have energized some of the sensitive relays of channel 2 thus causing the emergency start of the Keowee units and the valves to reposition. These theories however, cannot be substantiated with the evidence collected during the investigation.

All technicians in group A and B were interviewed as a part of the investigation. No evidence of personnel error or procedural deficiency was found.

This event is not NPRDS reportable. A review of events within the last year shows that this is not a recurring event. There was no release of radioactive material, radiation exposure, or personnel injury associated with this incident; therefore, the health and safety of the public were not affected.

CORRECTIVE ACTIONS

Immediate

1. Keowee Units 1 & 2 were shutdown by operator action.
2. Keowee logic reset button was pushed in the control room.
3. Instrumentation and Electrical (I&E) technician reset Engineered Safeguard (ES) System channels 1 and 2 from test to operating position.
4. Operations reopened valves 2PR-4, 5, 8, and 10.
5. Reactor Building Purge was returned to service.
6. Radiation monitors (RIAs) 45, 47, 48 and 49 were returned to service.



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Subsequent

1. Operations initiated Work Request 21102C for I&E to investigate why the Keowee Hydro units emergency started and why some valves of ES channel 2 went to their ES position.
2. Maintenance Support Engineering (I&E group) investigated why the Keowee Hydro units emergency started.

Planned

NONE

SAFETY ANALYSIS

The safety related function of the Keowee hydro units is to provide emergency power to Oconee units in the event that on-site power is lost and/or an Engineered Safeguard (ES) System signal is present. During this event the Keowee Hydro units automatically started, for unknown reasons. The Standby Bus did not energize nor was the Main Feeder Bus de-energized. In the worst case, if ES spuriously actuates with a unit on line, the unit will trip on high Reactor Coolant System pressure without prompt operator action. If it did trip, operator action would be required to control the transient. Guidance for this is included in appropriate procedures. There were no personnel injuries, radiation exposures, radioactive material releases, or other hazards to the employees or public as a result of this event. The health and safety of the public were not affected.