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July 21, 2005

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269,-270, -287
Licensee Event Report 269/2005-01, Revision 0
Problem Investigation Process No.: O-05-3599

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 269/2005-01, Revision 0, regarding an inoperable Emergency Power Path due to a failed electrical contactor.

This report is being submitted in accordance with 10CFR 50.73(a)(2)(i)(B) as operation in a condition prohibited by Technical Specifications and 50.73(a)(2)(ii)(B) as an unanalyzed condition. This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

R. A. Jones

Attachment

Document Control Desk

Date: July 21, 2005

Page 2

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INPO (via E-mail)

LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB: NO. 3150-0104
 Estimated burden per response to comply with this mandatory collection request: 50 hours.
 Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

EXPIRES: 06/30/2007

1. FACILITY NAME Oconee Nuclear Station, Unit 1	2. DOCKET NUMBER 05000- 0269	3. PAGE 1 OF 11
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4. TITLE
Exceeded Tech Spec: Emergency Power Path Aux Power Source Inoperable

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	24	2005	2005	- 01	- 00	07	21	2005	Unit 2	05000 0270
									Unit 3	05000 0287

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)									
	20.2201(b)	<input type="checkbox"/>	20.2203(a)(3)(i)	<input type="checkbox"/>	50.73(a)(2)(i)(C)	<input type="checkbox"/>	50.73(a)(2)(vii)	<input type="checkbox"/>		
10. POWER LEVEL 100	20.2201(d)	<input type="checkbox"/>	20.2203(a)(3)(ii)	<input type="checkbox"/>	50.73(a)(2)(ii)(A)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)	<input type="checkbox"/>		
	20.2203(a)(1)	<input type="checkbox"/>	20.2203(a)(4)	<input type="checkbox"/>	50.73(a)(2)(ii)(B)	<input checked="" type="checkbox"/>	50.73(a)(2)(viii)(B)	<input type="checkbox"/>		
	20.2203(a)(2)(i)	<input type="checkbox"/>	50.36(c)(1)(i)(A)	<input type="checkbox"/>	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(ix)(A)	<input type="checkbox"/>		
	20.2203(a)(2)(ii)	<input type="checkbox"/>	50.36(c)(1)(ii)(A)	<input type="checkbox"/>	50.73(a)(2)(iv)(A)	<input type="checkbox"/>	50.73(a)(2)(x)	<input type="checkbox"/>		
	20.2203(a)(2)(iii)	<input type="checkbox"/>	50.36(c)(2)	<input type="checkbox"/>	50.73(a)(2)(v)(A)	<input type="checkbox"/>	73.71(a)(4)	<input type="checkbox"/>		
	20.2203(a)(2)(iv)	<input type="checkbox"/>	50.46(a)(3)(ii)	<input type="checkbox"/>	50.73(a)(2)(v)(B)	<input type="checkbox"/>	73.71(a)(5)	<input type="checkbox"/>		
	20.2203(a)(2)(v)	<input type="checkbox"/>	50.73(a)(2)(i)(A)	<input type="checkbox"/>	50.73(a)(2)(v)(C)	<input type="checkbox"/>	OTHER	<input type="checkbox"/>		
	20.2203(a)(2)(vi)	<input type="checkbox"/>	50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/>	50.73(a)(2)(v)(D)	<input type="checkbox"/>	Specify in Abstract below or in NRC Form 366A	<input type="checkbox"/>		

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME B.G. Davenport, Regulatory Compliance Manager	TELEPHONE NUMBER (Include Area Code) (864) 885-3044
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	EK	CNTR	G080	Y					

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE		
YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO		MONTH	DAY	YEAR

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On 5/24/2005, with all three Oconee Units at 100% power in Mode 1, Oconee Operations and Engineering concluded that both Keowee Emergency Power Paths could be lost following certain single failures. An electrical contactor failed in the "Normal" supply to the cooling system of the Main Transformer, which is in the Overhead Path. The "Back up" supply from the redundant Underground Path closed automatically. This line up would allow loss of both Emergency Power Paths on certain single failures. At 1350 hours TS 3.8.1 condition C was entered. The system was realigned and the TS condition was exited at 1540 hours.

An investigation determined that the unacceptable alignment had existed since 0820 on 4/21/2005. Operations personnel found parts from the contactor on 5/3/2005, notified their supervision but it was assumed the parts were from a different component with a known problem and did not take further action.

Root Causes are 1) the operability assessment failed to detect inadequate train separation 2) failure of the operator to verify his assumption. The component failed primarily due to age. It is obsolete and a suitable replacement is on order.

This event is considered to have no significance with respect to the health and safety of the public.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Oconee Nuclear Station, Unit 1	05000269	2005	01	00	2 OF 11

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

EVALUATION:

BACKGROUND

This event is reportable per 10CFR 50.73(a)(2)(i)(B) as operation in a condition prohibited by Technical Specifications (TS) and 50.73(a)(2)(ii)(B) as an unanalyzed condition. The event involves operation in a configuration where train independence was not maintained, creating a condition where a system failed to meet the single failure criterion. Per guidance in NUREG 1022 section 3.2.4 this constitutes an unanalyzed condition. This system is analyzed for this condition (to support the TS completion times for required actions) but the condition existed for a period substantially longer than the allowed completion time.

The Keowee Emergency Power System [EIIS:EK] consists of two Keowee Hydroelectric Units (KHU-1, KHU-2) that provide an emergency on-site power source for Oconee Nuclear Station (Oconee) via two separate and independent paths. One path is the Underground feeder through transformer CT-4 [EIIS:XFMR] and the Standby Buses [EIIS:EB] and the other is the overhead path through the Keowee Main Step-up Transformer to the 230 KV Switchyard [EIIS:FK] and the individual Oconee Unit's Start-up Transformers.

TS 3.8.1 requires both KHUs and both power paths from Keowee to be operable whenever any Oconee unit is in Modes 1 through 4. One KHU or path may be removed from service for 72 hours. Both KHUs may be inoperable for up to 60 hours for planned reasons if the standby buses are first energized from transformer CT-5 from a Lee Combustion Turbine (LCT) via the Central Switchyard using a dedicated line (the Lee path). This last limiting condition for operation is reduced to 24 hours if both KHUs are inoperable for unplanned reasons and the LCT is aligned to the Standby Bus within 1 hour. In addition, TS 3.8.2 requires one KHU or LCT and its emergency power path to be operable for any Oconee unit in modes 5 and 6.

Per the Bases for TS 3.8.1, either KHU can be tied to the underground or overhead power path. The normal lineup is to dedicate one KHU to the underground emergency power path by closing Air Circuit Breaker (ACB) -3 or 4 and to align the other KHU to the overhead power path through ACB-1 or 2.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Oconee Nuclear Station, Unit 1	05000269	2005	01	00	3 OF 11

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

The Bases for TS 3.8.1 indicate that the Overhead path KHU receives auxiliary power via Keowee's Main Step-up Transformer through ACB-5, auxiliary transformer 1X, and 600 VAC Load Centers 1X (KHU-1) or through ACB-6 to transformer 2X and Load Center 2X (KHU-2). Similarly, the Underground Path receives auxiliary power from Oconee Unit 1 via transformer CX through ACB-7 to auxiliary transformer 1X (KHU-1) or through ACB-8 to 2X (KHU-2).

Each Keowee Unit can start and accelerate without AC power from either of its auxiliary sources. This condition is known as a "Black Start."

Prior to this event Oconee Units 2 and 3 were operating at 100% power in Mode 1 with no safety systems or components out of service that would have contributed to this event. Unit 1 was in Mode 5 for a refueling outage. Subsequently, Oconee Unit 1 made the following Mode changes:

- 5/10/2005 9:42:22 PM Entered Mode 4
- 5/11/2005 9:20:02 AM Entered Mode 3
- 5/14/2005 5:21:00 PM Entered Mode 2
- 5/15/2005 11:30:00 AM Entered Mode 1

Thus Unit 1 entered the mode of applicability for TS 3.8.1 on 5/10/2005. These Mode changes did not impact the event described below.

EVENT DESCRIPTION

On 5/3/2005 Keowee Operator "A" (KO A) discovered parts of an electrical contactor [EIIS:CNTR] in the bottom of the control cabinet for the Keowee main step-up transformer. KO A reported this to Keowee Supervisor "B" (KS B). Both of these individuals are unlicensed personnel. Together they returned to the cabinet to assess the condition.

Several electrical contactors are located within the cabinet, but are hidden from view behind a closed inner sub-compartment door. One of several fan bank control contactors had a known problem with an open maintenance work order for its repair. KO A and KS B assumed the parts to be from that contactor, took no action to verify this initial assumption, and therefore took no actions at that time to initiate additional investigation or repairs.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Oconee Nuclear Station, Unit 1	05000269	2005	- 01	- 00	4 OF 11

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

On 5/19/2005 a Nuclear Maintenance Team was replacing a cooling fan on the Keowee main step-up transformer. KO A showed the contactor parts to the maintenance technicians, who determined that the parts came from the Keowee main step-up transformer auxiliary power "Normal source" transfer contactor, which supplies power to the transformer cooling system fans and pumps. At the time, power was being supplied from the "back-up" source via another contactor. A work order and Problem Investigation Process (PIP) 05-3599 were initiated to document the broken contactor.

As part of the PIP documentation, Oconee Operations requested an Operability assessment for the Keowee main step-up transformer on 5/19/2005. Electrical Component Engineer "C" (ECE C) performed the assessment but focused on the requirements of the transformer. ECE C concluded that the transformer was operable because auxiliary power remained available to the transformer cooling system via the back-up source. The Operations Shift Manager (a licensed SRO) concurred.

At 1855 hrs on 5/23/2005, Electrical Engineering evaluated a postulated failure of the back-up source concurrent with an assumed design basis event if Keowee was initially generating to the grid such that the transformer was at operating temperature. In such a condition the transformer could be operated for only one hour before reaching temperature limits. As a result, Oconee conservatively elected to restrict Keowee Grid operation temporarily.

Also on 5/24/2005, Maintenance Support personnel suggested that Keowee Operations tag the contactor out of service and physically disable it to prevent it possibly causing additional damage if it received a close signal in its condition.

On 5/24/2005, while preparing safety tags to remove the contactor from service, Keowee Operators questioned if the resulting configuration could violate train independence criteria for the Emergency Power Path alignment.

Electrical Engineering personnel were consulted and recognized that the existing alignment allowed a single failure of the 2XA motor control center for KHU-2, the KHU aligned to the Underground path, to also result in loss of Main Transformer cooling on the Overhead power path. As a result, at 1350 hours Operations declared entry

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Oconee Nuclear Station, Unit 1	05000269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5	OF 11
		2005	- 01	- 00		

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

for all three Oconee Units into TS 3.8.1 Condition C for the Overhead power path being inoperable (a 72 hour allowed completion time).

The immediate corrective action was to change which Keowee unit was aligned to which path. Therefore, KHU-1 was aligned to the underground path and KHU-2 was aligned to the overhead path. At 1540 hours Operations declared both paths operable and exited the TS condition. Also, the KHU-1 normal transformer feeder breaker was opened.

On 5/25/2005 Operations and Engineering removed the restriction on normal operation to the grid.

The contactor is obsolete and an equivalent replacement was not readily available from vendors. A suitable replacement has been identified and ordered. It will be installed following receipt.

Subsequent to this event, an investigation team used computer records to conclude the normal power source transfer contactor closed properly during a routine realignment on 4/4/2005 at approximately 1542 hours. At the end of the evolution the contactor opened and it is presumed that the parts broke off at that time. During subsequent challenges, power was restored via the back-up source contactor after intervals ranging from 5 to 40 seconds. The only indication was a loss of cooling flow alarm which cleared immediately upon restoration of power. However, KHU-1 was aligned to the Underground path, which is the acceptable configuration, until 4/21/2005. At 0820 hours on that date, KHU-1 was realigned to the overhead path using OP/0/A/2000/044. Although not recognized at the time, this alignment subjected both power paths to a single-failure.

The appropriate action for this condition is TS 3.8.1 condition C, required action C.1, which requires an operability check for the newly aligned underground unit within one hour. However, OP/0/A/2000/044 does not require an operability check following a routine swap. Therefore TS non-compliance began at 0920 hours when the allowed completion time was exceeded for TS 3.8.1 required action C.1 (perform an Operability verification surveillance). Required actions C.2.2.1 - C.2.2.4 were also not met due to failure to recognize entry into the TS condition.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Oconee Nuclear Station, Unit 1	05000269	2005	- 01	- 00	6	OF 11

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

As mentioned in the Background section above, the Lee path performs the same safety function as Keowee, and can be aligned per TS as a compensatory action when Keowee is not operable. The Lee path was available during this event except for a period from 1530 hours on 5/8/2005 until 0510 hours on 5/13/2005. During that interval Transformer CT-5 and the Lee path were out of service for scheduled Preventative Maintenance (PM).

In addition, Oconee has a Standby Shutdown Facility (SSF) which can be used to maintain one or more units in Mode 3 for certain scenarios as credited in the Oconee licensing basis. The SSF power system (diesel) provides an alternate source of emergency power for those scenarios. The SSF power system was available throughout this event until 5/24/2005. On 5/24/2005 at 0815 hours, the SSF diesel was removed from service for PT/O/A/0400/11 (Diesel Generator Performance Test). At 1049 hours, the SSF diesel was returned to service. At 1303 hours, the SSF Diesel Generator was started per OP/O/A/1600/010 enc. 4.16 "Testing of the SSF Diesel Generator." However, at 1415 the SSF Diesel Generator tripped on actuation of the generator lockout relay and remained inoperable until well after 1540 hours when the Keowee event terminated.

CAUSAL FACTORS

Root Cause #1 - The engineer performing the operability assessment did not consider the system alignment impact on transformer operability with only one power source available to the transformer.

No analysis had documented the requirement that the Keowee main transformer cooling power either must be able to transfer between power sources or must be aligned specifically to the KHU aligned to the overhead path.

The interaction of the transformer cooling power and the alignment of the Keowee Units to the emergency power paths had not been identified and documented prior to this occurrence.

The fact that this interaction had not been recognized impacted this event in several ways:

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Oconee Nuclear Station, Unit 1	05000269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	7	OF 11
		2005	- 01	- 00		

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

1. No alarm or procedure guidance exists to verify availability of both power sources. A test that would have detected this failure is conducted every eighteen months but was last performed in September 2004. Therefore the failure on 4/4/2005 was not detected in a timely manner.

2. No Design Basis Document, training material, or Engineering document properly describes the required function. Therefore, even after the failure was discovered, its significance was not properly recognized. ECE C and the Operations Shift Manager performing the Operability Assessment reached the wrong conclusion because they did not know that required redundancy had been lost.

Root Cause #2 - The Keowee Supervisor did not verify the origin of the parts found in the transformer control cabinet.

The KO A had opened the transformer control cabinet door to perform a routine alignment change. While performing this task, the operator observed parts from a contactor had fallen into the bottom of the control cabinet. He notified KS B. Both made the assumption that the part was from a near-by component with a known problem and which had an outstanding Work Order for its repair. KS B failed to assure that the assumption was properly verified and, as result appropriate subsequent actions were not initiated. Therefore, even after discovery of parts indicating a failed component, the condition was allowed to exist for a period of time longer than permitted by TS.

Contributing Cause - Equipment Failure Due to Aging along with heat fluctuation

The broken contactor parts were a plastic plunger within the contactor coil and an attached relatively large piece of metal which, when closed, becomes part of the magnetic core of the contactor relay. Apparently the plastic plunger weakened over time, with thermal expansion/contraction caused by heat fluctuation being a factor in the degradation. Once weakened, it is postulated that the weight and force of the core while opening when de-energized was sufficient to break the plastic plunger and allow the core portion of the assembly to fall. Further investigation will be performed after the contactor is removed.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Oconee Nuclear Station, Unit 1	05000269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	8	OF 11
		2005	- 01	- 00		

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

The equipment failure of the contactor is not considered a root cause of the reportable event because component failures are anticipated. TS provide appropriate action times to allow for timely corrective action of such failures. If proper action had been taken within the TS action time, this event would not be reportable.

CORRECTIVE ACTIONS

Immediate:

1. The KHUs were realigned to the opposite power paths. This aligned the KHU supplying power to the Main Transformer cooling fans to the Overhead path. The KHU serving as the power source to the failed contactor was aligned to the Underground path.

Subsequent:

1. A replacement contactor was identified and ordered.
2. Oconee conservatively elected to restrict Keowee Grid operation temporarily.

Planned:

1. A suitable replacement contactor will be installed following receipt.
2. Following removal, continue the investigation of the failed contactor and document findings.
3. Evaluate Keowee equipment with power sources from both Keowee Units and logic that is power path specific to determine if there are any Keowee Unit alignment vs. path issues.
4. Update Keowee System Design Basis Document and other documents as necessary to reflect the required functions of these power contactors and the impact of failures on the emergency power paths.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Oconee Nuclear Station, Unit 1	05000269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	8 OF 11	
		2005	01	00		

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

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LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Oconee Nuclear Station, Unit 1	05000269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	9	OF 11
		2005	- 01	- 00		

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

- Provide guidance to control and verify proper operation and alignment of the Keowee Main Transformer power supply contactors.

The corrective actions indicated above are NOT considered NRC Commitment items. There are no NRC Commitment items contained in this LER.

SAFETY ANALYSIS

One actual single failure occurred associated with this event. However, due to the failure to recognize that failure and take appropriate corrective actions, Oconee continued to operate from 0820 hours on 4/21/2005 until 1540 hours on 5/24/2005, a period of 33 days, in a condition where an additional single failure could have resulted in a loss of both KHU emergency power paths. Because this period exceeds the TS allowed action time for one power path to be inoperable, Oconee considers that an additional single failure must be postulated for the purpose of this analysis.

If the postulated additional single failure (resulting in the loss of auxiliary power to KHU-2) occurred during a design basis event, it is expected that, without credit for Operator intervention, both emergency power paths could fail. The overhead path could fail due to loss of cooling to the Main Step Up transformer and the underground path could fail due to loss of hydraulic control pressure for the wicket gates resulting in loss of frequency control. However, these failure modes are not expected to result in power path failures until a minimum of one hour after the loss of auxiliary power. During this time Operations would have been able to realign KHU-1, the KHU with auxiliary power available, to the Underground path and/or to have started and aligned a LCT via the Lee path. Guidance to perform these actions is contained within appropriate normal and emergency procedures. Therefore, the condition being reported did not result in a loss of safety function.

The Design Basis Event scenario for this postulated event requires the following events to occur simultaneously:

- a Loss of Coolant Accident (LOCA) on one of the three Oconee units in progress,

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Oconee Nuclear Station, Unit 1	05000269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	10	OF 11
		2005	- 01	- 00		

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

- 2. a Loss of Off site Power (LOOP) event where the 230 Kv switchyard is separated from the grid,
- 3. a fault within the 2XA motor control center.

Due to the low probability of the simultaneous occurrence of these three conditions, and due to the time available, and high probability and ease of performing the mitigating operator actions, the risk associated with this Design Basis Event scenario is considered low.

In terms of the Probabilistic Risk Assessment results, the principle scenarios are:

- 1. A Loss of Off site Power (LOOP) event occurs,
 - 2. Recovery of offsite power is unsuccessful,
 - 3. A fault disables the 2XA motor control center, and
 - 4a. The SSF is unavailable, which leads to a Reactor Coolant Pump seal LOCA.
- OR
- 4b. The emergency feedwater system [EIIS:BA] fails, resulting in a loss of all secondary side heat removal.

A risk assessment of this event determined that the impacts on the estimated Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) were not significant.

Therefore, the event described in this LER was not significant with respect to the health and safety of the public.

ADDITIONAL INFORMATION

There have been no similar failures of contactors at Oconee Nuclear Station. A data base search was performed for similar events with similar root causes within the previous three years. None were found; therefore this is not a recurring event.

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

This event is considered reportable under the Equipment Performance and Information Exchange (EPIX) program. The failed component is a contactor, Part Number CR109E000ALD, made by General Electric.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Oconee Nuclear Station, Unit 1	05000269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	11 OF 11	
		2005	- 01	- 00		

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

Energy Industry Identification System (EIIS) codes are identified in the Text within brackets [EIIS:xx].