

FACILITY NAME (1) Oconee Nuclear Station, Unit One DOCKET NUMBER (2) 05000269 PAGE (3) 1 OF 9

TITLE (4) Potential Operation Outside Design Basis For Appendix R Fire Due To An Inadequate Procedure

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)	
03	19	98	98	07	00	04	17	98	Oconee, Unit Two	05000270	
									Oconee, Unit Three	05000287	

OPERATING MODE (9) N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (Check one or more of the following) (i1)																				
POWER LEVEL (10) 87%	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(i)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	<input type="checkbox"/> 50.73(a)(2)(x)	<input type="checkbox"/> 73.71(b)	<input type="checkbox"/> 73.71(c)	<input type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A)

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

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)
 YES (f yes, complete EXPECTED SUBMISSION DATE) X NO
 EXPECTED SUBMISSION DATE (15) MONTH DAY YEAR

ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines) (16)
 On March 17, 1998, Unit 1 was at approximately 87% full power, Unit 2 was in a refueling outage, and Unit 3 was at 100% full power. During a review of Operations procedures for the Improved Technical Specification Project, it was recognized that performance of the damage assessment procedure following an Appendix R fire could possibly damage valves LP-1, LP-2, CF-1 and CF-2. A Problem Investigation Process Report was initiated to evaluate the apparent discrepancy. On March 19, 1998, engineering concluded that procedural guidance following a specific fire might prevent the plant from being able to achieve cold shutdown. Should the Appendix R fire damage the insulation of a control conductor from a specific valve cable in such a manner that only two specific conductors short together in the eight conductor cable, the valve might fail to operate. The procedure was placed on administrative hold to ensure that it is not used, without notifying engineering, until appropriate corrections are made. Current operations are not affected by the procedure since it is only used to assess damage following an Appendix R fire. The root cause is written communication; content; technical inaccuracies. Corrective actions include revising the procedure and reviewing other components for similar problems.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (6)

PAGE (3)

Oconee Nuclear Station, Unit One

05000 269

YEAR

SEQUENTIAL
NUMBERREVISION
NUMBER

98

07

00

2 OF 9

EVALUATION:

Background

Valve LP-1 (Low Pressure Injection/Reactor Coolant System Isolation Valve) and Valve LP-2 (Low Pressure Injection Hot Leg Suction Isolation Valve) are motor operated valves in series. They isolate the Reactor Coolant System [EIIS:AB] from the Low Pressure Injection System [EIIS:BP]. These valves are located inside the Reactor Building [EIIS:NH] and are normally in the closed position. They are required to open to establish normal decay heat removal when going to cold shutdown conditions.

There are two Core Flood Tanks per Unit at Oconee that are part of the Emergency Core Cooling System [EIIS:BP]. Each tank is pressurized with approximately 600 psig of nitrogen which is intended to force borated water into the reactor vessel if pressure in the Reactor Coolant System drops below 600 psig following an event. Each tank has an electric motor operated outlet valve CF-1 (Core Flood Tank A Outlet Valve) and CF-2 (Core Flood Tank B Outlet Valve). During normal operation, these valves are open with their breakers locked open. The valves are required to be closed during a normal shutdown to cold shutdown to prevent the Core Flood Tanks from discharging to the reactor vessel.

10 CFR 50 Appendix R, Section III.G.1, states that fire protection features shall be required for structures, systems, and components important to safe shutdown. These features shall be capable of mitigating fire damage so that one train of systems, necessary to achieve and maintain a hot shutdown condition, remains operable from either the control room or alternate shutdown location(s).

Oconee Appendix R fire scenarios are mitigated either from the unit's main control room or from the Standby Shutdown Facility (SSF) [EIIS:NB]. Cold shutdown is required to be established within 72 hours of an Appendix R fire. The fire scenario in which the main control room becomes unavailable and the SSF is activated employs the use of an "Appendix R Damage Repair Valve Control Panel" to aid in achieving cold shutdown from hot shutdown on one or more of the three Oconee Units. Each unit's panel contains controls for valve positioning of several valves including LP-1, LP-2, CF-1 and CF-2.

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

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

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Oconee Nuclear Station, Unit One	05000 269	98	07	00	3 OF 9

Description of Event

On March 17, 1998, as a part of the Improved Technical Specification Project, Operations staff personnel were in the process of performing a review of Operations procedures. During the review of OP/0/A/1102/024, "Operational Guidelines Following a Fire in the Auxiliary Building, Turbine Building, or Vital Area", it was discovered that operators were directed to verify power to certain valves. To perform the verification, operators would need to close breakers that are open. This was intended to verify whether or not cable replacement would be needed. A concern was identified to engineering that closing the breakers might potentially damage equipment and/or prevent the achievement of cold shutdown within 72 hours.

A Problem Investigation Process Report was initiated and Engineering was contacted to determine the possible effect on the systems assuming operators performed the procedure as written.

On March 18, 1998, the operations procedure was conservatively placed on hold pending further evaluation of the potential problem. Interim guidance was issued to require notification of engineering personnel prior to using procedure OP/0/A/1102/024. Current plant operation was not impacted by the procedure problem since it would only be used to assess damage following an Appendix R fire.

On March 19, 1998, an engineering analysis of the affected components concluded that valves LP-1, LP-2, CF-1 and, CF-2 could be adversely affected.

If the fire was a "smart" fire, it could selectively damage or short certain conductors in the control cable between the Control Room and the Electrical Equipment Room, without shorting the cables to ground.

There are two specific conductors in the eight conductor control cable that, if shorted together, could cause the valve to move in a conservative or non-conservative direction. For this scenario to occur, the two conductors could not be shorted to the armor sheath or any other of the remaining six conductors. The effect of verifying the power supplies by closing the electrical breaker might render the valve(s) incapable of opening or closing electrically. Also, irreversible mechanical damage

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 9
		98	07	00	

could occur to the valve motor and to the manual gear train of the electric operator before the valve breaker trips on overload protection resulting in the valve(s) being incapable of opening or closing by normal manual methods. This is only a problem if the valve tries to position itself in the non-conservative direction.

On March 19, 1998, at 2020 hours, the NRC was notified via the Emergency Notification System. Unit 1 was at 90% full power, Unit 2 was in a refueling outage and, Unit 3 was at 100% full power.

This event was reported under 10 CFR 50.72(b)(2)(iii)(A), shutdown the reactor and maintain it in a safe shutdown condition. After further review this LER is being reported under 10 CFR 50.73(b)(1)(ii)(B), a condition outside the design basis of the plant.

On April 6, 1998, an assessment to determine the cause of the failure to recognize the procedural problem was initiated. The operations procedure for damage assessment following an Appendix R fire was originally written in 1985. In the mid 1980s the breakers were left in the closed position during all operating conditions. The procedure required checking indicating lights for LP-1, LP-2, CF-1, and CF-2 to determine valve operability. This was based on a normal practice of verifying normally de-energized components for position indication verification. This process overlooked the fact that component operation due to a fire could affect the valve operability. In 1987, the procedure was revised to require the valve breakers to be in the open position except when valves were required to be manipulated during plant shutdowns. This change was a result of information related to spurious actuations during an Appendix R fire. Although this change conservatively eliminated spurious acutations during the initial stages of a fire, it did not account for the potential spurious actuation of components during the damage assessment process.

During the investigative process for this report, it was discovered that the portions of the procedure, Damage Assessment Following an Appendix R Fire, which address CF-1 and CF-2, had not been appropriately placed on hold. Only the enclosures associated with valves LP-1 and LP-2 had been placed on hold. On April 14, 1998, the enclosure associated with CF-1 and CF-2 was placed on hold.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 9
		98	07	00	

Conclusion

The root cause of this event is Written Communication; Content; Technical inaccuracies. The procedure for damage assessment following an Appendix R fire had not considered the complete electrical circuit implications of having closed or closing breakers to verify operability of valves. The procedure has basically remained unchanged for verifying valves LP-1, LP-2, CF-1, and CF-2 during the post-fire damage assessment since 1987.

The original analyses for Appendix R fires evaluated cable and conductor failures and concluded that they were not credible for the Duke Power nuclear facilities due to armor sheathed cable construction. Subsequent to the initial Appendix R analyses, Generic Letter 86-10 was issued and addressed hot shorts. Duke evaluated the information in Generic Letter 86-10 and concluded that additional precautions related to hot shorts should be implemented for valves LP-1, LP-2, CF-1, and CF-2. Valves LP-1 and LP-2 provide a high pressure/low pressure boundary between the Reactor Coolant System and Low Pressure Injection (LPI) System. Although considered highly unlikely, a hot short that mispositioned these valves could challenge the integrity of the LPI System. Thus, measures were implemented to eliminate the potential for mispositioning of these valves during a fire. Similar measures were conservatively implemented for valves CF-1 and CF-2 since they are located inside containment. Valves LP-1, LP-2, CF-1 and CF-2 must be manipulated to achieve cold shutdown within 72 hours as required during an Appendix R fire.

Additional evaluations for valves LP-1, LP-2, CF-1, and CF-2 addressed conditions during the fire for cable and conductor failures. These evaluations took into account the position of electrical breakers pre-fire and recommended changes to preclude damage due to spurious actuations. Based on the results of the evaluation, the breaker positions were changed to be open during normal operation. However, operator breaker manipulations post-fire were not adequately addressed. The electrical breakers are closed to verify operability of the power supplies. As described previously, this method of verifying power supplies might damage the equipment so that it could not be operated in a normal manner. Thus, adequate information was not provided to Operations by Engineering at the time the procedure was revised in 1987 to comprehensively address the impact of hot shorts on the subject valves.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 OF 9
		98	07	00	

A search of the previous LERs over the last two years indicates that Appendix R LERs have occurred at Oconee (LER 269/96-03, concerning the technical inoperability of the Reactor Coolant Makeup System and LER 270/96-07, concerning the technical inoperability of the Low Pressure Injection System). Also, there have been LERs involving valves LP-1 and LP-2 (LER 270/96-01 and 269/97-03, concerning the post LOCA boron dilution design basis not being met). However, these LERs were associated with work practice or inadequate designs. Therefore, this LER is considered non-recurring.

There were no personnel injuries, releases of radioactive materials, or equipment failures associated with this LER.

CORRECTIVE ACTION:

Immediate:

- 1) Valves LP-1 and LP-2 enclosures of procedure OP/0/A/1102/024 were placed on hold. Interim guidance was provided to Operations to contact Engineering personnel for assistance in the event of a fire where post-fire damage assessment is needed.

Subsequent:

- 1) The procedure enclosures associated with valves CF-1 and CF-2 were placed on hold.

Planned:

- 1) Revise the operations procedure to prevent closing breakers, prior to a more detailed investigation, during the post Appendix R fire damage assessment.
- 2) Develop an appropriate process for circuit validation during a post Appendix R fire damage assessment. Revise appropriate procedure(s) to accomplish this process.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	7 OF 9
		98	07	00	

- 3) Determine if other valves could have similar characteristics during a post Appendix R fire event and take appropriate actions.
- 4) Implement process changes to require appropriate engineering technical reviews when procedures affecting the mitigation of an accident are written or revised.

Planned corrective actions number 1, 2, and 4 are considered to be NRC Commitment Items. These are the only NRC Commitment items contained in this LER.

SAFETY ANALYSIS:

10 CFR 50 Appendix R requires the unit to be at cold shutdown within 72 hours of an Appendix R fire.

Low Pressure Injection valves LP-1 and LP-2 are required to be opened to achieve cold shutdown conditions. Core Flood valves CF-1 and CF-2 are required to be closed to achieve cold shutdown conditions.

Following certain Appendix R events, operators are dispatched to the Standby Shutdown Facility (SSF) to achieve cold shutdown conditions. An Appendix R Damage Repair Valve Control Panel is placed in operation approximately 10 hours into an Appendix R event. If operators determined that damage was extensive enough so that the SSF was required, the control panel would be connected. The valve breakers in the plant would not have been closed to verify operability and the valves would operate using the control panel.

In the initial assessment following the fire it might be concluded that there was not significant enough damage to require use of the SSF and the Damage Repair Valve Control Panel. Operators would then begin the damage assessment as required by the procedure for operational guidelines following a fire.

If the operators closed the breaker for valve CF-1 and/or CF-2 to verify operability and damage to one of these valves resulted, this condition would be identified prior to the Core Flood Tank (CFT) contents discharging to the Reactor Coolant System (RCS). While performing the normal shutdown

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	8 OF 9
		98	07	00	

procedure, operators would identify that either CF-1 and/or CF-2 would not close before reaching the RCS pressure (600 psig) needed to start emptying the tank(s). RCS pressure could then be maintained above 600 psig until the valve could be closed and/or nitrogen pressure could be vented from the CFT.

If breaker manipulations resulted in damage to either valve LP-1 and/or valve LP-2, the unit cooldown could be continued using the SSF Auxiliary Feedwater Pump and the Steam Generators to remove decay heat. Safe shutdown conditions could be maintained via steam generator heat removal until a Reactor Building entry could be made to manually operate the valves.

The probability of hot shorts causing valve damage is low. Only a small percentage of the possible pairs of conductors shorting together in the eight conductor cable can cause valve damage. The certain pairs of conductors, which could cause valve damage by shorting together, would need to short together first without the remaining conductors shorting together. The more likely short is a short to ground between the metal jacket and any conductor close to the outside of the cable which will burn first and likely contact first. Also, it is likely that other conductors in the cable would be shorting simultaneously from the effects of the fire before damage to the valve could occur.

The potential for the precise conductor to conductor fault necessary to cause valve damage, without any other electrical faults, is estimated to be less than 2 percent. This is particularly true in this case, since the concern about valve damage is from valve actuation after the fire rather than valve actuation during the fire.

In summary, the operating procedure for fire damage assessment has the potential to cause failure of certain valves (LP-1, LP-2, CF-1 and CF-2) during the troubleshooting process. However, additional actions could eventually be taken to manually open the valves. The impact of this failure would be a delay in reaching cold shutdown conditions within 72 hours, as required by the Appendix R.

The likelihood of the necessary conditions to create this failure is considered low because the following conditions must occur:

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	9 OF 9
		98	07	00	

1. fire must occur in specific locations
2. the subject valves are not damaged by the fire
3. a "smart hotshort" of a unique set of conductors must occur

There are contingency procedures for using the SSF to maintain Auxiliary Feedwater [EIIS:BA], Reactor Coolant Makeup, and diesel generator power [EIIS:EK] for periods longer than 72 hours.

Therefore, plant safety would have been maintained in spite of the deficiency in the operating procedure.

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