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DOCKET #
 05000269

SUBJECT: LER 88-012-00: on 880809, incorrect routing of SSF incore thermocouple cables due to design deficiency.

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Oconee Nuclear Station, Unit 1										DOCKET NUMBER (2) 0 5 0 0 0 2 6 9 1										PAGE (3) 1 OF 0 7																																
TITLE (4) Incorrect Routing of SSF Incore Thermocouple Cables due to a Design Deficiency																																																				
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On August 9, 1988 at 1100 hours, with Units 1, 2, and 3 at 100% power, it was discovered that the Incore Thermocouples (ICTC) feeding the Standby Shutdown Facility (SSF) were routed through the East Penetration Room (EPR). The EPR is not expected to survive the all consuming fire postulated in Appendix R of 10CFR50 and therefore the ICTC could not be considered to be operable from the SSF. The requirements of Appendix R were reviewed and it was determined that it was necessary to have hot leg temperature indication. The ICTC are redundant to the hot leg indication and therefore not necessary for maintenance of a hot shutdown condition. The immediate actions taken were to declare the SSF inoperable. The subsequent actions were to perform an operability evaluation of the SSF, review SSF Safety Evaluation Reports, and revise the proposed TS table to add the hot leg temperature indication and to delete the ICTC. The SSF was then declared operable. The root cause of the incorrect routing of the ICTC cables was Design Deficiency, due to the lack of documentation justifying the present routing of the ICTC cables.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED CMB NO 3150-0104
EXPIRES 8/31/85

FACILITY NAME (1) Oconee Nuclear Station, Unit 1	DOCKET NUMBER (2) 05000269	LER NUMBER (3)			PAGE (3)	
		YEAR 88	SEQUENTIAL NUMBER -012	REVISION NUMBER -00	02 OF 07	

TEXT (If more space is required, use additional NRC Form 366A's) (17)

SEQUENCE OF EVENTS

February 17, 1978 NRC was informed that the Standby Shutdown Facility (SSF) cables will be routed through the West Penetration Room (WPR).

February 22, 1980 Decision made to investigate providing Reactor Coolant System (RC) [EIIS:AB] temperature indication to the SSF through use of the Incore thermocouples (ICTC) [EIIS:THC].

March 17, 1980 Oconee Nuclear Station (ONS) was provided with three (3) options for using the ICTC to provide RC temperature indication to the SSF.

April 2, 1980 ONS chose the option which has the ICTC exit containment from the East Penetration Room (EPR) and route through conduit to the WPR and then to the SSF.

February 5, 1981 Original design (wiring diagrams) for SSF related RC hot leg temperature instrumentation approved.

February 19, 1981 Appendix R of 10CFR50 became effective for ONS.

March 4, 1981 Original design (wiring diagrams) for SSF related ICTC instrumentation approved.

April 30, 1981 The SSF was identified as the ONS solution for the Appendix R requirements.

November 3, 1983 A letter was issued in Design Engineering listing equipment in ONS Reactor Building to 10CFR50 Appendix R criteria.

March 7, 1984 NRC IE Information Notice 84-09 gave option of using RC hot leg temperatures or ICTCs for minimum monitoring capabilities for safe shutdown conditions.

February 4, 1986 A design study on Vital/Protected Area Barrier Analysis was initiated.

March 19, 1986 Proposed SSF Technical Specifications issued with ICTCs identified as required SSF instrumentation.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES 8/31/95

FACILITY NAME (1) Oconee Nuclear Station, Unit 1	DOCKET NUMBER (2) 05000026988	LER NUMBER (6)			PAGE (3) 03 OF 07
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TEXT: If more space is required, use additional NRC Form 306A (11-77)

April 28, 1986 NRC safety evaluation for the SSF approved SSF as Appendix R solution and references separation of SSF cables through the WPR. ICTCs listed as monitoring instrumentation in the NRC safety evaluation.

July 25, 1988 Design study found that ICTC are routed through the EPR.

August 9, 1988 Problem Investigation Report was initiated on the incorrect routing of the ICTC cables.

August 11, 1988 Operability Evaluation for the SSF was written which allows the SSF to be operable with hot leg temperature instead of ICTC.

August 12, 1988 Proposed Technical Specification revision was submitted to the NRC which deletes the ICTC and adds hot leg temperature.

BACKGROUND

The Standby Shutdown Facility (SSF) is to be utilized in the event of fire, flood, or sabotage. The SSF provides the ability to bring either or any combination of the three units to a hot shutdown condition and maintain it for 72 hours. Due to the scenarios under which the SSF is required to be operable, there are redundant strings of minimum required instrumentation provided to the SSF. The design of the SSF provides physical and electrical separation between the SSF instrumentation and the balance of plant instrumentation. The separation is provided so that a means of achieving hot shutdown conditions is available, either through use of the SSF or the balance of plant equipment, in case of fire, flood, or sabotage. The minimum instrumentation required to be operable for the SSF is:

- 1) Reactor Coolant System Pressure
- 2) Reactor Coolant System Temperature T(cold)
- 3) Reactor Coolant System Temperature T(hot)
- 4) Pressurizer Water [EIIS:PZR] Level
- 5) Steam Generator [EIIS:SG] Level
- 6) Diesel Generator Air Start System [EIIS:LC] Pressure

Appendix R of 10CFR50 outlines the NRC requirements for recovering from a large magnitude fire. When Appendix R became effective for Oconee Nuclear Station (ONS), the SSF was designated as the means of mitigating this scenario.

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TEXT - If more space is required, use additional NRC Form 308A (11/77)

DESCRIPTION OF INCIDENT

In a February 17, 1978 response to a NRC request for additional information on cable separation criteria, it was stated that Standby Shutdown Facility (SSF) cables would be routed through the West Penetration Room (WPR) to the SSF and separated from normal equipment cabling in the EPR by a three (3) hour fire barrier. On February 2, 1980, a decision was made to look into the possibility of providing Reactor Coolant System (RC) temperature parameters to the SSF through use of the Incore Thermocouples (ICTC). This decision was made because of problems encountered with using the hot leg Resistance Temperature Device (RTD) and maintaining redundant signals to the main control room. As a result of this decision, Design Engineering provided ONS with three (3) options in a letter dated March 17, 1980. The second of these options brought the ICTC out of the EPR and then routed them through conduit to the WPR and then to the SSF. In a letter dated April 2, 1980, option 2 was chosen in a letter signed by the Instrument and Electrical Engineer. This is the method by which the ICTC were installed and routed to the SSF. This installation was later documented on Revision 1 of System Description for the SSF Reactor Coolant Makeup System Auxiliary Service Water System. Subsequently the design problems associated with providing RC hot leg temperature indication to the SSF were resolved. In early 1981, the designs for the SSF related RC hot leg temperature and ICTC instrumentation were released for installation.

On February 19, 1981, Appendix R of 10CFR50 "Fire protection program for nuclear power facilities operating prior to January 1, 1979" became effective for ONS. On April 30, 1981, the last of six (6) letters was sent to the NRC which identified the SSF as the ONS solution to the requirements of Appendix R. A letter dated January 25, 1982, was sent to the NRC, addressing NRC staff concerns. Item four (4) of these concerns dealt with cable separation criteria for the SSF with respect to Appendix R requirements. In this letter it was stated that "The control power instrumentation cabling required to maintain hot shutdown from the SSF for each reactor unit is routed through the west penetration room to their respective devices inside containment." This letter also stated that SSF cables were separated from one train of the redundant hot shutdown equipment routed through the EPR by a three (3) hour fire barrier. However, design calculations which justify the use of the conduit as a fire barrier or justify the routing of the SSF cables through the EPR could not be found.

On April 28, 1983, the Safety Evaluation Report for the SSF was issued by the NRC. This report referenced the SSF cabling required for hot shutdown through the WPR to containment. This report also listed ICTCs as minimum instrumentation to assure safe plant operation and shutdown conditions.

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On November 3, 1983 a letter was issued in Design Engineering with a list of the equipment and associated cables located within the Reactor Building which are subject to 10CFR50 Appendix R criteria. This list included the SSF related RC hot leg temperature instrumentation, but did not include the SSF related ICTCs. This letter was an internal Design letter and was never communicated to any other department or group in the Duke Power organization at that time. On March 7, 1984 the NRC issued IE Information Notice 84-09 which indicated that the minimum monitoring capability necessary achieve safe shutdown included the option of using either RC hot leg temperature or ICTCs.

On February 4, 1986, the Vital/Protected Area Barrier Analysis design study was initiated. On July 25, 1988, a letter was sent to Design Engineering-Civil from Design Engineering-Electrical which raised a concern about the routing of the ICTC cables. This letter stated that the ICTC cables were routed from the EPR instead of the WPR according to As-Built drawings and that the routing had been confirmed by a site survey on Unit 2. On August 5, 1988 a letter was sent from Design Engineering-Safety Analysis to Design Engineering-Civil which verified that the SSF related RC hot leg temperature and ICTC indication served redundant shutdown SSF functions, and that the ICTCs were not required for SSF operation. This was an internal document to Design personnel.

On August 9, 1988, ONS Compliance was notified, a Problem Investigation Report was written and the SSF was declared inoperable until resolution could be determined and implemented. On August 11, 1988 an Operability Evaluation for the SSF was completed which justified SSF operability based on the availability of hot leg temperatures through the hot leg RTD's. The as-built drawings were reviewed to verify that the hot leg cables were routed through the WPR. On August 12, 1988, the proposed amendment to Technical Specification Table 3.18-1 was revised to list the hot leg temperature as one of the minimum required instruments for the SSF and the ICTC were deleted from this table.

CAUSE OF OCCURRENCE:

The root cause of the incorrect routing of the Incore Thermocouples (ICTC) cables through the East Penetration Room (EPR) is due to a design deficiency, as a result of deficient documentation. The calculations which were performed to justify the conduit as a three (3) hour fire barrier or to justify the routing of the ICTC cables through the EPR have not been found. It was stated that the cables would be routed through the West Penetration Room (WPR) in two (2) letters to the NRC. These letters were sent in response to the NRC's request for additional information on cable separation for the SSF and the NRC concerns on Appendix R fire

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED CMS NO 3150-3104

EXPIRES 8/31/85

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protection requirements. After the initial problems with the hot leg Resistance Temperature Devices (RTD), Design Engineering resolved the problems and redesigned the system to incorporate redundant hot leg RTDs. However, at that time ICTCs had been designated as the temperature monitoring equipment in multiple documents to the NRC (and other Duke groups), including the NRC safety evaluation. Design never took the necessary action to change these documents. This decision to use the hot leg RTDs was also made after the criteria of a three hour fire barrier and separation through the West Penetration Room had been established. At this point all calculations needed to justify the routing and fire barrier criteria should have complete and on file.

It is not known whether the calculations justifying this routing were completed and lost or if they were ever performed. A weakness was also identified in the amount of time which occurred from the discovery of the misrouted cables to the notification of the station Compliance group and initiation of a Problem Investigation Report.

A review of the past three (3) years revealed that a similar reportable incident has occurred in the past (LER 269/87-02). Therefore, this incident is listed as a recurring event. This is based on the fact that the previous incident was a similar event with the same root cause. Design Deficiency was cited as the root cause in LER 269/87-02 (10CFR50 Appendix R, Failure to Meet Hi/Lo Pressure Interface Requirements of Generic Letter 81-12, Due to Design Deficiency). The misrouted cables occurred prior to this event and therefore the corrective actions on that report had not been implemented at the time of this incident. As a result of that incident, the Topform program was implemented which should minimize the chances of a similar incident in the future. This program requires formal documentation of changes in design scope, engineering decisions, and design inputs, as well as Design Engineering interface with station personnel.

Since this event did not involve a Component Failure/Malfunction it is not NPRDS reportable. No radioactive material releases, radiation exposures or personnel injuries occurred as a result of this incident; therefore, the health and safety of the public were not affected.

CORRECTIVE ACTIONS

The immediate correction action was to initiate Problem Investigation Report (PIR) and declare the Standby Shutdown Facility (SSF) inoperable.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMS NO. 3150-0104

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Subsequent corrective action was to:

- Perform an Operability Evaluation for the SSF determining that the facility could perform its function using Reactor Coolant System Temperature T(hot) in place of the Incore Thermocouples;
- Submit a revision to proposed Technical Specification Table 3.18-1 to include Reactor Coolant Temperature T(hot) and delete Incore Thermocouples;
- Review SSF Safety Evaluation Reports (SER) and conclude that T(hot) is an acceptable substitute for Incore Thermocouples and that no revisions to the SSF SERs are needed;
- Design reviewed ONS Technical Specifications, SSF design basis documents, and the Mechanical Systems list to ensure that all cable routes for required SSF equipment and instrumentation are routed correctly;

Planned corrective actions are for:

- Design Engineering to review this report and stress the importance of prompt notification to Station Compliance groups whenever equipment operability concerns are raised.

ANALYSIS OF OCCURRENCE:

There were no incidents which required utilization of the SSF during this incident. Subsequent actions found that it was necessary to have the Reactor Coolant System (RC) Temperature T(hot) indication rather than Incore Thermocouples. It was also verified that T(hot) was correctly routed and therefore would have been available in the case of an Appendix R fire. There were no unplanned safety system actuations and no safety limits were exceeded. There were no exposures, radiation releases or injuries associated with this event. The health and safety of the public were not affected.

Duke Power Company
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Hal B. Tucker
Vice President
Nuclear Production
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DUKE POWER

March 21, 1989

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

Subject: Oconee Nuclear Station
Docket No. 50-269, -270, -287
LER 269/88-12

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/88-12 concerning the incorrect routing of standby shutdown facility incore thermocouple cables.

This report is being submitted on a voluntary basis and is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

PJN/390

Attachment

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