



**Commonwealth Edison**

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RLB-90-130

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Reference: Quad Cities Nuclear Power Station  
Docket Number 50-265, DPR-30, Unit Two

Enclosed is Special Report 04-02-90-016, Revision 00, for Quad Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 50.46: The licensee shall report the nature of any significant change to or error discovered in the limiting emergency core cooling system (ECCS) analysis and its estimated effect.

Respectfully,

COMMONWEALTH EDISON COMPANY  
QUAD CITIES NUCLEAR POWER STATION

R. L. Bax  
Station Manager

RLB/MJB/eb

Enclosure

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The acceptance criteria for the time delay was 20 + 5 seconds. This criteria was provided by the Nuclear Engineering Department (NED) in a November 7, 1989 letter. The letter was written in response to a discrepancy noted while testing Modification 4-1-88-6. This modification was installed so that MCC 18/19-5 would transfer, if required, upon a loss of DC power. During the modification testing the transfer was timed at 25 seconds. The modification approval letter stated that the transfer time should have been approximately 15 seconds. NED provided a letter stating that the relay [RLY][62] setpoint and acceptance criteria was 20 ± 5 seconds.

On April 12, 1990, NED was asked to evaluate the 38.99 second time delay transfer. At 1545 hours, after conversations with Nuclear Fuel Services (NFS) and General Electric (GE), it was suspected that the time delay was outside the design basis for a loss of coolant accident (LOCA) analysis. The NRC was notified at 1836 hours using the Emergency Notification System (ENS) phone in accordance with 10CFR50.72 (b)(2)(i). It was later determined that this event did not fall under the 10CFR50.72 notification requirement, since it was an unanalyzed condition which did not significantly compromise plant safety. On April 25, 1990, this event was determined reportable in accordance with 10CFR50.46 as a Special Report. Electrical Maintenance Department (EMD) personnel removed the relay [RLY] [62], reset it to its nominal 20 second setting, and returned it to service. On April 14, 1990, at 1023 hours, QTS 170-12 was performed again on MCC 28/29-5 with an acceptable transfer time delay of 21.3 seconds.

C. APPARENT CAUSE OF EVENT:

This event is being reported in accordance with 10CFR50.46: The licensee shall report the nature of any significant change or error discovered in the limiting Emergency Core Cooling System (ECCS) analysis and its estimated effect. A significant change or error is one which results in a calculated peak fuel cladding temperature different by more than 50°F from the temperature calculated for the limiting transient using the last acceptable model, or is a cumulation of changes and errors such that the sum of the absolute magnitudes of the respective temperature changes is greater than 50°F. The licensee shall provide this report within 30 days and include a proposed schedule for providing a reanalysis or taking other action as may be needed to show compliance with 50.46 requirements.

This report will also serve as the final report for Potentially Significant Event (PSE) 90-07.

The cause of this event was setpoint drift. The cause of the time delay drift was utilizing a CR2820 relay in this application. GE SIL 230, Rev. 2, identified that these relays have a tendency to increase the time delay after long periods in a de-energized condition. GE recommended replacing these relays with an Agastat relay.

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A contributory cause was the fact that the LOCA analysis had changed without adequate review. When the LOCA analysis was changed from NEDO 24146A to SAFER/GESTR, the limiting condition changed from the failure of the RHR injection valves to failure of HPCI or a DG. With the RHR injection valve failure, MCC 18/19-5(28/29-5) feed transfer time did not need to be considered. With the failure of a DG as one of the limiting conditions, the transfer time became a significant part of the analysis. The SAFER/GESTR analysis became effective on June 22, 1988 for Unit 2.

There was an inadequate review of SIL 230. The relays were not identified when other CR2820 relays were replaced under modification M4-1(2)-84-33.

D. SAFETY ANALYSIS OF EVENT:

This relay being set at 38.99 seconds allowed operation in an unanalyzed condition. The SAFER/GESTR analysis assumes 58 seconds, which includes the following:

1. 13 seconds for the Diesel Generator to come up to speed and load on to the bus.
2. 45 seconds for the Reactor Recirculation (Recirc) (RR) [AD] pump [P]-discharge valve [V] to close. The Recirc pump discharge valve is required to go closed on the loop which the Low Pressure Coolant Injection System (LPCI) [BO] is injecting into to ensure that the flow is into the vessel [VSL][RPV].

The following times are actual stroke times for the Recirc pump discharge valves:

1. 1-202-5A 23 seconds
2. 1-202-5B 26 seconds
3. 2-202-5A 23 seconds
4. 2-202-5B 24 seconds

Using the actual stroke times rather than the assumed times, Unit 1 has a LPCI injection time of 51 seconds which includes 25 seconds for the relay setting and 26 seconds for the slowest Recirc pump discharge valve. Unit 2 had a LPCI injection time of 63 seconds which included 39 seconds for the as-found relay setting and 24 seconds for the slowest Recirc pump discharge valve.

The Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limits are calculated in the SAFER/GESTR analysis. If the MAPLHGR limits were exceeded and a LOCA were to occur, the peak cladding temperature could exceed 2200°F. 2200°F is the point at which a self-sustaining zirc-water reaction occurs.

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GE did an analysis to verify a 75 second LPCI injection time would not allow the peak cladding temperature to exceed 2200°F. The following is a table in °F that compares the analyzed peak cladding temperature (PCT) to the PCT if a 75 second time delay is assumed.

	58 sec. PCT	75 sec. PCT	LIMIT PCT
NOMINAL	828	980	
APP K	1377	1660	2200
UPPER BOUND	1275	1430	1600
LICENSING	1383	1670	

Calculations show a probability of a simultaneous LOCA, LOOP, and failure of the unit diesel to supply the bus is less than  $2 \times 10^{-7}$  events per year.

Before June 22, 1988, the limiting condition for the LOCA analysis was failure of the Residual Heat Removal (RHR) [BO] injection valves. The time delay for MCC 18/19-5(28/29-5) was part of the LOCA analysis before June 22, 1988.

The consequences of this event are minimal because with a time delay of 75 seconds, the PCT is well below the PCT limits. In this event, a time delay of 63 seconds was found, which provided an additional margin to the PCT analyzed.

**E: CORRECTIVE ACTIONS:**

The relay time was adjusted and at 1023 hours on April 14, 1990, QTS 170-12 was performed. During this surveillance the relay was timed at 21.3 seconds.

The Unit 2 relay was replaced on May 1, 1990 with an Agastat relay. QTS 170-12 was repeated and the Agastat relay timed at 21 seconds.

A Justification for Interim Operation was written for Unit 1 on April 12, 1990. The basis for the Justification for Interim Operation was that the Recirc pump discharge valves are assumed to close in 45 seconds for the SAFER/GESTR analysis. Actual closure time is 26 seconds for the slowest valve. The time on Unit 1 is 51 seconds which is less than the 58 seconds assumed in the analysis.

The time delay relays for MCC 18/19-5 will be replaced with an Agastat relay under work request Q83923 (NTS 2652009001601).

NFS has committed to formulating a plan to prevent recurrence of the inadequate review of the analysis (NTS 2652009001602).

QTS 170-12 will be revised so that the Recirc pump discharge valve stroke time is considered. The Recirc pump discharge valve stroke time and the time delay relay setpoint will be added so that the analyzed time is not exceeded (NTS 2652009001603).

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A search will be made for other CR 2820 relays that were overlooked during Modification 4-1(2)-84-33 (NTS 2652009001604).

Substantial improvements have been made in the review of SILs since SIL 230 was issued. The programmatic improvements in place now will prevent this event from occurring in the future.

10 CFR 50.46 requires formulating a plan after finding a greater than 50°F error in the LOCA analysis. In this case the corrective action was to reset the time delay to within the 20+5 second tolerance, so that the greater than 50°F error no longer exists. Since the error in the LOCA analysis no longer exists, a re-analysis is not required.

F. PREVIOUS EVENTS:

The drift problem on the CR 2820 relays had previously been identified as a station and industry problem. Modification M4-1(2)-84-33 had replaced other CR 2820 relays.

Based on the corrective actions completed and to be completed, no further action is deemed necessary.

G. COMPONENT FAILURE DATA:

The failed relay was a General Electric relay, part number CR2820B127AA2, Manufacturers number 36080A.