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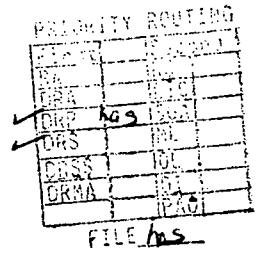
October 17, 1989



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Mr. A. Bert Davis
Regional Administrator
U.S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

Subject: Dresden Station Units 2 and 3
Quad Cities Station Units 1 and 2
Postulated Voltage Regulator Failure
on Emergency Diesel Generators
NRC Docket Nos. 50-237/249 and 50-254/265

Mr. Davis:

At the request of Mr. E.G. Greenman, enclosed are two evaluations related to the subject low probability failure scenario which has potential impact on ECCS equipment availability. Both Quad Cities and Dresden Stations made voluntary ENS notification on October 12, 1989 after determining that our emergency power configurations would also be susceptible to the postulated scenario (recently identified by Northern States Power Company).

Attachment A documents the Commonwealth Edison Company assessment that reasonable assurance of safety is maintained despite the susceptibility of the Dresden and Quad Cities designs to this very low probability (approximately 10^{-8}/yr.) event. Attachment B presents the associated probability evaluation.

Your staff has been provided with copies of the temporary procedure changes which have been implemented to direct operator actions to mitigate the postulated event at Dresden and Quad Cities, respectively. Based on input from R.M. Lerch, the procedures are currently being revised to incorporate several improvements. In addition, tailgate sessions have been conducted at both stations to assure proper awareness by operating personnel.

As discussed with your Staff and the respective NRR Project Managers, CECo will provide our plans to eliminate this design deficiency and schedules for implementation as part of the voluntary LER to be submitted within 30 days.

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In the interim, the Region and NRR will be kept informed of our progress and, specifically, the feasibility of corrective measures during the current Quad Cities Unit 1 outage and the near term Dresden 3 outage will be addressed.

Please contact this office should further information be required.

Very truly yours,

J A Silady

J.A. Silady
Nuclear Licensing Administrator

lm

Attachments

cc: E.G. Greenman - Region III
T.M. Ross - Project Manager, NRR
B.L. Siegel - Project Manager, NRR
S.G. DuPont - Senior Resident Inspector, Dresden
R.L. Higgins - Senior Resident Inspector, Quad Cities

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ATTACHMENT A

Assessment of Reasonable Assurance of Safety

The LPCI/RHR swing bus transfer circuit has been identified as susceptible to degraded diesel generator output such that transfer may not occur when required. This scenario is of minimal safety significance for the following reasons:

1. The sequence of events postulated is unique and extremely remote. First, a design basis LOCA must occur; second, a loss of offsite power (LOOP) must occur; and third, the diesel generator output must degrade to a point where equipment function is affected, but the voltage remains above the dropout point for the contactor in the LPCI swing bus transfer circuit. To be of concern, this degradation must occur after the diesel generator is powering the emergency bus. The degradation must also occur before the LPCI injection valve is open. This time window is less than 40 seconds for the bounding case. Not only is the probability of these events occurring individually over the life of the plant low; the probability of them occurring simultaneously, within the short time window necessary for diesel degradation to be of concern, is judged to be extremely low (upper bound of 1.2×10^{-8} to 3×10^{-8}). An analysis of the probability of these events follows this assessment.

2. Surveillances are performed monthly per the Technical Specifications to assure diesel generator operability. Surveillance on the diesel auto start and load, including the LPCI swing bus transfer, is performed each refueling outage.

3. The diesel generators are monitored continuously during diesel operation. Significant degradation in the DG output will result in a control room alarm to alert the operator. Monitored parameters include both voltage and frequency. In addition, bus undervoltage is alarmed separately in the control room.

4. Both Dresden and Quad Cities have implemented procedures which provide the operators with symptoms by which to recognize the failure of the LPCI injection valve swing bus to transfer when required. Immediate and subsequent operator actions to diagnose the condition and effect a transfer from the degraded source are provided in these procedures.

In summary, the postulated accident scenario is of minimal safety significance due to:

- the extremely unlikely sequence of events which must occur in a very narrow time period (probability on the order of 10^{-8}).

- regular surveillances which would detect diesel generator voltage/frequency degradation.

- continuous monitoring of key diesel generator parameters via control room alarms during diesel operation.

- interim procedures implemented to mitigate the concern.

Due to these mitigating factors, reasonable assurance of safety exists for the Dresden/Quad Cities LPCI/RHR swing bus.

ATTACHMENT B

Probability Analysis of Degraded Diesel Generator Output

This analysis estimates the probability of simultaneous large LOCA, loss of offsite power, and degraded voltage failure of the emergency diesel generator. It is based on the Dresden/Quad Cities specific designs, and on failure data from IEEE-500-1984. The failures of interest are those which result in bus voltage outside the range in which the LPCI equipment and the LPCI swing bus transfer logic will operate satisfactorily.

IEEE-500, page 94, provides a failure rate for voltage regulators of 7.11 x 10(-6)/hr for all failure modes. Dresden and Quad Cities test the emergency diesel generators monthly per the Technical Specifications. The mission time for undetected failures is the average time since the last test, or 1 month/2. The expression for undetected failures is, therefore,

P = (7.11 x 10(-6)/hr) (1 month/2 x 30.44 days/mo x 24 hr/day)
= 2.6 x 10(-3)

Detected failures would be discovered during diesel generator operation or surveillance by an undervoltage alarm, overvoltage trip, or other indicated condition. For simplicity, it is assumed that the indication fails 1% of the time. Associated failures not detected by the alarm are therefore 100 times less likely than other undetected failures, and will be neglected.

From NSAC-111, the generic LOOP frequency is 0.078/yr. This number implies approximately one LOOP during power operation every ten unit-years, which is much higher than CECo experience. A recently calculated LOOP frequency typical for the Dresden/Quad Cities plants is 0.047/yr. A standard large LOCA frequency is 1 x 10(-4)/yr. This value dates back to WASH-1400 and is certainly high considering contemporary leak-before-break analysis. Therefore, an upper bound estimate of simultaneous LOOP, LOCA, and voltage regulator failure is

(4.7 x 10(-2)) (1 x 10(-4)) (2.6 x 10(-3)) = 1.2 x 10(-8)

It is possible that degraded conditions may result from failures other than the voltage regulator. IEEE-500, page 1219, provides a failure rate of emergency AC diesel driven generators in a degraded condition of 0.018 x 10(-3)/hr. This failure rate includes degraded conditions under which the transfer circuit will operate correctly; therefore, this failure rate bounds the degraded output events of concern. Using this failure rate in the above calculation provides an upper bound estimate for the scenario of concern of approximately 3 x 10(-8).

A rule of thumb for excluding unlikely events (e.g., aircraft crash) from consideration for nuclear power plants is 10(-7) per plant year. A typical plant core damage frequency from PRA's is 10(-4). Even if every simultaneous LOOP, LOCA, and degraded emergency AC supply resulted in core damage, the increase in core damage frequency would be negligible. Therefore, the scenario under consideration is not a significant contributor to overall risk.