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RLB-92-119

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U. S. Nuclear Regulatory Commission
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Reference: Quad Cities Nuclear Power Station
Docket Number 50-265, DPR-30, Unit Two

Enclosed is Licensee Event Report (LER) 92-013, Revision 01, for Quad Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 50.73(a)(2)(ii). Any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded, or that resulted in the nuclear plant being in a condition that was outside the design basis of the plant.

Respectfully,

COMMONWEALTH EDISON COMPANY
QUAD CITIES NUCLEAR POWER STATION

R. L. Bax
R. L. Bax
Station Manager

RLB/TB/plm

Enclosure

cc: J. Schrage
T. Taylor
INPO Records Center
NRC Region III

STMGR 366

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TEXT Energy Industry Identification System (EIS) codes are identified in the text as [XX]

Similar second level undervoltage concerns were revealed during the recent Electrical Distribution System functional Inspection (EDSFI) at Dresden Station. Due to the similarities between Dresden and Quad Cities Stations, Nuclear Engineering Department (NED) made the decision to evaluate the potential for these degraded voltage concerns at Quad Cities. Station personnel were notified of the degraded voltage problems upon completion of the preliminary loading calculations.

Compensatory actions had previously been taken on Unit One as a result of the April 7, 1992, ENS notification of degraded voltage conditions to ensure equipment operability on Unit One.

There were no other systems or components inoperable at the beginning of this event which could have contributed to this event.

C. APPARENT CAUSE OF EVENT:

This Licensee Event Report is being submitted for both Units in accordance with 10CFR50.73(a)(2)(ii), which requires reporting of any event or condition that resulted in the condition of the nuclear plant, including its principal safety barriers, being seriously degraded, or that resulted in the nuclear plant being in an unanalyzed condition that significantly compromises plant safety.

The apparent cause of the event was a reconciliation between the current method of performing load analysis and the original load analysis methodology. However, the design was adequate at the time of approval and installation based on the design methodology in use at that time. Based on present methodology the following items have been identified as deficiencies in the original load analysis calculations.

1. Past computer modeling of plant electrical loading was not as accurate as today's computer modeling.
2. Load data in the past was taken at the source (Bus) of the load rather than from the motor terminals. Therefore, actual motor required voltage was not the basis for the calculations.
3. Impedance losses in power feed cables were assumed incorrectly. Actual loads (horsepower) were used in the calculations, but with improper cable impedance loss assumptions.
4. Calculations assumed a loading on 480 volt transformers [XFMR]. Transformer voltage drops were not accurately modeled. In addition, since the original calculations were performed, additional loading has been added which would be running in a LCOA condition.

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5. Increased motor currents due to lower motor voltage were not accurately analyzed.
6. Inadequate documentation control and review of setpoint calculations.

D. SAFETY ANALYSIS OF EVENT:

It was determined by NED on April 7, 1992, that the existing Unit Two Second Level Undervoltage Relay settings were inadequate to assure proper protection of all Safety Related equipment, and that in order to insure adequate protection, modifications were needed to be performed on Unit Two. Unit Two was in the Cold Shutdown mode when Quad Cities was notified of the calculations, and the decision was made to perform these modifications prior to the startup of Unit Two. Therefore, the safety significance of the event was minimal because the unit was in cold shutdown and the safety related loads were not required.

It was determined by NED on April 23, 1992, that the existing Second Level Undervoltage Relay settings on Unit One were inadequate to assure proper protection of all Safety Related equipment, and that in order to insure adequate protection, compensatory actions were needed for continued Unit One operation. Unit One was in the Run mode when Quad Cities was notified of the calculations. However, compensatory actions had already been implemented as a result of the Unit Two degraded voltage calculation of April 7, 1992. Therefore, based on the compensatory measures already in place, the safety significance of the event was minimal because adequate voltage would have been available to operate safety related loads, had they been needed.

In addition, the safety significance was minimal due to the extremely low probability of a LOCA concurrent with a degraded voltage condition. History has also shown that the incidence of degraded voltage in the switchyard has been extremely small.

E. CORRECTIVE ACTIONS:

Immediate corrective actions for Unit Two were to design and install modifications which would trip unneeded loads on receipt of a LOCA initiation signal in order to ensure adequate bus [BU] voltage to start safety-related loads. Modification M4-2-91-019 tripped the following loads from Unit Two 480 volt Safety Related Buses on receipt of a LOCA signal:

- a. Drywell Coolers
- b. Reactor Building Closed Cooling Water pumps [P]

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- c. Fuel Pool Cooling pumps
- d. Recirc MG Set ventilation [VA] fans [FAN]
- e. Turbine Building Exhaust and Supply fans

Modification M4-2-92-006 was divided into ten partials defined as follows:

- a. Partial A through G are proposed cable pulls to safety related loads, which are scheduled to be installed during Q2R12. These cable pulls will improve terminal voltage at the motors, but are not considered to be essential to safe plant operation at this time (NTS #2652009205002).
- b. Partial H ensures that the 1/2 Diesel Generator [DG] (DG) Auxiliaries (DG room vent fan, DG Cooling Water Pump (DGCWP), and fuel oil transfer pump) will automatically transfer to the unit with a LOCA to ensure adequate power supplies to these loads.
- c. Partial I installs a redundant power feed (from Unit Two) to the 1/2 DGCWP cooler fans (This issue is documented in Licensee Event Report 02-92-014).
- d. Partial J provided parallel control power cabling for the Residual Heat Removal (RHR) Low Pressure Coolant Injection [50] (LPCI) 29A, 29B, and 50 valves, and also the Recirculation [AD] system 5A and 5B valves. This ensures that proper voltage is available to start these valves in a degraded voltage condition.

In addition, the second level undervoltage relays were replaced with relays which had a tighter reset tolerance (0.5%). With the changes made by the modifications, NED performed another calculation, and the second level undervoltage relays for Unit Two were reset at the new setpoint of 3886 volts +/-7.0 V. All of these modifications, with the exception of Modification M4-2-92-006 partials A through G, were completed prior to startup of Unit 2 from refuel outage Q2R11. Partial A through G will be completed in Q2R12, if required.

Immediate corrective action for Unit One was to implement compensatory measures (temporary procedure 7750) to assure adequate terminal voltage to Unit One safety related loads. Temporary Procedure 7750 was initiated immediately upon receipt of the Unit Two degraded voltage calculations on April 7, 1992. The compensatory measures include:

- 1. Continuously monitor Bus [BU] 18/19 voltages, and if voltage gets below 460 V for an extended period of time (approximately 5 minutes), then:

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- a. Notify System Power Supply to increase switchyard and safety bus voltage to acceptable levels.
 - b. Surveillances which could result in an autostart of either diesel generator [DG] (DG) will not be performed.
2. If Bus 18/19 voltage drops below 450 volts, the bus shall be declared inoperable and the appropriate Technical Specification action statements shall be implemented. If voltage is restored to above 450 volts, the bus will be declared operable.
 3. If a confirmed Unit One Loss of Coolant Accident (LOCA) signal exists and Bus 18/19 voltage is below 450 volts, trip the 4 kV Bus 13 to 13-1 or Bus 14 to 14-1 feed breaker, as applicable. This will cause the bus to de-energize and sequence the loads onto the associated Emergency Diesel Generator.

Further corrective action will be to complete the design of modifications to rectify the undervoltage condition. These modifications are dependent on final calculation completion by NED. Modifications are expected to be similar to those implemented for Unit Two. Required modifications will be installed during Q1R12.

In addition, the second level undervoltage relays on Buses 13-1 and 14-1 will be replaced with relays which have a tighter reset tolerance (0.5%) during Q1R12. The relay setpoint will be reset to a value, as defined by NLD, which will ensure adequate protection of safety-related equipment, when final load calculations are complete.

F. PREVIOUS EVENTS:

There have been no previous events of Second Level Undervoltage Design Non-Compliance at Quad Cities Station based on methods of calculations performed in the past.

There has been a similar event at Dresden Station.

<u>LER Number</u>	<u>Title</u>
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LER 91-021/050237	Improper Setpoint of Second Level Undervoltage Relays Due to Management Deficiency
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During an Electrical Distribution System Functional Inspection (EDSFI), the NRC inspection team questioned whether the setting of the Second Level Undervoltage relays would provide adequate protection to Class 1E equipment. An Engineering review was performed. The review resulted in implementation of compensatory measures.

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G. COMPONENT FAILURE DATA:

<u>Manufacturer</u>	<u>Nomenc'</u>	<u>Model Number</u>	<u>Mfg. Part Number</u>
N/A	N/A	N/A	N/A

The cause of this event was not attributed to a component failure.