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May 18, 1992

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTN: Document Control Desk

SUBJECT: Quad Cities Station Units 1 and 2
Service Test Results for 250V DC Batteries
NRC Docket Nos. 50-254 and 50-265

REFERENCES: (a) J.L. Schrage (CECo) to T.E. Murley letter dated December 20, 1991.

(b) L.N. Olshan (NRR) to T.J. Kovach (CECo) letter dated January 21, 1992.

Dear Dr. Murley:

Based upon service testing results on the Dresden Station Unit 3 250V DC batteries in October, 1991, Commonwealth Edison (CECo) conducted an evaluation of the 250V DC load profiles for Quad Cities Station. CECo presented the results of that evaluation, the operability evaluation for the load profiles, a discussion of the proposed service test procedure, and the planned modifications to the 250V DC system in Reference (a). Reference (b) presented the staff's review and acceptance of the operability evaluation, the proposed service test procedure, and the planned modifications. The purpose of this letter is to present the results of the service test conducted on the Unit 2 250V DC battery, which was performed on January 23, 1992.

The service test indicated that the terminal voltage of the Unit 2 250V DC battery did not fall below the required 210 volts for the duration of the test. Although the delivered load during the first twelve seconds of the test (approximately 1116A for 12 seconds) was slightly less than the initial duty cycle requirement (1150A for 15 seconds), the load which was subsequently delivered (1162A for 17 seconds) was more demanding than the load profile requirement (in both magnitude and duration). The load delivered during the remainder of the four hour service test met or exceeded the required load profile. Therefore, Commonwealth Edison considers the results of the service test acceptable. The service test procedure and results are summarized in the Attachment.

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If there are any questions or comments, please direct them to John L. Schrage at 708-515-7283.

John L. Schrage
Nuclear Licensing Administrator

Attachment

cc: Bert Davis, Regional Administrator-RIII
L. N. Olshan, Project Manager - NRR
T. E. Taylor, Senior Resident Inspector - Quad Cities

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ATTACHMENT

Battery Testing Considerations

IEEE Standard 450-1987 provides recommended testing guidance for lead storage batteries. Section 6.6 of the standard states:

> "A service test is a special battery capacity test which may be required to determine if the battery will meet the design requirements (battery duty cycle) of the dc system. The system designer should establish the test procedure and acceptance criteria prior to the test."

The standard continues to state:

> "...the discharge rate and test length should correspond as closely as is practical to the design requirement (battery duty cycle) of the dc system."

Battery duty cycle is defined as the load currents that a battery is expected to supply for specified time periods. This guidance implies that the battery should be tested to its duty cycle, and not necessarily the design load profile to which the battery is sized to.

Given this guidance, and the current capabilities of test equipment, CECo utilized fifteen (15) second intervals as a basis for a battery duty cycle service test.

Load Profile

The accident scenario with the most limiting load profile for the Quad Cities Station, Units 1 and 2 250V DC batteries was determined to be an Intermediate Break LOCA with the unit at power (HPCI in test); the opposite unit in Shutdown Cooling mode with RCIC in standby. This load profile is described in Table 1.

Service Test Equipment Configuration

The configuration of the test equipment used during the service test is shown in Figure 1. This configuration is summarized below.

1. The required load (as defined by the load profile) was automatically sequenced onto the battery at 15 second intervals using a load box and control computer

2. The acceptability of the service test was determined by continuously monitoring the battery terminal voltage with a calibrated digital voltmeter (DVM), and verifying that the voltage remained above 210 volts for the duration of the service test.

3. The discharge current (the load placed upon the battery by the load box/control computer) was monitored with a second calibrated DVM and calibrated shunt (1200A/100 mV). Voltage across the shunt was monitored with the DVM and then converted to current through use of the current/voltage ratio. In addition to monitoring the discharge current, the calibrated shunt also provided electrical signals to the load box/control computer in order to establish the proper load; and a strip chart recorder to provide an uncalibrated indication of voltage and current.

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Service Test Results

The service test was conducted utilizing three engineers for monitoring and control of the test. An engineer was stationed at the DVM/shunt equipment to ensure that the delivered load from the load box/control computer met the load profile requirement. If the delivered load did not meet the requirement within the first ten seconds of the applicable time period, this engineer was required to notify a second engineer, who was stationed in the battery room, to switch the control computer to a manual mode and adjust the load to meet the required load profile. The first engineer would then verify that the delivered load met the requirement for the applicable time period. A third engineer (also stationed in the battery room) continuously monitored the DVM which was monitoring the terminal voltage to verify acceptable performance.

The load profile for the Unit 2 battery required a load of 1150A for the first 15 seconds (see Table 1). Upon commencement of the service test, the first engineer determined that the delivered load did not meet the required load. After ten seconds this engineer notified the second engineer to switch to a manual mode and increase the load. This was accomplished, and the first engineer verified that the delivered load met and exceeded the requirement of 1150A at the twelfth second (1162A). This peak was maintained for approximately 17 seconds (based upon the peak and time indications from the strip chart recorder). The terminal voltage did not drop below 210 volts during this period. At this point, the second engineer switched the control computer back to the automatic mode. For the remainder of the four hour service test, the delivered load met or exceeded the required load; and, the terminal voltage remained above 210 volts.

Although the delivered load during the first twelve seconds of the test (approximately 1116A for 12 seconds) was slightly less than the initial duty cycle requirement (1150A for 15 seconds), the load which was subsequently delivered (1162A for 17 seconds) was more demanding than the load profile requirement (in both magnitude and duration). The load delivered during the remainder of the four hour service test met or exceeded the required load profile. Therefore, Commonwealth Edison considers the results of the service test acceptable.

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TABLE 1

Quad Cities
Units 1 and 2
250Vdc Battery Profiles

Intermediate Break LOCA with unit at power (HPCI in test); opposite unit in Shutdown Cooling mode with RCIC in Standby.

Time	Unit 1 Load (amps)	Unit 2 Load (amps)
0 - 15 sec	1167	1150
16 - 30 sec	235	235
31 - 45 sec	235	235
46 - 60 sec	179	179
1 - 2 min	128	128
2 - 6 min	87	86
6 - 7 min	422	421
7 - 30 min	220	219
30 - 120 min	83	82
120 - 239 min	54	53
239 - 240 min	297	295

The first minute of each profile has been divided into 15 second intervals. This will allow a more accurate reflection of the actual duty cycle the battery would encounter under actual emergency conditions.

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Figure 1
Service Test
Equipment Configuration