



Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

May 22, 1992

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555
Attn: Document Control Desk

Subject: Commonwealth Edison Company
GNB Type NCX-21 Batteries
10 CFR Part 21 Notification

Dear Dr. Murley:

The purpose of this letter is to notify the NRC Staff of concerns by Commonwealth Edison Company (CECo) regarding GNB type NCX-21 Batteries used in Class 1E applications. Provided as an attachment to this letter is CECo's notification in accordance with the requirements of 10 CFR Part 21, Section 21.1.(b), 21.3a(3), and 21.3.d(4).

If there are any questions regarding this notification, please direct them to Linda M. Taylor at (708)515-6641.

Respectfully,

Thomas J. Kovach
Nuclear Licensing Manager

Attachment: 10 CFR Part 21 Report

cc: A. Bert Davis, Regional Administrator - RIII
R. J. Barrett, Project Director, RIII - NRR
W. G. Rogers, Senior Resident Inspector - Dresden
T. Taylor, Senior Resident Inspector - Quad Cities

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In reply refer to

CHRON # 186195

10CFR21 Notification

GNB NCX-21 Class 1E Batteries

Applicability

This notification is submitted in accordance with the requirements of 10CFR21 Section 21.1.(b), 21.3a.(3) and 21.3.d(1).

Identification of Facility and Component

This notification concerns the deviation in the published specification of the GNB type NCX-21 cell that is used as design input when sizing a battery for a Class 1E application. The Dresden Unit 3 safety-related 250 volt battery is a NCX-21 supplied by GNB that was sized for its application based on the published discharge current at the one minute rate to an end voltage of 1.81 volts per cell at 77°F.

On October 14, 1991, the Dresden Unit 3 250 volt battery failed its service test. A service test is a special battery capacity test which Dresden Station committed to perform as a minimum once every 18 months (every refuel outage) on the station Class 1E batteries to determine if the battery will meet the design requirements of the DC system. The battery failed (battery terminal voltage dropped below a design minimum of 210 VDC) during the first minute of discharge which is the critical period to which the battery was ultimately sized to. During the root cause failure investigation by both the station and Nuclear Engineering Department (NED), the subject battery capacity was determined to be 96% of the manufacturer's rating. A review of the battery sizing calculation indicated that based on the battery's manufacturer's published data, the battery should have still met its design requirements at 96% capacity. Additional testing of the battery demonstrated that although the battery could deliver 96% of rated capacity during a low rate discharge, the battery could not perform to its published ratings for a high rate discharge, in this case, the battery's one minute rate.

Identification of Component Manufacturer

The Class 1E NCX-21 battery was manufactured and supplied by:

GNB Industrial Battery Company
Woodlake Corporate Park
829 Parkview Blvd.
Lombard, IL 60148-3249
(708) 629-5200

Nature of Deviation

The published discharge rates for a cell type supplied by the battery manufacturer is often used as design input when sizing a battery or evaluating an existing installation. Therefore, any deviation in the published discharge rate, in the non-conservative direction, could result in a battery that will not meet design expectations.

The deviation in the published one minute rating of the NCX-21 cell could affect applications where 1) a NCX-21 battery is designed for an end voltage or minimum terminal voltage that equates to 1.81 VPC and 2) the NCX-21 battery was selected for the application based on the published one minute rating of the cell.

In cases where an NCX-21 battery was sized using the published one minute rating of the cell to an end voltage of 1.81 VPC and the battery was sized neglecting design margin and aging factors recommended in IEEE-STD-485-1983, there is a potential that the battery may not meet its design requirements and battery terminal voltage would drop below the system design minimum voltage during the critical one minute period to which the battery was sized. However, licensees that perform service tests on their Class 1E batteries every refuel outage, can determine from the results of the test if the battery can meet the design requirements of the system. A service test is performed to validate the design of a battery system, therefore, the effects of the rating deviation would be identified through this process.

In cases where an NCX-21 battery was sized using the published one minute rating of the cell to an end voltage of 1.81 VPC and the battery was sized using the IEEE-STD-485-1983 recommended design margin and aging factor, sufficient margin should exist assuming the battery is at or near 100% capacity, to compensate for the deviation in the one minute rating. However, expected design life of the battery becomes an issue. IEEE-STD-485-1983 recommends that when selecting a battery size, the battery's rated capacity should be at least 125% of the load expected at the end of its service life. Therefore, a battery's minimum acceptable capacity to meet the design requirements of a DC system is 80% capacity. IEEE-STD-485-1983 also recommends providing a design margin of 10-15% to allow for unforeseen additions to the DC system and less than optimum operating conditions of the battery. Although the design margin and aging factor will compensate for the deviation in the one minute rating of the cell in terms of how the battery will perform when at or near 100% capacity, the problem that exists is that the battery will not meet the design requirements of DC system when capacity is 80% as originally expected when the battery was sized. Therefore, the expected design life of the battery becomes affected by the deviation in the one minute rating.

Safety Significance

A deviation in the non-conservative direction in the published discharge rate that is used as design input when sizing a battery could result in a battery that will not meet design expectations. Specifically, the battery may not meet the design requirements of the DC system through its full expected design life.

Corrective Action and Location of Component

NED and the battery manufacturer (GNB) developed a test plan to validate the published one minute rating for the NCX-21 cell to an end voltage of 1.81 volts per cell (VPC) at 77°F. The results of the tests indicate that a deviation exists in the published one minute rating of the NCX-21 cell to an end voltage of 1.81 VPC at 77°F. The battery manufacturer concluded that the NCX-21 cell should be rated at 1050 amperes at the one minute rate to an end voltage of 1.81 VPC. This is a deviation from the published rating of 1264 amperes. The battery manufacturer has provided written notification to all their Class 1E NCX-21 customers of this deviation to the published data.

GNB Industrial Battery Company

A test program is being developed to validate the published ratings for other size cells in the NCX line that are predominantly used in Class 1E applications. The published ratings of the NCX-21 cell to an end voltage of 1.75 volts per cell will also be verified.

Commonwealth Edison

Presently, Commonwealth Edison Company (CECo) uses NCX-21 cells in 11 Class 1E applications. They are as follows:

<u>Station</u>	<u>Unit</u>	<u>System</u>
Dresden	2	125 VDC
Dresden	2	250 VDC
Dresden	3	125 VDC
Dresden	3	Alternate 125 VDC
Dresden	3	250 VDC
Quad Cities	1	125 VDC
Quad Cities	1	Alternate 125 VDC
Quad Cities	1	250 VDC
Quad Cities	2	125 VDC
Quad Cities	2	Alternate 125 VDC
Quad Cities	2	250 VDC

The Byron and Braidwood 250 volt batteries are also NCX-21 cells, however, they are non-safety-related and are not required to mitigate the consequences of an accident. NED has evaluated the significance of the one minute rating deviation as it pertains to the 11 Class 1E applications. The Dresden and Quad Cities 250 volt batteries are not affected because the batteries are now sized to an end voltage of 1.75 volts per cell with the addition of the 4 cells (120 cells total) to the system. Four cells were added to the Dresden and Quad Cities 250 volt batteries following the failure of the Dresden Unit 3 250 volt service test to increase the ampere-hour capacity these batteries. In addition, the Dresden Units 2 and 3 250 volt battery were subjected to an abbreviated service test following installation of the 4 additional cells. Results of the tests confirmed that the 250 volt batteries could meet the critical period design requirements of the DC systems.

The Quad Cities Unit 1 250 volt battery had passed its service test prior to the installation of 4 additional cells demonstrating that it will meet the design requirements of the DC system. A service test was performed on the Quad Cities Unit 2 250 volt battery following installation of the 4 additional cells (120 cell battery). Results of the test indicate that the battery could meet the design requirements of the DC system.

The Dresden and Quad Cities 125 volt and alternate 125 volt batteries were sized to an end voltage of 1.81 VPC, therefore, these batteries are affected by the deviation in the published one minute rating. The battery sizing calculations that were based on the battery's published one minute rating indicated that the 125 volt batteries have significant margin beyond the recommended 125% margin for aging per IEEE-STD-485-1983 (IEEE Recommended Practice for Sizing Large Load Storage Batteries for Generating Stations and Sub-Stations). Service tests have been performed on the Dresden Unit 3 and Quad Cities Unit 2 125 volt batteries during D3R12 and Q2R11 respectively. Results of these tests demonstrated that the batteries could meet the design requirements of the DC system. NED is presently re-evaluating the Dresden and Quad Cities 125 volt and alternate 125 volt battery sizing calculations using the new recommended one minute rating of the NCX-21 cell to determine what effect the decrease in the one minute rate of the cell has on the available margin between the required number of positive plates (to meet the design requirements) and the actual number of positive plates provided in the battery.

Contacts

Questions pertaining to this notification should be addressed to:

Linda Taylor
Nuclear Engineering Department
Commonwealth Edison Company
1400 Opus Place, Suite 500
Downers Grove, IL 60515
(708) 515-6641