

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

April 20, 1995

NRC INFORMATION NOTICE 95-21: UNEXPECTED DEGRADATION OF LEAD STORAGE
BATTERIES

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to possible degradation of lead storage batteries within the first two years of service. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

Palo Verde

Arizona Public Service Company (APS, the licensee) installed AT&T round cell batteries at Palo Verde, after continued problems with the originally installed batteries. During a 1994 maintenance outage at Palo Verde Unit 2 the licensee tested performance on the AT&T batteries which were less than two years old. The capacities of the batteries were lower than expected; the capacities had decreased instead of increasing.

Train B (Battery Banks B and D) had been declared inoperable on October 1, 1994, because the measured capacity was slightly less than 90 percent capacity. On October 7, 1994, Train A (Battery Banks A and C) was declared inoperable because a projection of the capacity test results indicated that the battery capacities would be below 90 percent. The Palo Verde Technical Specifications acceptance criterion for the AT&T battery capacity is at least 90 percent of the manufacturer's rating when subjected to a performance discharge test.

Oconee Unit 2

Replacement Exide batteries of the standard lead calcium cells (rectangular) were installed less than two years ago. In testing batteries 2CA and 2CB, certain cells were found to have capacities lower than expected.

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At Oconee Unit 2, Battery 2CB was tested on January 4, 1995. The test indicated that the overall capacity of the battery was only 77 percent. Battery 2CA was tested on January 12, 1995, and its overall capacity was about 80 percent. The Oconee design commitments require that the battery capacity should exceed 80 percent. The two batteries were installed in January 1993, and the testing took place within two years of installation.

Discussion

IEEE Standard 450-1987, "IEEE Recommended Practice for Maintenance, Testing and Replacement of Vented Lead-Acid Batteries for Stationary Applications," recommends that a performance test of the battery capacity should be made within the first two years of service. It is typically expected that battery capacity will not decrease in that period and, in fact, it often shows a slight increase.

Although the designs differ, in both cases the batteries indicated a significant decrease in capacity, and a decrease is not consistent with the normal behavior expected for either of these batteries.

Both licensees are taking steps to rectify the degradation in the batteries by replacing the defective cells or entire battery banks. In addition, they are attempting to find the root cause of the abnormal degradation. At Palo Verde, the licensee determined that adequate margin existed between the projected battery capacities and worst case design loading.

With respect to the AT&T batteries, APS maintains that the root cause of the drop in capacity in the Unit 2 cells likely involves contamination and an inadequate curing process because of an increase in production rate during the time the Palo Verde Unit 2 cells were manufactured. These problems apparently did not exist when the Palo Verde Unit 1 and 3 cells were manufactured. After the licensee noted the degradation of the Unit 2 batteries, spare cells in Units 1 and 3 were found to have no decrease in expected capacity. In addition, the licensee has learned that the AT&T cells used as the Class 1E dc sources in McGuire and Byron/Braidwood nuclear plants were also not manufactured in this time of very high production.

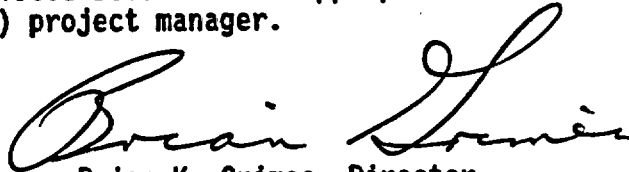
Although not as significant as the capacity loss noted above, APS and AT&T have found additional cells that show some of the same tendency toward early loss of capacity. This may be due to existing variations occurring in the materials selection and manufacturing process. To minimize the effect on final battery capacity, APS and AT&T developed a specific dedication process to be used during the manufacture acceptance testing phase to identify and reject cells that show early loss of capacity.

AT&T and APS also believe that some of the drop in capacity in the Palo Verde Unit 2 cells, as well as the unexpected drop seen during the dedication testing of the new cells purchased for replacement, is due to the additional testing which has involved a number of discharge and recharge cycles in a relatively short period of time.

APS has replaced the Unit 2 battery cells with new AT&T cells that have undergone factory testing for at least two discharge/recharge cycles, that still show substantially greater capacity than is needed for the design basis Palo Verde Unit 2 loading, and that meet the specific dedication criteria developed by APS and AT&T. The licensee is also studying the influence of the recharging methodology on battery performance.

AT&T and APS plan an extensive test program to establish the cause of the unexpected capacity decrease in the replacement cells. Exide is still in the process of establishing the root cause for the degradation at Ocone.

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Brian K. Grimes, Director
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Information Notice No.	Subject	Date of Issuance	Issued to
94-64, Supp. 1	Reactivity Insertion Transient and Accident Limits for High Burnup Fuel	04/06/95	All holders of OLs or CPs for nuclear power reactors.
95-18, Supp. 1	Potential Pressure-Locking of Safety-Related Power- Operated Gate Valves	03/31/95	All holders of OLs or CPs for nuclear power reactors.
95-20	Failures in Rosemount Pressure Transmitters due to Hydrogen Per- meation into the Sensor Cell	03/22/95	All holders of OLs or CPs for nuclear power reactors.
95-19	Failure of Reactor Trip Breaker to Open Because of Cutoff Switch Material Lodged in the Trip Latch Mechanism	03/22/95	All holders of OLs or CPs for nuclear power reactors.
95-18	Potential Pressure-Locking of Safety-Related Power- Operated Gate Valves	03/15/95	All holders of OLs or CPs for nuclear power reactors.
95-17	Reactor Vessel Top Guide and Core Plate Cracking	03/10/95	All holders of OLs or CPs for boiling water reactors.
95-16	Vibration Caused by Increased Recirculation Flow in a Boiling Water Reactor	03/09/95	All holders of OLs or CPs for boiling water reactors.
95-15	Inadequate Logic Testing of Safety-Related Circuits	03/07/95	All holders of OLs or CPs for nuclear power reactors.
95-14	Susceptibility of Con- tainment Sump Recircula- tion Gate Valves to Pressure Locking	02/28/95	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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DATE	03/02/95		03/08/95		03/16/95		3/ 15 /95	
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