Southern California Edison Company

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August 10, 1994

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: **Docket No. 50-362**
**Operability of Batteries**
**San Onofre Nuclear Generating Station**
**Unit 3**

This letter addresses the operability of five battery jars at San Onofre Unit 3.

Between February and May, 1993, Southern California Edison (Edison) replaced battery banks 2B007, 3B007, and 3B008 at San Onofre Units 2 and 3 with new Exide Type 2GN-15 batteries. During installation of battery bank 3B007 on its seismic racks, minor electrolyte leakage in the form of crystallized white droplets was noticed on the outside of a battery jar. A Non Conformance Report was generated and the manufacturer was contacted for a site inspection.

Edison performed air pressure tests of all of the new batteries and identified several cells (each battery jar contains 2 cells) with minor air leakage at the seal between the battery jar cover and the jar outer casing. Edison was able to obtain replacement batteries with no jar-to-cover leakage prior to the completion of the installation of the new batteries in battery banks 2B007 and 3B007.

Replacement of battery bank 3B008 had been completed prior to discovery of the leakage condition. In-place testing of the new batteries in bank 3B008 identified 5 cells with minor jar-to-cover leakage. Because of the difficulty associated with replacement of these batteries due to the San Onofre battery rack configuration, Edison and Exide evaluated the long-term operability of these 5 cells.

Enclosed is a letter from Exide which addresses the operability of the batteries with jar-to-cover leakage. This letter discusses the manufacturing process, the character of the leaks, seismic testing (performed by Edison) of jars with leaks, and the long-term performance of the cement used to seal the cover to the jar. The conclusion of this letter is that the batteries will continue to perform their intended function and will not experience physical or functional degradation through their 20-year nuclear qualified life.

To insure the continued operability of the San Onofre batteries, Edison performs ongoing inspections of each of the safety related batteries in

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accordance with IEEE Standard 450-1980, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Generating Stations and Substations." These inspections are included in Edison procedures SO123-I-2.2, 2.3, and 2.4, and include the following:

1. Monthly visual inspection of the external casing of each cell for cracks and evidence of electrolyte leakage.

2. Quarterly inspection of all cells for cell voltage, specific gravity, electrolyte level and temperature.

3. Annual detailed physical inspection of each cell.

Based on the evaluations performed by Edison and Exide as well as the periodic inspections performed by Edison, it is our conclusion that the 5 cells with minor air leakage are acceptable for continued operation through their qualified life.

If you would like additional information regarding this matter, please let us know.

Sincerely,

Walter C. Marsh

Enclosure

cc: L. J. Callan, Regional Administrator, NRC Region IV
K. E. Perkins, Jr., Director, Walnut Creek Field Office, NRC Region IV
J. A. Sloan, NRC Senior Resident Inspector, San Onofre Units 2 & 3
M. B. Fields, NRC Project Manager, San Onofre Units 2 and 3

YUASA EXIDE INC.

RECEIVED
AUG 0 2 1994
A.J. THIEL

July 29, 1994

Mr. Allen J. Thiel
Manager, Electrical Systems Engineering
San Onofre Nuclear Generating Station
Southern California Edison Company
Post Office Box 128
Mail Drop D2A
San Clemente, CA 92674-0128

*Ref.:* Jar to Cover Leak for GN-15 Cells

Dear Mr. Thiel:

The purpose of this letter is to answer the concerns Southern California Edison Company (SCE) has over the five Class 1E Exide type 2GN-15 battery jars installed at San Onofre Nuclear Generating Station (SONGS) which have been determined to have jar-to-cover leaks.

The reason for these leaks is due to improper cementing during the manufacturing process which was not detected during the factory tests. These types of seal leaks are pin-holes and can only be detected by pressurizing the jars. The presence of pin-holes causes a slow pressure drop during testing resulting in a pressure drop of slightly more than the 0.1 lb. acceptance criteria. Any large voids in the cement would cause a rapid pressure drop which is not the case with the subject battery jars. The Industrial Battery Product/Process Specification for sealing the type GN cells (PPS-13, Section 5.0) contains specific instructions for placing a uniform film of accelerator on the jar and a continuous ribbon of adhesive in the cover channel prior to placing the cover on the jar. The sealing procedure has a number of accelerator and cement application checks to prevent any large area voids. Electrolyte leaks through pin-holes are insignificant and have no adverse effect on performance of the batteries.

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The character of this type of pin-hole was confirmed by cross sectioning a "leak site" on a jar from the same battery shipment after the battery was seismically tested by SCE. The leak path was found to be in a cement void in the corner radius of the jar. There was no absence of cement in the immediate area of the void confirming that this was a localized pin hole. The void was caused by lack of adhesion of the cement to the corner of the jar, not an absence of cement. Cross sections were made in two other planes on the cement joint adjacent to the void site. Small discrete bubble type voids (3-9 mils) were present in one of the sections between the top of the jar and the cement. There were no areas with a continuous void in the cement on either of the joint sections next to the pin-hole.

Two "leaky" jars from the same battery shipment as the installed five batteries were seismically tested by SCE, and, according to the test report, some electrolyte loss was observed. However, the flame arrestors, which are vented to atmosphere, contributed to the majority of this electrolyte loss, and leaks through the pin-holes were extremely minor, if any. The cells undergoing seismic testing were functionally tested and monitored prior to, during, and after the test and showed no degradation of electrical capacity. It is important to note that the jar with the pin-hole leak did not show any change in the pressure drop rate after the seismic test. The other seismically tested jar had a cross threaded terminal post which did not seal properly. This seal recovered because the grease around the terminal shifted and plugged the leak path during the seismic test. The seismic test demonstrated that the cement joints with the pin-hole leaks are resistant to the maximum mechanical stress expected during the battery's service life.

The cement used to seal the battery jar to its cover was tested at Yuasa-Exide to verify its resistance to acid, its tensile strength, no crazes caused under different stresses, and no leaks due to high temperature/high voltage float. Based on these tests, the cement used for the GN cells will not degrade over the qualified life of the battery. The acrylic cement has a maximum operating temperature of 120°C, well above any potential thermal stress environment the battery would experience during operation. The technical literature on acrylic type cement indicates that it has satisfactory resistance to sulfuric acid. This type of cement

fuses into jar and jar lid material creating a seamless bond which will not separate over time. This testing and evaluation demonstrates that the cement is resistant to chemical attack and thermal stresses imposed during the operating life of the batteries.

Based on the tests and evaluation conducted by Exide as well as seismic testing of leaky jars performed by SCE, these batteries at SONGS will continue to perform their intended function and they will not experience physical or functional degradation from the jar-to-cover leaks through their 20 years nuclear qualified life.

I hope the above explanation will satisfy the concern about the operability of the leaky cells.

Sincerely yours,

Manahar A. Patel

Manahar A. Patel
Manager, Stationary
Product Engineering

MAP/csm

cc: F. L. Tarantino