Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

DCD

June 29, 1990

Mr. A. Bert Davis
Regional Administrator
U.S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, Il 60137

Subject: Byron Station Units 1 and 2
Response to Inspection Report
Nos. 50-454/90012 and 50-455/90011
NRC Docket Nos. 50-454 and 50-455

Reference: a) May 29, 1990 letter from W.D. Shafer to Cordell Reed

Dear Mr. Davis:

Reference (a) provided the results of the routine inspection conducted by W. Kropp from April 1 through May 12, 1990 at Byron Station. The inspection report indicated that certain activities appeared to be in violation of NRC requirements. The Commonwealth Edison Company response to the Notice of Violation is provided as Attachment A. Attachment B provides the requested written response to open item 454/90012-02 and 455/90011-01.

If you have any questions regarding this response, please direct them to this office.

Very truly yours,

T.J. Kovach
Nuclear Licensing Manager

/scl:ID47-1

Attachments

cc: NRC Resident Inspector-Byron
NRC Document Control Desk

JUL 2 1990

IE01
1/1

Attachment A

NOTICE OF VIOLATION
454/90012-01

10 CFR 50, Appendix B, Criterion III, as implemented by Commonwealth Edison Company's Quality Assurance Manual, Quality Requirement 3.0, requires that:

a. Measures shall provide for the verification and the checking of the adequacy of a design such as by the performance of design reviews or by the use of alternate or simplified calculational methods.

b. Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design.

ASME NQA1 "Quality Assurance Program Requirements for Nuclear Facilities, Supplement 35-1", Section 4, Design Verification, states that:

a. Measures shall be applied to verify the adequacy of design.

b. Results of design verification efforts shall be clearly documented.

c. Acceptable verification methods include but are not limited to: design reviews, alternate calculations, or qualification testing.

Contrary to the above, the licensee failed to:

a. Identify during the design review process documented in the On-Site Reviews (OSR) for calculation 19-D-15 that the minimum temperature correction factor for the 125 Vdc station battery electrolyte did not agree with the Technical Specifications. As a result of the incorrect temperature correction factor, Byron Batteries 111, 112, 212 were not designed at the proper size for a DC crosstie configuration between Unit 1 and 2 with a minimum electrolyte temperature of 60 degrees F. as specified in the Byron's Technical Specification.

b. Review calculation 19-D-15, that was utilized to justify Battery 111 operability with 57 cells versus 58 cells, prior to the calculation's use in an OSR. The review and approval were approximately 7 weeks after the calculation was used in OSR 89-127 for determining Battery 111 operability with 57 cells.

c. Perform a design review prior to using a single cell charger when attempting to restore cell #53 in Battery 111 in March, 1990. The use of a single cell charger was not approved as a Temporary Alteration in accordance with procedure BAP 330-2, "Temporary Alterations."

1. Response

A. The Byron Station battery sizing calculations were performed by Sargent & Lundy (S&L) utilizing 69° F as the minimum expected battery room temperature. The Station Technical Specifications state that "the average electrolyte temperature of all connected cells is above 60° F". Therefore, Commonwealth Edison agrees the design calculations based on 69° F are not consistent with the 60° F value as specified in the Technical Specifications.

A re-evaluation of the Class 1E batteries revealed that they have adequate capacity to perform their intended safety-related function at the 60° F Technical Specification minimum temperature for both normal and crosstie operating scenarios (assuming a successful diesel generator start) and in either a 57 or 58 cell operation based on the following:

- The batteries were originally sized based upon an assumed four-hour outage of all AC power at the Station. The four-hour battery duty cycle was consistent with S&L standard ESC-291 in existence at that time.

- All batteries can support the four-hour duty cycle committed to in the UFSAR at the Technical Specification minimum temperature of 60° F during normal plant operation. (i.e., excluding crosstie load).

- Under crosstie operating conditions (where one unit's battery and battery charger are supplying the loads of both units) the battery capacity is apparently exceeded at the end of battery life sometime after two hours into the battery duty cycle, in the event of a concurrent loss of all AC power, (i.e., both offsite and onsite diesel-generator emergency power) and a Loss of Coolant Accident (LOCA).

The fact that the batteries apparently do not have the necessary capacity to support the four-hour original duty cycle plus the crosstie load at 60° F at the end of battery life is not safety-significant because the original load scenario (based on S&L standard ESC-291) is overly conservative. Further, a four-hour AC outage is not credible since the diesel-generators restore AC power in approximately 10 seconds.

IEEE STD 946 provides direction on the determination of the duty cycle. It states that the overall duration cannot be less than the estimated time interval necessary to restore AC power to the battery chargers, but that the duration is determined by engineering judgment. Under the Design Basis Event (concurrent LOOP, LOCA and single failure), a battery would only be required during the interval between the LOOP and the diesel generator load pick-up, which is approximately 10 seconds. All batteries have adequate capacity assuming the maximum crosstie load at 60 F for that interval. Even with the loss of a diesel generator as the postulated single failure, the redundant division is available to accomplish the safety function.

B. S&L Calculation 19-D-15 was prepared by S&L on May 4, 1989, based on discussions between S&L, CECo Engineering and Byron Station personnel. The purpose of the calculation was to demonstrate operability of Battery 111 with 57 cells (i.e., minus one cell).

Calculation 19-D-15 was also reviewed by S&L on May 4, 1989 but not dated pending resolution of a conflict between two GNB battery discharge characteristic curves. However, S&L had clearly established at this time that the results of the calculation would not be affected regardless of which characteristic curve was employed since a bounding approach was used. S&L therefore, communicated the results of the calculation to CECo via a letter dated May 5, 1989 to expedite resolution of the battery operability concern. The CECo on-site review was also performed on May 5, 1989 to expedite resolution of the battery operability concern. The CECo on-site review was also performed on May 5, 1989 based on S&L's letter and the discussions held between the on-site review members, CECo engineering and S&L personnel. The S&L calculation was subsequently dated, reviewed and approved on June 27, 1989 following resolution of the conflict between the two GNB battery discharge characteristic curves.

Commonwealth Edison agrees S&L made an error by not signing and dating the calculation on May 4, 1989. In retrospect this could have been done, stating the assumptions made, and subsequently performing another calculation when the curve issue was resolved.

The recorded review and approval dates of the calculation resulted from the desire to precisely identify the discharge characteristic curve which applied. In retrospect this judgement was in error. This delay is an isolated event driven by the unique nature of the problem encountered.

C. Commonwealth Edison agrees that a design review should have been done via a Temporary Alteration. The affected cell has since been replaced by a new cell.

2. Corrective Actions

- The immediate interim corrective action taken, relative to the electrolyte temperature concern, was to restrict the use of the 125 vdc system crossties at both Byron and Braidwood Stations. Batteries 111, 211 and 212 could only be crosstied when the battery room temperature was above 70° F while Battery 112 would not be crosstied at all.

- Investigations of the S&L battery sizing calculations at other CECo nuclear stations were performed. The results revealed that there were no similar discrepancies between the minimum temperature used in the design calculations and the Station Technical Specifications at other stations.

- Upon completion of new battery sizing calculations, design changes or operating procedure changes will be implemented to remove the temporary operating restrictions.

- The Byron/Braidwood ELMS calculation has been revised to incorporate as a basis the 60° F temperature identified in Technical Specification surveillance requirement 4.8.2.1.2.1

- The single cell charger has been labeled to require a Temporary Alteration prior to use.

D. Corrective Action to Prevent Recurrence

1. Sargent and Lundy has addressed the temperature discrepancy identified through their in-house QA program. The generic implications of this non-compliance were also discussed in depth at the S&L Electrical Department Projects meeting on April 6, 1990. (Complete)

2. A review of ELMS versus UFSAR and Tech Specs for analysis and testing will be performed by NED. This review is to ensure that the UFSAR references the latest version of ELMS and will be completed by July 16, 1990.

3. The Byron Station On-Site Review program is being revised and will include a checklist for operability determination with regard to equipment and regulatory requirements. The new program will be approved for use by August 3, 1990.

E. Date when Full Compliance will be Achieved

ELMS versus UFSAR review completion - July 16, 1990
OSR Program revision completion - August 3, 1990.

Attachment B

Open Item
454/90012-02 and 455/90011-01

NRC inspection report #455/90012 and #454/90011 identified concerns relative to use of proper calibration of instruments when performing specific gravity measurements on Station 125 vdc safety related batteries as well as the frequency of equalize charges on those batteries.

It was found by the inspectors that the Station was measuring specific gravities using a 60/60 hydrometer while the vendor information stated that a 77/77 hydrometer was utilized at the factory and during factory performance tests. Attached is a May 4, 1990, letter from Mr. K. Uhlir to Byron Station identifying the correlation between a 60/60 hydrometer and a 77/77 hydrometer. The Station has taken the correction factor from this information and has applied it to the previous quarterly as well as weekly surveillances and has determined that specific gravity readings corrected to a 77/77 hydrometer remained above the technical specifications minimum specific gravity of 1.205 for the overall battery average with no single cell below 1.195.

In addition, Byron Station has procured several 77/77 hydrometers and will, by September 30, 1990, take specific gravity readings using these hydrometers. Procedures associated with this activity will be reviewed and revised as necessary by September 30, 1990.

To address the concern of equalize charge frequency, Byron Station will review all appropriate procedures and will revise those procedures to assure that unnecessary equalize charges are eliminated. It will be the intent of this review to assure that the Station performs equalize charges in accordance with vendor recommendations.

This review and associated procedure changes will be completed by September 30, 1990.

1747v:6

May 4, 1990

Subject: Temperature Correction of Lead Acid Storage Battery Electrolyte Specific Gravities using Hydrometers Certified at 60°F/60°F.

Messrs. R. Bax, G. Diederich, E. Eenigenburg, T. Joyce, R. Pleniewicz, R. Querio

During a recent NRC Inspection at Byron Station it was revealed that safety related battery specific gravity readings were performed using hydrometers that were certified at 60°F/60°F. Review of past battery surveillances showed that the observed specific gravity readings from the 60°F/60°F hydrometers were temperature corrected to the actual electrolyte temperature using 60°F as a basis of measure.

Specific gravity readings and the published performance data of the lead acid storage batteries used in safety related applications at all six of CECo's nuclear stations are based on a temperature of 77°F. Per IEEE STD-450 and the battery manufacturer instructions, specific gravity readings should be corrected for actual electrolyte temperature. The recommended temperature correction factor is also based on 77°F. Therefore, it is important that any specific gravity readings taken with a hydrometer certified at 60°F/60°F be converted to a 77°F/77°F basis of measure prior to correcting for actual electrolyte temperature and level. Failure to make this conversion will result in specific gravity readings approximately 2 points (0.002) less than actual for observed specific gravity readings in the 1.195 to 1.225 range.

Nuclear Engineering recommends that the station adopt the following practices in order to preclude incorrect specific gravity readings during battery surveillances:

1. When possible, use a hydrometer certified at 77°F/77°F. By doing so, the correction factors for actual electrolyte temperature and level may be applied directly to the observed reading.

2. When using a hydrometer certified at 60°F/60°F, use the attached guidelines for conversion of the observed specific gravity reading to a 77°F/77°F basis of measure.

3. Specify a 77°F/77°F certification of any new hydrometers procured in the future.

4. Hydrometers are typically certified at either 77°F/77°F or 60°F/60°F. Should any station be using a hydrometer certified to a temperature other than this, notify engineering to obtain direction on proper conversion to a 77°F/77°F basis of measure.

Guideline for Temperature Correction of Lead Acid Storage Battery Electrolyte Specific Gravities

Purpose: This guideline shall provide instruction on correcting specific gravity readings for temperature when using hydrometers certified at 60°F/60°F.

References:
1. National Bureau Standards, Circular 19.
2. IEEE-450-1987
3. ASTM D891-89

Criteria: Specific gravity readings are based on a temperature of 77°F (25°C). The readings must be corrected for the actual electrolyte temperature. Specific gravity readings taken with a hydrometer certified at 77°F/77°F correct for temperature by adding 1 point (0.001) to the reading for each 3°F (1.67°C) above 77°F and subtracting 1 point for each 3°F below 77°F. Using a hydrometer certified at 60°F/60°F requires conversion to a 77°F/77°F basis of measure prior to correcting for actual electrolyte temperature.

Guideline

The following method shall be used to convert specific gravity readings at 60°F/60°F to a 77°F/77°F basis of measure:

1. Multiply the observed reading of specific gravity taken with a hydrometer certified at 60°F/60°F by +0.001752.

2. Add the value obtained from step 1 to the observed reading of specific gravity.

Example:

Specific gravity 77°F/77°F = Sp. Gr. 60°F/60°F + (0.001752 x Sp. Gr. 60°F/60°F)

3. Correct for actual electrolyte temperature by adding 1 point (0.001) to the specific gravity reading determined at the 77°F/77°F basis of measure for each 3°F above 77°F and subtract 1 point for each 3°F below 77°F.

4. Correct for electrolyte level per manufacturers recommendations.

ZELECT/5
KWU/pam