

Commonwealth Edison Company
Braidwood Generating Station
Route #1, Box 84
Braceville, IL 60407-9619
Tel 815-458-2801



November 16, 1995

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Braidwood Nuclear Power Station Unit 1,
Operability Assessment of Safety Related Battery 112 and
Supplemental Actions to be Taken
NRC Docket Number 50-456

Reference: D. Saccomando letter dated November 9, 1995, to the Document Control Desk
Providing Clarification of Braidwood Unit 1 Steam Generator Inspection Data

A conference call was held on November 14, 1995, between members of the NRC staff and Commonwealth Edison Company (ComEd), regarding an operability assessment for safety related battery 112. The assessment concluded that although a modified performance discharge test performed on October 30, 1995, did not result in the expected capacity, battery 112 was still considered to be operable. The basis for this determination was, in part, the successful completion of a service test on battery 112. A copy of the operability assessment is included in the attachment. As a result of the discussions, ComEd is committing to perform the following actions:

1. In order to demonstrate that capacity has been fully restored to battery 112 and to satisfy recommendations of IEEE Std. 450, Braidwood Station will perform single cell modified performance discharge tests on representative cells of battery 112 following a minimum of 30 days on continuous float charge. The single cell test on three of the 112 battery cells (5%) will be completed prior to April 1996. This date is based on the time necessary to obtain the appropriate equipment, write and approve the necessary procedures, conduct training and perform the test in a safe, conservative fashion.
2. The entire battery will be subjected to a modified performance discharge test during the next outage of sufficient duration to allow Battery 112 to be out of service for 10 days. The next scheduled outage of sufficient duration to perform the test is the Unit 1 midcycle steam generator inspection outage as discussed in the above reference.
3. A battery impedance test will be performed on the 112 battery cells once each week until the battery impedance readings stabilize.

Subsequently, a battery impedance test will be performed on the 112 battery cells once each quarter until the modified performance test is successfully completed.

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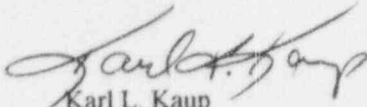
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If your staff has any questions or comments concerning this letter, please refer them to Allen Checca, Braidwood System Engineering Supervisor, at (815)458-2801, extension 2243.



Karl L. Kaup
Site Vice President
Braidwood Station

KLK/JML/tts
Attachments

cc: H. J. Miller, NRC Regional Administrator - RIII
R. R. Assa, Project Manager - NRR
C. J. Phillips, Senior Resident Inspector
K. A. Strahm, Vice President PWR Operations

ATTACHMENT

Operability Assessment of Battery 112

ATTACHMENT B
CONCERN SCREENING FORM

1.0 ISSUE IDENTIFICATION:

1.1 Description of Operability Issue:

Operability evaluation of Batteries 112
as requested by the NRC in response
to surveillance testing performed during
AIRAS

PIF # _____

Date

11-10-95

Preparer

E. E. Adams

Unit

1

System

DC

EPN(s)

1DC02E

Expected Due Date

N/A

1.2 How and by whom was this condition identified?

NRC / NRR CONFERENCE CALL WITH BRADWOOD STATION - 11/10/95 15:00

2.0 CONCERN SCREENING:

YES NO

2.1 Does the issue involve a condition of a SSC where there has been a loss of quality or functional capability?

☐

☒

2.2 Does the issue involve a failure to conform to applicable codes or standards specified in the UFSAR?

☐

☒

2.3 Does the issue involve equipment NOT meeting UFSAR design requirements?

☐

☒

2.4 Does the issue involve operating experience information or engineering reviews that demonstrate a design inadequacy?

☐

☒

2.5 Does previous guidance require an operability determination?

☐

☒

2.6 Does the issue involve an existing but unanalyzed condition or accident?

☐

☒

If any of the above questions 2.1 - 2.6 = YES, continue with section 3.0 below.

If all of the above questions 2.1 - 2.6 = NO, attach a justification, sign 4.3 below, exit this procedure and continue with IRP process.

3.0 INITIAL OPERABILITY ASSESSMENT:

YES NO

3.1 Is a valid prior evaluation of this condition available? If YES, attach copy to this form, sign 4.3 below, exit this procedure and continue with IRP process. If, NO continue below.

☐

☐

3.2 Does previous operability policy exist in the Appendices?
If YES, record applicable section _____
and take the required action.

☐

☐

3.3 Is it reasonable to expect that operability will be assured as a result of a more detailed evaluation? Briefly explain basis:

☐

☐

If 3.3 = NO, NOTIFY the Shift Engineer to IMMEDIATELY declare the equipment inoperable.

If 3.3 = YES, initiate Attachment C in a timely manner commensurate with the safety significance.

4.0 ADDITIONAL REQUIRED ACTIONS:

4.1 Notify SED/SEC for evaluation support, if required: Person Notified

N/A

Time/Date

4.2 Preparer

E. E. Adams / J. Z. Barone

11/10/95

4.3 Shift Engineer Approval

[Signature]

11/10/95

Braidwood On-site Review and Investigation Report

OSR Number: 95-170 Date: 11/10/95
 Subject Review: Battery 112 Operability Assessment

Requested by: D. Huston X 2511

Disciplines Required: ☒ A Nuclear Power Plant Technology
☒ B Reactor Operations
☐ C Reactor Engineering
☐ D Chemistry
☐ E Radiation Protection
☐ F Instrumentation and Control
☒ G Mechanical and Electrical Systems

Participants: Reg Assur Supv Sys Eng Supv
OP Engineer
Ita Support Eng Supv

OSR Membership Approved [Signature]
 Technical Staff Supervisor / Date

10CFR50.59 Screening is Required: - - - - - Y/N [Signature]

If yes, attach completed documentation in accordance with BwAP 1205-6.

10CFR50.59 Safety Evaluation is Required: - - - - - Y/N [Signature]

If yes, attach completed documentation in accordance with BwAP 1205-6.

(If a Safety Evaluation is Required, then Concurrence is Required by Offsite Review)

Concurrence Required by Offsite Review? (per Section C.6) - - - Y/N [Signature]

Findings and Recommendations:

Onsite Review Committee concurs with the conclusions of this operability assessment

On-Site Review Committee: Signature indicates concurrence with Findings and Recommendations and 10CFR50.59 Safety Evaluation.

Signatures	Discipline(s)	Date
<u>J. L. B...</u>	-	<u>11/10/95</u>
<u>[Signature]</u>	-	<u>11/10/95</u>
<u>[Signature]</u>	B, G	<u>11/10/95</u>
<u>E. E. Adams</u>	A, B, G	<u>11-10-95</u>
<u>P. J. H...</u>	AB, FI	<u>11-10-95</u>

Approved by: [Signature] 11-10-95
 STATION MANAGER DATE

APPROVED

BRAIDWOOD ON-SITE REVIEW AND INVESTIGATION REPORT

OSR No. 95 - 170

* NOTE *
* This checklist is provided as guidance for OSR *
* preparation and review. Items should be *
* completed as appropriate. *

Preparer

App. N/A

I. SYNOPSIS FORMAT

☒ Purpose _____
☒ Executive Summary of Findings and Recommendations _____
☒ References _____
☒ Bases of Findings and Recommendations _____
☒ Contingency Actions Recommended _____

II. DOCUMENTATION REVIEWED: (List Applicable Sections in Synopsis)

☒ UFSAR _____
☒ Tech Specs. _____
☒ Admin Tech Requirements _____
☒ Safety Evaluation Report _____
☒ Fire Protection Report _____
☒ Prior 10CFR50.59 Safety Evals _____
☒ NRC Commitments _____
☒ Vendor Documentation _____
☒ Special Permits/Licenses _____
☒ Station Procedures _____
☒ Environmental Qualification _____
☒ Design Basis Documentation _____
☒ Drawings _____
☒ Maint. History (TJM) _____
☒ NPRDS _____
☒ PRA Info. _____
☒ Prior NED OE 40.1 Operability Evaluations _____

III. PLANT CONDITIONS: (Discuss Applicable Items in Synopsis)

☒ Applicable Modes Modes 1, 2, 3, 4
☒ Work In-Progress/Planned Detail @ earliest opportunity
☒ Temporary Alteration Installed _____
☒ Out-of-Service _____
☒ Degraded Equipment Log _____
☒ Abnormal Valve Lineups _____
☒ Effect on Opposite Train _____
☒ Effect on Other Unit _____
☒ Effect on Other Station _____
☒ Training Required _____

IV. OTHER CONSIDERATIONS: (Discuss Applicable Items in Synopsis)

☒ Consistency (dates, document no.s, values, EID's etc.) _____
☒ Grammar (Continuity, spelling, flow, etc.) _____
☒ Engineering Review of A/E Calculations and Assumptions _____
☒ Adequately Documented _____
☒ Reportability (10CFR21, 10CFR72, etc) _____

Prepared by: [Signature]

APPROVED

Braidwood Station Battery 112 Operability Assessment

System Design

The Engineered Safety Features (ESF) 125 Vdc system at Braidwood Station provides control power to the reactor trip switchgear, Main Control Board ESF sections, ESF switchgear control systems, and other safety-related systems requiring d-c power. Each unit is provided with two physically separate and electrically isolated sources of 125 Vdc ESF power (each with its own battery, battery charger and distribution bus). The four d-c busses are numbered 111, 112, 211 and 212 corresponding to unit 1, divisions 11 and 12 and unit 2, divisions 21 and 22.

In addition to the weekly and quarterly surveillance requirements, operability of the batteries is demonstrated by performing a battery discharge test every refueling outage. This can be satisfied with either a service test as specified in Technical Specification section 4.8.2.1.2.d or a modified performance discharge test as specified in section 4.8.2.1.2.e.

The service test is a discharge test that is required to determine if the battery can supply its design basis accident (DBA) loads. This test is performed every 18 months during shutdown.

The modified performance discharge test is a test of the battery's actual capacity compared to the manufacturer's rating and the battery's ability to meet the first minute load of the duty cycle. This test satisfies the requirements of a service test and a performance discharge test. The data obtained in this test is used to benchmark and trend battery capacity. A modified performance discharge test is required to be performed at least once per 60 months during shutdown. It can be performed in lieu of a service test to satisfy Technical Specification 4.8.2.1.2.d.

Event Narrative

On October 30, 1995, Braidwood Station performed a modified performance discharge test on battery 112. Expected capacity was not provided from battery 112 during the performance of this test. The modified performance test results were reviewed and it was determined that the less than anticipated capacity was the result of the manufacturer's pre-test recommendations not being met. AT&T, the manufacturer of the Bus 112 battery, states that prior to a discharge capacity test the battery should be on float charge for at least 30 days without a boost charge and without a battery discharge exceeding 30 minutes (AT&T Lineage 2000 Round Cell Product Manual, 157-629-700 Issue 1 dated August, 1990). The basis for AT&T's restriction is due to gas entrapment which occurs in all lead acid cells following a recharge.

This gas entrapment is more pronounced in the Round Cell due to its design(horizontally stacked plates allow for an increase in gas entrapment). More time is required for the gases to vent in the Round Cells than in a conventional rectangular lead acid cell. The gases produced as a result of charging a lead acid battery are hydrogen at the negative plates and oxygen at the positive plates. These gases are being produced as a result of the disassociation of water in the electrolyte, particularly near the end of recharge period when all cells are at full state of charge and will no longer accept a charge. Although the plates of the cells are fully charged as indicated and verified by visual inspection and cell parameters such as individual cell voltages and specific gravities, the trapped gases temporarily reduce cell capacity because they increase the cell's internal resistance and reduce the effective surface area of the active material in contact with the electrolyte.

Temporary capacity reductions of this nature are recognized and accounted for by proving additional capacity margin when sizing a battery in accordance with IEEE Std. 485-1983, (Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations). The capacity margin allows for unforeseen additions to the DC system and less than optimum operating conditions of the battery, conditions potentially caused by improper maintenance, recent discharge or ambient temperatures lower than anticipated. The capacity margin for battery 112 is 31%.

The unexpected discharge of battery 112 was caused by an inadvertent trip of the parallel output breakers used to feed the 112 bus from a temporary charger during maintenance activities. During the two hour period required to replace the defective breakers, the 112 battery carried the bus. Due to this unexpected discharge of the battery six days prior to the modified performance discharge test (approximately 120 amperes for 2 hours or 240 ampere-hours), the initial conditions for the test were not satisfactorily met. The measured capacity from the test did not accurately reflect the actual capacity of the battery and therefore cannot be compared to the manufacturer's rating.

Due to the inability to meet the initial requirements of a modified performance discharge test, a decision was made to perform a service test in order to satisfy the Technical Specification surveillance requirement of performing a battery discharge test every 18 months.

Conclusions

Based on our knowledge of the design and characteristics of the battery, it is our judgement that battery 112 would have successfully passed its modified performance discharge test had the unexpected discharge not occurred. This judgement is

supported by the 112% capacity measured on battery 111 during its modified performance discharge test on October 5, 1995. The cells in battery 112 were from the same production lot as battery 111. In addition, all the cells were acceptance tested together at the manufacturer's factory. The average capacity of all the cells during the acceptance test was found to be 110%.

The design basis loads of battery 112 are 563 amps for a 1 minute duration and 390 amps for a 59 minute duration with a terminal voltage of 108 Vdc or above at a minimum temperature of 60 °F. During the service test performed on November 6, 1995, a 1 minute duration load of 563 amps and a 59 minute duration load of 390 amps resulted in a minimum terminal voltage of 110.6 Vdc. Based on these results, battery 112 has demonstrated its ability to perform its intended function during a design basis accident and can be considered operable. This conclusion is further supported by the results of the modified performance discharge test performed on October 30, 1995. The 92% capacity measured during the performance test is well above the 73% capacity required to meet the present design basis loads. (73% is the capacity required to meet the present design basis loads based on current sizing calculations.)

Follow Up Actions

In order to demonstrate that capacity has been fully restored to battery 112 and to satisfy the recommendation of IEEE Std. 450, Braidwood Station will perform single cell modified performance discharge tests on representative cells of battery 112 following a minimum of 30 days on continuous float charge.

The entire battery will be subjected to a modified performance discharge test during the next outage of sufficient duration.