NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

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EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

# LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| Indian Point 3 | 05000286 | 1 OF 8 |

TITLE (4) Discovery of a Design Deficiency in the DC Power System Which Could Result in Loss of the Battery Chargers Causing the Plant to be Outside Design Basis due to Inadequate Emergency Power

| EVENT DATE (5) | | | LER NUMBER (6) | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | |
|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAME | DOCKET NUMBER |
| 03 | 13 | 97 | 97 | -- 003 -- | 01 | 08 | 15 | 97 | | 05000 |
| | | | | | | | | | FACILITY NAME | DOCKET NUMBER 05000 |

| OPERATING MODE (9) | N | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| POWER LEVEL (10) | 100 | | 20.402(b) | | 20.405(c) | | 50.73(a)(2)(iv) | | 73.71(b) |
| | | | 20.405(a)(1)(i) | | 50.36(c)(1) | | 50.73(a)(2)(v) | | 73.71(c) |
| | | | 20.405(a)(1)(ii) | | 50.36(c)(2) | | 50.73(a)(2)(vii) | | OTHER |
| | | | 20.405(a)(1)(iii) | | 50.73(a)(2)(i) | | 50.73(a)(2)(viii)(A) | | (Specify in Abstract below and in Text, NRC Form 366A) |
| | | | 20.405(a)(1)(iv) | ✓ | 50.73(a)(2)(ii) | | 50.73(a)(2)(viii)(B) | | |
| | | | 20.405(a)(1)(v) | | 50.73(a)(2)(iii) | | 50.73(a)(2)(x) | | |

LICENSEE CONTACT FOR THIS LER (12)

| NAME | TELEPHONE NUMBER (Include Area Code) |
|---|---|
| Anthony Russo, Design Electrical Engineer | 914-736-2565 |

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS |
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| | | | | | | | | | | |
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| SUPPLEMENTAL REPORT EXPECTED (14) | | | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|---|---|---|---|---|---|---|
| | YES (If yes, complete EXPECTED SUBMISSION DATE). | ✓ NO | | | | |


ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On March 13, 1997, with the plant at 100 percent power and normal temperature and pressure, operations reported the plant outside design basis as a result of an engineering determination that there was a design deficiency in the 125 volt DC Electrical Distribution System (EDS) power supplies due to an inability of the system to meet single failure criteria during use of a backup battery charger (BC). The reported condition existed periodically since a design modification added a backup battery charger (BC-35) to the 125 volt DC EDS and powered it from a 480 volt AC bus that is supplied from one of three Emergency Diesel Generators (EDG-33). When BC-35 is used in lieu of a normal charger to sustain the DC power supply supporting one of the other two EDGs, a Loss of Offsite Power or Safety Injection and a postulated single failure to EDG-33, or its associated bus/power circuit could result in loss of two BCs. Subsequent battery depletion could result in loss of one of the two remaining EDGs. The potential loss of two of three EDGs places the plant outside its design basis. The event was caused by the original classification of BC-31, 32, 33 as non-seismic which was relied upon for the modification to add BC-35 and resulted in no consideration of cross-tie effects. Further review determined that the non-safety classified BC's perform a safety function. The cause of classifying the BC's originally as non-seismic was the unavailability of qualified BCs, but the failure to adequately justify their classification could not be determined. Corrective actions include an evaluation to document the BC's design basis, re-classification of BCs 31, 32, 33, 35 as Seismic Class I/QA Category I, revision of procedures, and issuance of a temporary modification for limited use of BC-35. This event had no significant effect on the health and safety of the public.

Note: The Energy Industry Identification System Codes are identified within the brackets { }

## DESCRIPTION OF EVENT

On March 13, 1997, at approximately 1650 hours, Operations concluded that past operation of the backup battery charger {BYC} (BC) could place the plant outside its design basis and made a one-hour non-emergency notification (Log No. 31948) to the NRC at approximately 1746 hours. At the time of reaching this conclusion, the plant was at 100 percent reactor power, Reactor Coolant System (RCS) temperature at approximately 567 degrees F, RCS pressure at approximately 2235 psig, and pressurizer level at approximately 46 percent. The Operations determination was based on an evaluation of Deviation Event Report (DER) 97-0521, written by Design Engineering to identify that there was a design inadequacy in the 125 volt DC Electrical Distribution System (EDS) {EJ} that is due to an inability of the system to meet single failure criteria during use of a backup battery charger. While evaluating this issue, engineering also identified that normal battery chargers (BC) 31, 32, 33 would be relied upon to support operation of safety related equipment subsequent to the two hour duty cycle of the safety related station batteries but were not seismically qualified.

Power is supplied to 125 volt DC instrumentation and control loads {EE} by the 125 volt DC EDS which normally receives power from the 480 volt AC EDS {ED} to the 125 volt DC EDS via the battery chargers. The 125 volt DC EDS consists of four independent power panels each of which is provided with a dedicated battery {BTRY} and battery charger. Batteries 31, 32, 33 and 34 are charged from battery chargers 31, 32, 33, 34, respectively, which are in turn powered from 480 volt safeguards buses {BU} 5A, 6A, 2A and 3A. Buses 2A and 3A are tied together and considered a single safeguards bus. The charger functions to supply continuous DC bus loads while recharging the battery during normal and accident conditions. In the event that the 480 volt AC EDS is lost, the batteries are sized to supply its expected shutdown loads following a plant trip and loss of AC power for at least two hours. A backup charger (BC-35) was added in 1985. Engineering discovered that during the times BC-35 is used as a substitute for either BC-32 or BC-33, a Loss of Offsite Power (LOOP) or a Safety Injection (SI) signal and a postulated single failure of EDG-33, or its associated 480 volt bus/power circuit may cause loss of DC power input (via the backup battery charger) to a second EDG.

Engineering's investigation found that this could lead to loss of the second EDG after depletion of its battery. Although the EDGs are self exciting (except during startup), a field shutdown circuit of the EDG exciter regulators contains a relay (K1) {RLY} that is powered by an external DC power source (the associated battery). Upon loss of battery power (designed for at least two hours with no battery charger available), de-energization of the K1 relay in the EDG exciter regulator would cause loss of EDG output. In addition, as a result of further investigation Engineering also concluded that because BC-31, 32, 33 and 34 are not Seismic Class I,QA Category I, they could not be credited with performing their function following a LOOP (assumed LOOP with seismic or LOCA). Further engineering analysis concluded that there was a need to ensure that a continuous source of power was available to 125 volt DC and 118 volt AC safety related loads subsequent to the two hour duty cycle of the station batteries.

Engineering's investigation discovered that during implementation of the original design, the BCs were specified to be seismically qualified but this requirement was changed as a result of the unavailability of manufacturers that could supply BCs with seismic qualification. The change in design requirements for use of non-seismically qualified BCs was justified in a memorandum that used assumptions and engineering judgement. The BCs were classified and licensed as non-seismic components in FSAR Section 16.1. The FSAR identified the DC power supply system as seismic Class I, but the BCs as seismic Class III (i.e., those structures and components which are not directly related to reactor operation or containment). The battery chargers were re-classified in 1989 from Non-Category I to Category M. Category M is assigned to non-safety related structures, systems, or components to which a modified quality assurance program must be applied. FSAR Section 8.2 discusses the 125 volt EDS and the BCs but does not discuss the BCs non-safety classification. Engineering could not identify the basis of the assumptions and the engineering judgement used to allow classification of the BCs as non-seismic and Non-Category I. The basis of the original classification was not substantiated in the design of the plant or discussed in the FSAR and recognized in licensing documentation.

Engineering identified several past opportunities that occurred which could have identified the design deficiencies with the BCs such as the modifications that replaced BC's 31, 32, 33, the modification that installed BC-34, and a seismic issue from an NRC Electrical Distribution System Functional Inspection (EDSFI).

The Non-Seismic, Non-Category I design basis was relied upon for the modifications. During the EDSFI, the NRC questioned the availability of the 125 DC EDS due to concerns on the seismic qualification of the BC's. The 1991 inspection (50-286/91-80) was the first documented indication that the BCs may be required to operate following the two hour duty cycle of the batteries. The civil/structural engineering group, in support of electrical engineering, developed a calculation to resolve the NRC concern using the methodology of the Generic Implementation Plan (GIP) for resolution of Unresolved Safety Issue A-46, and the NRC Safety Evaluation Report on the GIP. Based on the experience-based seismic adequacy verification, the evaluation concluded the BC's were seismically adequate to meet seismic Class I requirements. At that time the Authority did not have a company wide action tracking system nor a formal process for identifying and resolving non-conforming conditions and NRC issues. Once the seismic verification was complete and the issue closed by the NRC no further re-classification action was taken. A SQUG as-built walkdown of BCs 31, 32, 33, 34 was performed which augmented the calculation and provided verification of the adequacy of BC-31, 32, 33, but identified BC-34 as an outlier due to grating that required attachment to cabinet framing. The reasons for the seismic classification was not questioned and without a formal corrective action process the review for extent of condition was inadequate and the BCs were not qualified and upgraded to QA Category I by a documented re-classification evaluation. Upon identification of the issue in 1997, a SQUG seismic adequacy verification was performed for BC-35 and BC-34 was re-verified. Immediate resolution of the outlier condition for BC-34 was not considered necessary because BC-34 is not associated with an EDG and its power circuit design allows instrument bus 34 to be re-powered by operator action using established procedures from a safeguards MCC.

BC-31, 32, 33, 34, and 35 are manufactured by Exide Corporation {E353}. BC-31, 32, and 35 are model number SCRF 130-3-400-E; BC-33 is model number USF 130-3-200, and BC-34 is model number USF 130-3-150.

## CAUSE OF EVENT

The event was caused by classification of battery chargers 31, 32, and 33 as Non-Seismic, Non-Category I during the original design. This Non-Seismic, Non-Category I design basis was relied upon for the modification that added BC-35 therefore the effects of the cross-tie were not evaluated.

The classification of the battery chargers as non-seismic during the original design was due to the unavailability from manufacturers of seismically qualified BCs at the time. The cause of the failure to adequately justify and document the basis for using non-seismically qualified equipment in a safety application could not be determined. A mindset evolved that the original as-licensed condition was acceptable and formed the basis for later actions (i.e., modifications, seismic inspection issue). The cause of the failure to re-classify the BCs to QA Category I as a result of the EDSFI seismic issue was the existing mindset, and an inadequate extent of condition review due to a lack of re-classification requirements and a corrective action process. The inappropriate actions should not recur because there is a company wide corrective action program (DER) and a computerized action commitment tracking system (ACTS) which requires non-conforming/degraded conditions to be recorded and actions tracked (ACTS). The procedure for classification of structures, and systems requires a safety evaluation and FSAR change as applicable, and the procedure for technical evaluations of components and replacement items requires a review of the FSAR and a DER for changes to QA category. A new procedure for FSAR changes requires a DER for discrepancies and a safety evaluation. These changes and improvements are expected to prevent recurrence.

## CORRECTIVE ACTIONS

The following corrective actions have been or will be performed to address the causes of this event:

- A Protective Tagging Order was issued to prevent the use of the backup battery charger.

- An Operational Shift Order was issued notifying operators of the problem with the BCs, use of BC-35, procedural changes required for returning the power to the BCs within two hours, and the DC requirement of the EDGs. Issued April 2, 1997.

- Engineering performed an assessment to document the safety related equipment required subsequent to the two hour duty cycle of the station batteries and developed a classification upgrade and safety evaluation that upgraded BC 31, 32, 33, and 35 to safety class components (Seismic Class I, QA Category I). Engineering concluded that BC-34 is not required to be Seismic Class I, QA Category I because its safety related load, instrument bus 34 has the capability to have power supplied by either one of two Seismic Class I, QA Category I MCCs.

- The Plant Equipment Data Base (PEDB), a computerized database of plant equipment that includes identification of a components quality class was updated to reflect the BC classification upgrade.

- A temporary modification (TM) was developed to allow use of the backup battery charger (BC-35) for contingencies. The TM allows use of BC-35 when a normal BC is out of service and provides for re-powering BC-35 from an appropriate power source thereby satisfying single failure criteria.

- The System Operating Procedure SOP-EL-3, "Battery Charger and 125 Volt DC System Operation," was revised to state that the backup battery charger (BC-35) should not be used in its present configuration except for battery surveillance testing during cold shutdown conditions. If used during plant operation then it shall be used with the implementation of the referenced temporary modification.

- The appropriate procedures were revised to provide precautions to alert operators that the batteries have a two hour design limit and the MCCs supplying the BCs must be re-energized to restore the BCs within two hours to prevent loss of the associated DC buses, that EDG output could be lost due to an externally powered DC shunt circuit in the EDG exciter regulator controlling field excitation, and if BC-34 will be out of service for greater than two hours then instrument buses 34, 34A shall be switched to backup power within two hours.

- The Emergency Operating Procedures (EOPs) will be reviewed to determine if any additional revisions/enhancements are desired for resetting of BC-31, BC-32, and BC-34 and manual transfer of instrument bus 34 as provided by the LER corrective action revisions to SOPs and Off Normal Operating Procedures (ONOP). The review will be completed prior to reactor startup from the current refueling outage.

## ANALYSIS OF EVENT

The condition is being reported under 10 CFR 50.73 (a)(2)(ii)(B). The licensee shall report any operation or condition that resulted in the plant being in a condition that was outside the design basis of the plant. The condition is being reported because the onsite emergency AC power supply, which is designed to have a minimum of two Emergency Diesel Generators, could have been less than the minimum during past use of the non-safety related backup battery charger (BC-35), or as a result of non-safety grade battery chargers that can not be credited in a DBA/DBE.

During past maintenance when the backup battery charger (BC-35) has been used in place of BC-32 or BC-33, a LOOP or a SI signal and a postulated single failure of EDG-33, or its associated 480 volt bus/power circuit would cause loss of the battery charger that would result in battery depletion and a consequential loss of the associated EDG. This condition has existed since installation of BC-35 in 1985 whenever BC-35 was in use. The potential loss of more than one battery charger and their lack of qualification as safety related components and subsequent loss of all EDGs is a condition that has existed since the original plant operation.

A review of Licensee Event Reports (LERs) over the last three years for similar events concerning inadequate designs for single failure identified the following LERs: LER 96-001, 95-015-03, 95-007, 95-003.

## SAFETY SIGNIFICANCE

This event did not have a significant effect on the health and safety of the public. There was no actual safety significance because there was no loss of DC power nor any design basis accidents (DBAs) or earthquake with loss of offsite power (LOOP).

There have been two LOOPs events since backup battery charger 35 was installed in 1985. One LOOP occurred in February 1995 (LER 95-004) and another occurred in January 1996 (LER 96-002). Both LOOPs occurred during cold shutdown. A review of the operating history and plant log showed that during the LOOP in 1995, BC-35 was substituted for BC-34. However, BC-34 does not support an EDG and there are existing procedures to re-power instrument bus 34 by operator actions from safeguards MCC-36B or MCC-36C. During the LOOP in 1996, BC-35 was not being used. The individual battery chargers would have been reloaded using System Operating Procedure (SOP)-EL-15, "Operation of Non-Safeguards Equipment during Use of the Emergency Operating Procedures (EOPs)."

Procedure SOP-EL-15 requires re-energization of the BC power supplies, and contains precautions to alert operators that the batteries have a two hour design limit and that EDG output could be lost. The test time for operators on the Job Performance Measure (JPM) exam for align and reset of MCCs and lighting without offsite power is 20 minutes. Therefore, reset and energization of the MCCs is expected to occur within 2 hours.

The potential safety significance for design basis conditions were assessed as follows:

- Battery Chargers 31, 32, 33 would have performed their function. BCs 31, 32, 33 have been determined to be operable by operations based on a SQUG evaluation and an engineering evaluation that included a safety evaluation that upgraded the BCs to safety class. BC-35 was included in the upgrade and re-classification. Therefore, these chargers would not have failed in design basis events.

- Each of the four batteries were sized to carry its expected shutdown loads following a plant trip and loss of all AC power for a period of two hours and the battery chargers would be reloaded by operations for continued DC power. Without MCC-32, BC-34 could not be powered, but the load for battery 34, instrument bus 34 can be re-powered by operator action using established procedures from MCC-36B or MCC-36C.

A probabilistic calculation regarding the frequency of a LOCA with LOOP and a single failure of the 33 EDG determined that the frequency for this event was 6.68E-7 per year, and its associated Core Damage Frequency (CDF) is 4.94E-9 per year. The CDF per year is less than 2E-6 which is a level of probability considered to present no significant effect to public health and safety.