10227490



27

RH-5A17

02/19/2003 09:32:14 Steven D. "Steve" Baker (SDBAKER)

1) Description of Condition:
This Notification is being written to have two (2) Work Orders generated for the replacement of the 250VDC Batteries and to ensure that there is an open OD after RE21 related to the high levels of calcium in these Batteries. One Work Order should be written for the replacement of the 250VDC Div. I Battery in RE22 (associated action SCR 99-0465 #12) and one for the replacement of the 250VDC Div. II Battery in RE23 (associated action SCR 99-0465 #13).

Notification 10180700 documents the degraded condition of seven cells of the Div. I and II 250 VDC Batteries as well as a non-conforming condition associated with all cells of both batteries. During RE21 two (2) cells will be replaced in the Div. I 250VDC Battery and five (5) cells will be replaced in the Div. II 250VDC Battery. Completion of this work will eliminate the existing degraded condition. However, the non-conforming condition associated with all the cells will remain until both of the work orders initiated by this notification are completed by the end of RE23.

This Notification provides the means for generation of the new OD for the 250VDC Batteries. Currently this existing non-conformance is addressed under Notification 10180700, this is not a newly identified condition.

2) Requirement Not Met:
None, this is a request to have two (2) Work Orders generated and to ensure the OD for the 250VDC Batteries remains open once the work performed in RE21 is complete.

3) Method of Discovery:
Work associated with closing open 91-18 issues.

4) Immediate Actions Taken:
Discussed issue with several Operations personnel to ensure this would be the proper approach to close the open 91-18 issue and issue a new Notification to document what actions have happened up to this point and what actions we plan on taking to resolve the high calcium issue.

5) Recommendations:
Once work orders 4235345 and 4235346 have been completed in RE21, close the open GL91-18 in Notification 10180700. Then once those Work Orders have replaced the degraded cells, use this Notification and associated OD to track the open OD for the non-conformance of the 250VDC Batteries.

6) Location of Evidence:
Notification 10180700, Work Orders 4235345 and 4235346.

J-17

02/19/2003 10:55:48 Michael J. Manning (MJMANNI)

1) Immediate Actions Taken: NOTIFIED OPERATIONS, LICENSING, AND PED MANAGER

2) Basis For Ops Review. EQUIPMENT OPERABILITY RELATED. MAINTENANCE

RESOURCES REQUIRED TO REPLACE BATTERY CELLS IN THE FUTURE (RE-22 AND RE23 AT THIS TIME).

3) Basis For Classification: OD REQUIRED, CAP WILL TRACK OD CLOSURE. WORK ORDERS WILL NEED TO BE GENERATED TO PERFORM BATTERY CELL CHANGE OUTS.

4) Basis For Disp. Department: ELECTRICAL MAINTENANCE PERFORMS WORK ON BATTERIES

5) Apparent Cause: FABRICATION PROBLEM. ADDITIONAL CALCIUM ADDED TO A PORTION OF THE LEAD BATTERY PLATES DURING FABRICATION. THIS ADDITIONAL CALCIUM WHILE MAKING THE PLATES STRONGER ACCELERATES THE PLATE SWELLING PHENOMENA, WHICH CAN AFFECT THE LIFE OF THE CELL.

6) Clarification Comment. THE CONDITION OF HAVING A HIGHER CALCIUM CONTENT THAN DESIRED IS A NON-CONFORMING CONDITION. THE CELLS DO NOT BECOME DEGRADED UNTIL PLATE SWELLING IS OBSERVED. THIS IS A SLOW PROCESS AND CAN BE DETECTED IN TIME TO PREVENT A FAILURE. AFTER COMPLETION OF RE-21 NO CELLS WILL BE DEGRADED BUT WILL STILL BE CONSIDERED NON-CONFORMING.

NOTIFICATION 10180700 HAS AN OD DOCUMENTING THE CONDITION AND OPERABILITY JUSTIFICATION FOR REFERENCE. A NEW OD OR REVISON TO THE OLD OD WILL NEED TO BE DONE

10227490



03/25/2003 14:15:56 Peter J. Donahue (PJDONAH)

This OD (supplied by System Engineer Steve Baker) supercedes the previous OD associated with notification 10180700. The 5 cells exibiting accelerated cell growth have been replaced. This OD addresses the remaining cells associated with the part 21 related to the affect of high calcium levels on plate growth.

What SSC(s) is affected?

CNS-1-EE-BAT-250 1A
CNS-2-EE-BAT-250 1B

What is the safety function(s) performed by the SSC(s)?

The USAR VIII-6 describes the Safety Objective as follows...
To provide an uninterruptible source of power to supply all normal and emergency 125 volt DC and 250 volt DC control and power loads under all conditions.

And continues to describe the Safety Design Basis as follows...
1. Each 125 volt and 250 volt battery shall have adequate capacity to safeguard the station until AC power sources are restored.

2. Each battery charger shall have adequate capacity to restore its battery to full charge from a totally discharged condition while carrying the normal station steady state DC load.

3. The 125/250 volt DC power systems shall be arranged so that no single component failure will prevent the systems from providing power to a sufficient number of vital DC loads necessary for safe shutdown.

4. The 125/250 volt DC power systems shall be provided in accordance with the "IEEE 308 Criteria for Class 1E Electrical Systems for Nuclear Power Generating Stations", issued in 1970.

5. The 125/250 volt batteries and battery racks shall be Class I Seismic equipment to assure continuous operation of the equipment under maximum seismic shock conditions applicable to the area and locations of the equipment.

6. The 125/250 volt batteries shall provide power for maintaining the plant in a safe hot shutdown condition in the event Control Room operation is prevented by fire and the Alternate Shutdown System is used. Once the diesel-generator is on-line, it will power battery chargers in order to maintain station batteries in a fully charged state.

7. The 125/250 volt Division I and II batteries shall provide power for a 4 hour duration during a Station Blackout in accordance with 10CFR50.63, NUMARC 87-00, and Reg. Guide 1.155.However, the 125/250 volt Division II batteries are required to provide power for a 4 hour duration in accordance with 10CFR50 Appendix R Post-Fire Safe and Alternate Safe Shutdown Analysis Report.

The USAR VIII-6.3 Description also states...

The DC power systems (125/250 volt for power and control) supply DC power to conventional station emergency equipment and selected safeguard system loads. The DC power systems are credited with mitigating a Station Blackout event.

What are the requirements to be satisfied to perform the safety function?

Per Design Criteria Document DCD-5, #DC Electrical Distribution System#, the following criteria are applicable to the Station Blackout event:

The NRC, with the issuance of regulation 10CFR 50.63, required that nuclear utilities review their plant designs for safe shutdown in the event that all AC power, both off-site and onsite, is lost for some period of time. For CNS that period of time has been determined to be 4 hours. This means that, since the DC System is the only means of power for these 4 hours, the DC System batteries must have sufficient capacity to power all of the equipment used in safe shutdown that requires d-c power, for 4 hours without recharging.

Per Design Criteria Document DCD-5, #DC Electrical Distribution System#, the following criteria are applicable to the 125 V DC and 250 V DC subsystems (basis for criteria provided in parenthesis):

1. Load Capacity - The system shall have sufficient capacity and capability to start as well as operate all required safety loads within their voltage ratings in the event of either a transient or an accident (USAR Appendix G).

2. Monitoring and Indication - the availability of the DC Power system shall be monitored and indication of the operational status shall be provided in the Control Room (IEEE 308-1970).

3. Separation, Redundancy, and Independence - equipment shall have sufficient redundancy and independence so that no single failure of active components can prevent the required actions. For those systems which IEEE 279 is applicable, single failure of passive electrical components shall be considered also (General Design Criteria GDC-21, IEEE 308-1970).

4. Protective Devices - protective devices shall be provided to isolate failed components automatically (IEEE 308-1970).

5. Failure Modes and Effects - an analysis of the failure modes of Class 1E electric systems and the effect of these failures to power Class 1E loads shall be performed to demonstrate that a single failure does not prevent satisfactory performance of the minimum Class 1E loads required for safe shutdown (IEEE 308-1970).

6. Environmental Phenomena - the design of the DC system shall include allowance for environmental phenomena at the site (USAR Chapter I).

7. Testing - all components of the DC system that contribute to the emergency service portion functions shall be capable of individual function testing, inspection, and maintenance during normal plant operation (IEEE 308-1970).

8. Availability of Stored Energy - the DC system shall have a supply of stored energy in the form of batteries that have sufficient capacity to meet all of the essential requirements of Item 1 above (IEEE 308-1970).

The Batteries# ability to meet those design criteria stated above is assured by the Battery manufacturer#s quality assurance program controlling their processes so that the cells delivered for installation of CNS are within their design specifications.

When do the requirements have to be met?

The Technical Specifications contains the operability requirements for the 125/250V DC Power Systems.

Technical Specification 3.8.4 DC Sources-Operating, requires that the Division 1 and Division 2 125 V and 250 V DC electrical power sources shall be OPERABLE in MODES 1, 2, and 3.

Technical Specification 3.8.5 DC Sources-Shutdown, requires that the DC electrical sources shall be OPERABLE in MODES 4 and 5, during movement of irradiated fuel assemblies in the secondary containment to support the DC electrical power distribution subsystem(s) required by LCO 3.8.8, "Distribution Systems-Shutdown@.

Technical Specification 3.8.6 Battery Cell Parameters, requires that the battery cell parameters for the 125 V and 250 V batteries shall be within the limits of Technical Specification Table 3.8.6-1 and that the battery cell average electrolyte temperature for the 125 V and 250 V batteries shall be within required limit. This section applies when associated DC electrical power subsystems are required to be OPERABLE.

Technical Specification 3.8.7 Distribution Systems-Operating, requires that the onsite electrical distribution systems, including 125 and 250 volt DC systems, shall be OPERABLE in MODES 1, 2, and 3.

Technical Specification 3.8.8 Distribution Systems-Shutdown requires that the onsite electrical distribution systems, including 125 and 250-volt DC systems, shall be OPERABLE in MODES 4 and 5, during movement of irradiated fuel assemblies in the secondary containment.

How does the condition relate to the requirements?

The conditions identified are the non-conforming high levels of calcium within the positive plate grids of the 250VDC Batteries as identified in Part 21 Event number 36073. As stated in the Part 21 event number 36073, the non-conformance identified in the 250 VDC batteries has been bounded to type LCR-25 batteries supplied to NPPD in 1995. Currently, the only batteries in the plant that contain any of these cells are the 250 VDC batteries. Specifically, the 125 VDC batteries were replaced with cells manufactured in 2000 and 2001. Exide manufactures the Security, PMIS, fire pump, and 24 VDC batteries.

The potential failure mechanism that may result from the non-conforming high levels of calcium within the positive grid alloy is the acceleration of the normal age related phenomenon of the positive plate

growth. This would possibly result in an internal short, or loss of capacity.

Therefore, the condition has the potential to affect the requirement of load capacity of the 250 VDC Batteries.

What is the basis for meeting the requirements?

The result of the non-conforming high levels of calcium within the positive grid alloy is the acceleration of positive plate growth. Positive plate growth is a normal, age related phenomena that constitute a source of time dependent battery degradation. Therefore, the condition identified in this notification has not introduced any new failure modes or affected the batteries ability to meet load capacity requirements at this time. Rather the condition may result in the earlier than expected end of life of the individual cells that make up each battery. This in turn may affect the batteries ability to perform their intended safety function. The two consequences of the condition identified above are internal short and loss of capacity. Since these consequences are the result of a normally occurring phenomena, existing testing and inspection will detect them. The issue to be addressed is the timeliness of these predictive activities to preclude unacceptable cell degradation that may affect the batteries ability to perform its intended safety function.

This OD requires the following interim compensatory measures to monitor battery cells until they can be replaced.

1. In order to detect for signs of early plate growth in cells of the 250 VDC batteries, procedure 6.EE.611 must be implemented on a semi-annual basis until all cells subject to the non-conformance of Part 21 event number 36073 are removed from the plant. This will be accomplished by increasing the Surveillance frequency from its normally scheduled frequency of yearly to semi-annually until all effected cells have been removed. This is considered to be at a frequent great enough to detect any abnormal plate growth, this is based on the fact that this particular phenomenon is dependent upon the amount of excessive calcium in the positive plate grids. The cells with the highest amounts of calcium, and therefore having the greatest amount of plate growth, have already been removed. The cells that are left either have a normal percentage of calcium, or a small percent over normal. This means that we would not expect to see nearly the rate of plate growth that has been seen in the past. Based on our experience, the plate growth phenomenon is such that a cell with no signs of plate growth, would not suddenly experience rapid plate growth and lead to cell failure in less than six months. It is a slow gradual process and is dependent upon the amount of calcium in the grids.

When can the requirements be met?

The requirements are currently being met and will continue to be met until normal surveillance testing indicates otherwise. Currently, sufficient predictive measures are in place, such as visual inspections, to detect degradation before the batteries are unable to perform their intended safety function. Corrective Actions of SCR 99-0465 have

resulted in the development of a long-term action to replace all cells for which Part 21 event number 36073 is applicable. Following completion of these actions, the identified non-conforming condition and potential for the resultant degradation of cells will be permanently eliminated.

Can the condition abnormally degrade?

As stated above, the condition is the accelerated rate of cell degradation in the form of positive plate growth. The rate of plate growth is a function of the calcium concentration within the positive grid alloy, this was identified in the Part 21 Event number 36073. SCR 99-0465 was initiated due to the failure of a cell to meet surveillance testing requirements for voltage. As a result, the failure mechanism was identified and a number of cells were observed to have experienced unexpected cell growth. The failure mechanism was determined to be a function of the concentration of calcium in the positive grid alloy. Therefore while the rate of cell growth resulting from the higher than specified concentrations of calcium is greater than expected, the rate of future degradation will be bounded by that previously experienced. Thus, abnormal degradation can occur; however, sufficient predictive measures are in place to detect degradation before the batteries are unable to perform their intended safety function. Any cell that shows visual evidence of accelerated plate growth will be identified and have additional monitoring requirements above those already specified, until it is replaced.

Notification: 10180700

| | | | | |
|---|---|---|---|---|
| *Notification* | 10180700 | | *Notification type* | CR |
| *Description* | NO OD PERFORMED ON DEGRADED EQUIPMENT | | | Condition Report |
| *Reported by* | SDBAKER | 14:47:24 | *NotifictnDate* | 07/23/2002 |
| *Start date* | 07/23/2002 | | *End date* | 07/30/2002 |
| *Start time* | 14:47:24 | | *End time* | 12:47:24 |
| *Priority* | CM | | | |
| *Maintenance Rule* | MRRS | | *Overall Criticality* | |
| *FunctLocation* | CNS-1-EE-BAT-250 1A | 250VDC STA SERV BAT 1A | | |
| *SORT* | EE-BAT-250(1A) | | | |
| *Equipment* | | | | |
| *Order* | 4256605 | | | |
| *Assembly* | | | | |
| *MaintPlanGroup* | CAP | DO NOT USE | *Tel.* | |
| *Malf. Start Date* | | | *Malf. End date* | |
| *Malf. Start time* | 00:00:00 | | *Malf. End time* | 00:00:00 |

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07/23/2002 14:48:29 Steven D. Baker (SDBAKER)

1) Description of Condition:
Notifications 10151441 & 10151442 were written to have five cells within the 250VDC Batteries replaced in RE21. These Notifications were written by the System Engineer as a result of the on-going trending of the 250VDC Batteries. The Notifications were written in such a way as to request work in the upcoming outage and not as a degraded equipment issue. Neither of these Notifications resulted in an OD.

2) Requirement Not Met:
OD not prepared for installed plant equipment that appears to be degraded.

3) Method of Discovery:
NRC question during 95003 inspection.

4) Immediate Actions Taken:
Discussed issue with Operations Manager, STE, and Licensing.

5) Recommendations:

(a) Perform an OD on each of the two 250VDC Batteries given the condition identified in Notifications 10151441 & 10151442.

(b) CAP action to Operations to determine why OD was not performed.

6) Location of Evidence:
Battery rooms A & B.

07/23/2002 15:05:14 Michael J. Manning (MJMANNI)

1) Immediate Actions Taken: NOTIFIED PED MANAGER, OPS MANAGER, STE, AND LICENSING SUPERVISOR.

2) Bases For Ops Review. CAP ITEM REQUIRES OPS REVIEW.

3) Basis For Classification: XII.C.1 MANAGEMENT ISSUES REQUIRING APPARENT CAUSE.

4) Basis For Disp. Department: OPERATIONS DETERMINES NEED FOR OD.

5) Apparent Cause: NOTIFICATION TEXT SUPPORTED THIS AS NOT BEING AN OPERABILITY CONCERN. MORE INFORMATION AND HISTORY MAY HAVE HELPED.

6) Clarification Comment. RECOMMEND OD BE PERFORMED TO DOCUMENT SUPPORT OF OPERABILITY.

07/23/2002 18:16:01 William B. Jr. Green (WBGREEN)
INFORMATION GATHERING IS ONGOING FOR THIS CONDITION .

BELOW IS THE RESONABLE BASIS FOR OPERABILITY LOGGED IN THE NARRATIVE LOGS AT 1416 ON 7/23/02

Notifications 10151441 and 10151442 identified five battery cells, 250 VDC, that exhibit plate growth (250VDC Battery A cell 64, 250VDC Battery B cells 19, 66, 79, 95). This plate growth is at its earliest stage. A reasonable basis of assurance of Operability exists due to:

1) The plate growth was found at a very early stage. The plate growth that has been observed is much less severe than the plate growth that was evaluated in the OE associated with PIR 4-03002.

2) Quarterly Battery Surveillances were recently performed. All of the cells in question passed the surveillance and all readings for these cells were within the expected range of readings. When plate growth becomes excessive whiskers form that grow between the positive and negative plate and lower. This whisker growth affects ICV#s and specific gravity.

The Quarterly Surveillance for the 250 VDC Batteries was most recently performed on 7/3/02 with the following results;

| | | | |
|---|---|---|---|
| 250A | Voltage | SG | |
| Cell 64 | 2.25 | | 1.223 |
| 250B | Voltage | SG | |
| Cell 19 | 2.24 | | 1.212 |
| Cell 66 | 2.23 | | 1.212 |
| Cell 79 | 2.25 | | 1.223 |
| Cell 95 | 2.20 | | 1.215 |

The prior Quarterly Surveillance for the 250 VDC Batteries was performed on 4/10/02 with the following results;

| | | | |
|---|---|---|---|
| 250A | Voltage | SG | |
| Cell 64 | 2.24 | | 1.225 |
| 250B | Voltage | SG | |
| Cell 19 | 2.24 | | 1.213 |
| Cell 66 | 2.23 | | 1.219 |
| Cell 79 | 2.24 | | 1.226 |
| Cell 95 | 2.22 | | 1.221 |

Since these parameters are greater than the values required by Table 3.8.6-1 Category A, voltage greater than or equal to 2.13 V and Specific Gravity greater than or equal to 1.195, the battery remains at full capacity and capable of performing its safety function. (Holmes, Mark A. - Shift Supervisor)

07/23/2002 18:41:03 Mark A. Holmes (MAHOLME)
BATTERIES REMAIN OPERABLE AS INDICATED ABOVE.
08/03/2002 23:18:37 Mark A. Holmes (MAHOLME)
ACCEPTED THE REVISION TO THE INFORMATION GATHERING AND BATTERIES REMAIN OPERABLE

Notification: 10180700

**Task** ACTIVITY TAGD NA CAP ISSUE
*Partner*
*System Status* TSCO

**Task** REVIEW OPRV
*Partner*
*System Status* TSCO

07/23/2002 17:52:42 William B. Jr. Green (WBGREEN)
OPERATIONS REVIEW OF NOTIFICATION

Is the condition an immediate nuclear or personnel safety concern ?
[ ] YES - Immediately notify Shift Supervisor.
[X] NO

Is the condition reportable or potentially reportable per 10CFR20, 10CFR26.73, 10CFR50.72, 10CFR50.73 or 10CFR73.71 ? (ref. 2.0.5 and NUREG 1022)©
[ ] YES - Immediately notify Shift Supervisor
[X] NO

Does the condition affect or potentially affect any of the SSC(s) described in Attachment 4 ?
[X] YES - Immediately notify Shift Supervisor
[ ] NO - NOT IN SCOPE

OPERABILITY VERIFICATION

Does the condition call the SSC(s) performance into question?
[ ] NO - Basis:
[ ] YES - Declare SSC(s) INOPERABLE
[X] YES - Document a reasonable expectation of OPERABILTY on the Notification ©
AND
Perform INFORMATION GATHERING

Does the condition call the SSC(s) qualification into question?
[X] NO - Basis: THIS NOTIFICATION DOES NOT IDENTIFY A QUALIFICATION ISSUE
[ ] YES - Declare SSC(s) INOPERABLE
[ ] YES - Document a reasonable expectation of OPERABILTY on the Notification ©
AND
Perform INFORMATION GATHERING

Does the condition describe an existing but previously unanalyzed condition or accident?
[X] NO
[ ] YES - Declare SSC(s) INOPERABLE
[ ] YES - Document a reasonable expectation of OPERABILTY on the Notification ©
AND
Perform INFORMATION GATHERING

RESONABLE BASIS FOR OPERABILITY IS LOGGED IN NARRATIVE LOGS AT 1416 ON 7/23/02

OD IS IN PROGRESS A DRAFT WILL BE PROVIDED TO THE CONTROL ROOM AT 1200 ON 7/24/02

**Task** REVIEW CAP RCR - AC (XIII.C.1) OPS
*Partner*
*System Status* TSCO

07/25/2002 11:33:59 Ronnie Deatz (RCDEATZ)
RCR - AC (XIII.C.1) OPS

**Task** REVIEW SCRN NOT A WORK ITEM
*Partner*
*System Status* TSCO

**Task** REVIEW LIC NOT REPORTABLE
*Partner*
*System Status* TSCO

07/25/2002 09:40:09 Coy L. Blair (CLBLAIR)
THIS IS PRIMARILY A DOCUMENTATION ISSUE. THERE IS REASONABLE EXPECTATION THAT THE BATTERIES WILL PERFORM AS REQUIRED.

**Task** REVIEW MRUL N/A
*Partner*
*System Status* TSCO

**Task** REVIEW OPRV INFORMATION GATHERING
*Partner*
*System Status* TSCO

07/25/2002 17:44:48 William B. Jr. Green (WBGREEN)
SUPPORTING INFORMATION

What SSC(s) is affected?

CNS-1-EE-BAT-250 1A
CNS-2-EE-BAT-250 1B

What is the safety function(s) performed by the SSC(s)?

The USAR VIII-6 describes the Safety Objective as follows...
To provide an uninterruptible source of power to supply all normal and emergency 125 volt DC and 250 volt DC control and power loads under all conditions.

And continues to describe the Safety Design Basis as follows...
1. Each 125 volt and 250 volt battery shall have adequate capacity to safeguard the station until AC power sources are restored.

2. Each battery charger shall have adequate capacity to restore its battery to full charge from a totally discharged condition while carrying the normal station steady state DC load.

3. The 125/250 volt DC power systems shall be arranged so that no single component failure will prevent the systems from providing power to a sufficient number of vital DC loads necessary for safe shutdown.

4. The 125/250 volt DC power systems shall be provided in accordance with the "IEEE 308 Criteria for Class 1E Electrical Systems for Nuclear Power Generating Stations", issued in 1970.

5. The 125/250 volt batteries and battery racks shall be Class I Seismic equipment to assure continuous operation of the equipment under maximum seismic shock conditions applicable to the area and locations of the equipment.

6. The 125/250 volt batteries shall provide power for maintaining the plant in a safe hot shutdown condition in the event Control Room operation is prevented by fire and the Alternate Shutdown System is used. Once the diesel-generator is on-line, it will power battery chargers in order to maintain station batteries in a fully charged state.

7. The 125/250 volt Division I and II batteries shall provide power for a 4 hour duration during a Station Blackout in accordance with 10CFR50.63, NUMARC 87-00, and Reg. Guide 1.155.However, the 125/250 volt Division II batteries are required to provide power for a 4 2 hour duration in accordance with 10CFR50 Appendix R Post-Fire Safe and Alternate Safe Shutdown Analysis Report.

The USAR VIII-6.3 Description also states...
The DC power systems (125/250 volt for power and control) supply DC power to conventional station emergency equipment and selected safeguard system loads. The DC power systems are credited with mitigating a Station Blackout event.

What are the requirements to be satisfied to perform the safety function?

Per Design Criteria Document DCD-5, #DC Electrical Distribution System#, the following criteria are applicable to the Station Blackout event:

The NRC, with the issuance of regulation 10CFR 50.63, required that nuclear utilities review their plant designs for safe shutdown in the event that all AC power, both off?site and onsite, is lost for some period of time. For CNS that period of time has been determined to be 4 hours. This means that, since the DC System is the only means of power for this 4 hours, the DC System batteries must have sufficient capacity to power all of the equipment used in safe shutdown that requires d?c power, for 4 hours without recharging.

Per Design Criteria Document DCD-5, #DC Electrical Distribution System#, the following criteria are applicable to the 125 V DC and 250 V DC subsystems ( basis for criteria provided in parenthesis):

1. Load Capacity - The system shall have sufficient capacity and capability to start as well as operate all required safety loads within their voltage ratings in the event of either a transient or an accident (USAR Appendix G).

2. Monitoring and Indication - the availability of the DC Power system shall be monitored and indication of the operational status shall be provided in the Control Room (IEEE 308-1970).

3. Separation, Redundancy, and Independence - equipment shall have sufficient redundancy and independence so that no single failure of active components can prevent the required actions. For those systems which IEEE 279 is applicable, single failure of passive electrical components shall be considered also (General Design Criteria GDC-21, IEEE 308-1970).

4. Protective Devices - protective devices shall be provided to isolate failed components automatically (IEEE 308-1970).

5. Failure Modes and Effects - an analysis of the failure modes of Class 1E electric systems and the effect of these failures to power Class 1E loads shall be performed to demonstrate that a single failure does not prevent satisfactory performance of the minimum Class 1E loads required for safe shutdown (IEEE 308-1970).

6. Environmental Phenomena - the design of the DC system shall include allowance for environmental phenomena at the site (USAR Chapter I).

7. Testing - all components of the DC system that contribute to the emergency service portion functions shall be capable of individual function testing, inspection, and maintenance during normal plant operation (IEEE 308-1970).

8. Availability of Stored Energy - the DC system shall have a supply of stored energy in the form of batteries that have sufficient capacity to meet all of the essential requirements of Item 1 above (IEEE 308-1970).

The Batteries# ability to meet those design criteria stated above is assured by the Battery manufacturer#s quality assurance program controlling their processes so that the cells delivered for installation of CNS are within their design specifications.

When do the requirements have to be met?

The Technical Specifications contains the operability requirements for the 125/250V DC Power Systems.

Technical Specification 3.8.4 DC Sources-Operating, requires that the Division 1 and Division 2 125 V and 250 V DC electrical power sources shall be OPERABLE in MODES 1, 2, and 3.

Technical Specification 3.8.5 DC Sources-Shutdown, requires that the DC electrical sources shall be OPERABLE in MODES 4 and 5 during movement of irradiated fuel assemblies in the secondary containment to support the DC electrical power distribution subsystem(s) required by LCO 3.8.8, "Distribution Systems-Shutdown@.

Technical Specification 3.8.6 Battery Cell Parameters, requires that the battery cell parameters for the 125 V and 250 V batteries shall be within the limits of Technical Specification Table 3.8.6?1 and that the battery cell average electrolyte temperature for the 125 V and 250 V batteries shall be within required limit.. This section applies when associated DC electrical power subsystems are required to be OPERABLE.

Technical Specification 3.8.7 Distribution Systems-Operating, requires that the onsite electrical distribution systems, including 125 and 250 volt DC systems, shall be OPERABLE in MODES 1, 2, and 3.

Technical Specification 3.8.8 Distribution Systems-Shutdown, requires that the onsite electrical distribution systems, including 125 and 250 volt DC systems, shall be OPERABLE in MODES 4 and 5 during movement of irradiated fuel assemblies in the secondary containment.

How does the condition relate to the requirements?

The conditions identified are the non-conforming high levels of calcium within the positive plate grids of the 250VDC Batteries as identified in Part 21 Event number 36073 and the resulting accelerated positive plate growth of the five cells. As stated in the Part 21 event number 36073, the non-conformance identified in the 250 VDC batteries has been bounded to 356 type LCR-25 batteries supplied to NPPD in 1995. Currently, the only batteries in the plant that contain any of these cells are the 250 VDC batteries. Specifically, the 125 VDC batteries were replaced with cells manufactured in 2000 and 2001. The Security, PMIS, fire pump, and 24 VDC batteries are manufactured by Exide.

The potential failure mechanism that may result from the non-conforming high levels of calcium within the positive grid alloy is the acceleration of the normal age related phenomenon of the positive plate growth.

The potential failure mechanism that may result from the positive plate growth with the five cells is; an internal short, or loss of capacity.

Therefore, the condition has the potential to affect the requirement of load capacity of the 250 VDC Batteries.

What is the basis for meeting the requirements?

The result of the non-conforming high levels of calcium within the positive grid alloy is the acceleration of positive plate growth. Positive plate growth is a normal, age related phenomena that constitutes a source of time dependent battery degradation. Therefore, the condition identified in this notification has not introduced any new failure modes or affected the batteries ability to meet load capacity requirements at this time. Rather the condition may result in the earlier than expected end of life of the individual cells that make up each battery. This in turn may affect the batteries ability to perform their intended safety function. The two consequences of the condition identified above are internal short and loss of capacity. Since these consequences are the result of a normally occurring phenomena, existing testing and inspection will detect them. The issue to be addressed is the timeliness of these predictive activities to preclude unacceptable cell degradation that may affect the batteries ability to perform its intended safety function.

This OD recommends the following interim compensatory measures to monitor degraded battery cells until they can be replaced.

1. The individual cell voltage (ICV) should be monitored for any cells exhibiting time dependent degradation through positive plate growth to assure the cells can perform their design /safety function. Based on the risk significance of the battery systems, increased monitoring is prudent to assure their ICV does not fall below the Table 3.8.6-1 Category C limit of 2.10 volts before maintenance can be performed to replace the degraded cell. This will be done on a weekly basis by performing applicable portions of procedure 6.EE.601 or by CNS maintenance procedures and work instructions. This testing will be done until the degraded cells are removed from the plant. This increased testing will be performed under Work Order 4256606.

2. In order to detect plate growth in other cells of the 250 VDC batteries, it is recommended that procedure 6.EE.611 be implemented on a quarterly basis until all cells subject to the non-conformance of Part 21 event number 36073 are removed from the plant. This will be accomplished by increasing the Surveillance frequency from yearly to monthly until all effected cells have been removed.

The compensatory actions identified above were satisfactorily performed before the acceptance of this OD. All identified cells requiring increased monitoring had individual cell voltages above any Administrative or Technical Specification required value. Additionally, a visual inspection of all cells in the 250VDC Batteries using procedure 6.EE.611 was performed and did not identify any additional cells showing signs of positive plate growth.

SCR 99-0465 addressed aspects of testing and inspection, including timeliness, with corrective actions that remain appropriate for the currently observed condition. The actions of SCR 99-0465 are directly related to the observation of Notification 10151441 and 10151442 which identified the early stages of positive plate growth of five cells and the need for their replacement in RE21. Ultimately, the basis for meeting the requirements of the batteries is meeting the requirements of Technical Specifications 3.8.4, 3.8.5, 3.8.6, 3.8.7, and 3.8.8 which define the batteries limiting conditions of operation. Normal surveillance, the actions of SCR 99-0465 and the above recommended compensatory actions will detect degradation before it impacts operability.

When can the requirements be met?

The requirements are currently being met and will continue to be met until normal surveillance testing indicate otherwise. Currently, sufficient predictive measures are in place, such as visual inspections, to detect degradation before the batteries are unable to perform their intended safety function. Corrective Actions of SCR 99-0465 have resulted in the development of a long-term action to replace all cells for which Part 21 event number 36073 is applicable. Following completion of these actions, the identified non-conforming condition and potential for the resultant degradation of cells will be permanently eliminated.

Can the condition abnormally degrade?

As stated above, the condition is the accelerated rate of cell degradation in the form of positive plate growth. The rate of plate growth is a function of the calcium concentration within the positive grid alloy, this was identified in the Part 21 Event number 36073. SCR 99-0465 was initiated due to the failure of a cell to meet surveillance testing requirements for voltage. As a result, the failure mechanism was identified and a number of cells were observed to have experienced unexpected cell growth. The failure mechanism was determined to be a function of the concentration of calcium in the positive grid alloy. Currently, five cells have been identified as exhibiting indications of early cell growth. Since cell growth is a function of the calcium concentration, the growth rate for the five cells currently affected is less than those previously identified and removed. Furthermore, any future cell to experience accelerated growth will do so at a lower rate than any previously observed. Therefore while the rate of cell grow resulting from the higher than specified concentrations of calcium is greater than normal, the rate of future degradation will be bounded by that previously experienced. Thus, abnormal degradation can occur; however, sufficient predictive measures are in place to detect degradation before the batteries are unable to perform their intended safety function. The batteries that show evidence of accelerated plate growth at this time will be replaced during RE21.

**Task** REVIEW 9118 GL 91-18 RESOLUTION COMP ACTIONS
*Partner*
*System Status* TSCO

03/27/2003 11:12:02 Peter J. Donahue (PJDONAH)

This OD was superceded by the OD contained in notification 10227490. The cells exibiting accelerated cell growth have been replaced. The OD contained in notification 10227490 addresses the remaining cells associated with the part 21 related to the affect of high calcium levels on plate growth. This 9118 task can be closed.

**Task** REVIEW OPRV OPS MANAGER REVIEW
*Partner*
*System Status* TSCO

07/25/2002 15:51:44 Ricky Gardner (RLGARDN)

REVIEWED OPERABILITY DETERMINATION AND CONCUR.

**Task** REVIEW OPRV 2ND SS REVIEW
*Partner*
*System Status* TSCO

**Task** REVIEW OPRV INFORMATION GATHERING REV1
*Partner*
*System Status* TSCO

08/03/2002 22:37:11 William B. Jr. Green (WBGREEN)
SUPPORTING INFORMATION

What SSC(s) is affected?

CNS-1-EE-BAT-250 1A
CNS-2-EE-BAT-250 1B

What is the safety function(s) performed by the SSC(s)?

The USAR VIII-6 describes the Safety Objective as follows...
To provide an uninterruptible source of power to supply all normal and emergency 125 volt DC and 250 volt DC control and power loads under all conditions.

And continues to describe the Safety Design Basis as follows...
1. Each 125 volt and 250 volt battery shall have adequate capacity to safeguard the station until AC power sources are restored.

2. Each battery charger shall have adequate capacity to restore its battery to full charge from a totally discharged condition while carrying the normal station steady state DC load.

3. The 125/250 volt DC power systems shall be arranged so that no single component failure will prevent the systems from providing power to a sufficient number of vital DC loads necessary for safe shutdown.

4. The 125/250 volt DC power systems shall be provided in accordance with the "IEEE 308 Criteria for Class 1E Electrical Systems for Nuclear Power Generating Stations", issued in 1970.

5. The 125/250 volt batteries and battery racks shall be Class I Seismic equipment to assure continuous operation of the equipment under maximum seismic shock conditions applicable to the area and locations of the equipment.

6. The 125/250 volt batteries shall provide power for maintaining the plant in a safe hot shutdown condition in the event Control Room operation is prevented by fire and the Alternate Shutdown System is used. Once the diesel-generator is on-line, it will power battery chargers in order to maintain station batteries in a fully charged state.

7. The 125/250 volt Division I and II batteries shall provide power for a 4 hour duration during a Station Blackout in accordance with 10CFR50.63, NUMARC 87-00, and Reg. Guide 1.155.However, the 125/250 volt Division II batteries are required to provide power for a 4 hour duration in accordance with 10CFR50 Appendix R Post-Fire Safe and Alternate Safe Shutdown Analysis Report.

The USAR VIII-6.3 Description also states...
The DC power systems (125/250 volt for power and control) supply DC power to conventional station emergency equipment and selected safeguard system loads. The DC power systems are credited with mitigating a Station Blackout event.

What are the requirements to be satisfied to perform the safety function?

Per Design Criteria Document DCD-5, #DC Electrical Distribution System#, the following criteria are applicable to the Station Blackout event:

The NRC, with the issuance of regulation 10CFR 50.63, required that nuclear utilities review their plant designs for safe shutdown in the event that all AC power, both off-site and onsite, is lost for some period of time. For CNS that period of time has been determined to be 4 hours. This means that, since the DC System is the only means of power for this 4 hours, the DC System batteries must have sufficient capacity to power all of the equipment used in safe shutdown that requires d-c power, for 4 hours without recharging.

Per Design Criteria Document DCD-5, #DC Electrical Distribution System#, the following criteria are applicable to the 125 V DC and 250 V DC subsystems ( basis for criteria provided in parenthesis):

1. Load Capacity - The system shall have sufficient capacity and capability to start as well as operate all required safety loads within their voltage ratings in the event of either a transient or an accident (USAR Appendix G).

2. Monitoring and Indication - the availability of the DC Power system shall be monitored and indication of the operational status shall be provided in the Control Room (IEEE 308-1970).

3. Separation, Redundancy, and Independence - equipment shall have sufficient redundancy and independence so that no single failure of active components can prevent the required actions. For those systems which IEEE 279 is applicable, single failure of passive electrical components shall be considered also (General Design Criteria GDC-21, IEEE 308-1970).

4. Protective Devices - protective devices shall be provided to isolate failed components automatically (IEEE 308-1970).

5. Failure Modes and Effects - an analysis of the failure modes of Class 1E electric systems and the effect of these failures to power Class 1E loads shall be performed to demonstrate that a single failure does not prevent satisfactory performance of the minimum Class 1E loads required for safe shutdown (IEEE 308-1970).

6. Environmental Phenomena - the design of the DC system shall include allowance for environmental phenomena at the site (USAR Chapter I).

7. Testing - all components of the DC system that contribute to the emergency service portion functions shall be capable of individual function testing, inspection, and maintenance during normal plant operation (IEEE 308-1970).

8. Availability of Stored Energy - the DC system shall have a supply of stored energy in the form of batteries that have sufficient capacity to meet all of the essential requirements of Item 1 above (IEEE 308-1970).

The Batteries# ability to meet those design criteria stated above is assured by the Battery manufacturer#s quality assurance program controlling their processes so that the cells delivered for installation of CNS are within their design specifications.

When do the requirements have to be met?

The Technical Specifications contains the operability requirements for the 125/250V DC Power Systems.

Technical Specification 3.8.4 DC Sources-Operating, requires that the Division 1 and Division 2 125 V and 250 V DC electrical power sources shall be OPERABLE in MODES 1, 2, and 3.

Technical Specification 3.8.5 DC Sources-Shutdown, requires that the DC electrical sources shall be OPERABLE in MODES 4 and 5 during movement of irradiated fuel assemblies in the secondary containment to support the DC electrical power distribution subsystem(s) required by LCO 3.8.8, "Distribution Systems-Shutdown@.

Technical Specification 3.8.6 Battery Cell Parameters, requires that the battery cell parameters for the 125 V and 250 V batteries shall be within the limits of Technical Specification Table 3.8.6-1 and that the battery cell average electrolyte temperature for the 125 V and 250 V batteries shall be within required limit. This section applies when associated DC electrical power subsystems are required to be OPERABLE.

Technical Specification 3.8.7 Distribution Systems-Operating, requires that the onsite electrical distribution systems, including 125 and 250 volt DC systems, shall be OPERABLE in MODES 1, 2, and 3.

Technical Specification 3.8.8 Distribution Systems-Shutdown, requires that the onsite electrical distribution systems, including 125 and 250 volt DC systems, shall be OPERABLE in MODES 4 and 5 during movement of irradiated fuel assemblies in the secondary containment.

How does the condition relate to the requirements?

The conditions identified are the non-conforming high levels of calcium within the positive plate grids of the 250VDC Batteries as identified in Part 21 Event number 36073. As stated in the Part 21 event number 36073, the non-conformance identified in the 250 VDC batteries has been bounded to 356 type LCR-25 batteries supplied to NPPD in 1995. Currently, the only batteries in the plant that contain any of these cells are the 250 VDC batteries. Specifically, the 125 VDC batteries were replaced with cells manufactured in 2000 and 2001. The Security, PMIS, fire pump, and 24 VDC batteries are manufactured by Exide.

The potential failure mechanism that may result from the non-conforming high levels of calcium within the positive grid alloy is the acceleration of the normal age related phenomenon of the positive plate growth.

The potential failure mechanism that may result from the positive plate growth with the five cells is; an internal short, or loss of capacity.

Therefore, the condition has the potential to affect the requirement of load capacity of the 250 VDC Batteries.

What is the basis for meeting the requirements?

The result of the non-conforming high levels of calcium within the positive grid alloy is the acceleration of positive plate growth. Positive plate growth is a normal, age related phenomena that constitutes a source of time dependent battery degradation. Therefore, the condition identified in this notification has not introduced any new failure modes or affected the batteries ability to meet load capacity requirements at this time. Rather the condition may result in the earlier than expected end of life of the individual cells that make up each battery. This in turn may affect the batteries ability to perform their intended safety function. The two consequences of the condition identified above are internal short and loss of capacity. Since these consequences are the result of a normally occurring phenomena, existing testing and inspection will detect them. The issue to be addressed is the timeliness of these predictive activities to preclude unacceptable cell degradation that may affect the batteries ability to perform its intended safety function.

This OD recommends the following interim compensatory measures to monitor degraded battery cells until they can be replaced.

1. The individual cell voltage (ICV) should be monitored for any cells exhibiting time dependent degradation through positive plate growth to assure the cells can perform their design /safety function. Based on the risk significance of the battery systems, increased monitoring is prudent to assure their ICV does not fall below the Table 3.8.6-1 Category C limit of 2.10 volts before maintenance can be performed to replace the degraded cell. This will be done on a weekly basis by performing applicable portions of procedure 6.EE.601 or by CNS maintenance procedures and work instructions. This testing will be done until the degraded cells are removed from the plant. This increased testing was performed under Work Order 4256606. Continued testing will be performed under Work Order 4256863 which will be revised to include all affected cells.

2. In order to detect plate growth in other cells of the 250 VDC batteries, it is recommended that procedure 6.EE.611 be implemented on a quarterly basis until all cells subject to the non-conformance of Part 21 event number 36073 are removed from the plant. This will be accomplished by increasing the Surveillance frequency from yearly to quarterly until all effected cells have been removed. An Engineering Department Representative will be present when this procedure is performed to assist with resolving any discrepancies identified by this procedure.

The compensatory actions identified above were satisfactorily performed before the acceptance of this OD. All identified cells requiring increased monitoring had individual cell voltages above any Administrative or Technical Specification required value. Additionally, a visual inspection of all cells in the 250VDC Batteries using procedure 6.EE.611 was performed and did not identify any additional cells showing signs of positive plate growth. Since these compensatory actions were taken on 7/31/02, two additional cells were identified on 8/2/02 as having excessive positive plate growth, see notification 10183508, and 10183509. These two cells had not been identified as having excessive plate growth during the performance of 6.EE.611 which was performed on 7/31/02, Notification 10183707 was written to determine the cause of this discrepency. After the discovery of these two additional cells, their ICVs were taken and were verified to be within both the Administrative and Technical Specification required values. The System Engineer performed a very detailed inspection of both banks of the 250VDC Batteries on 8/2/02 and has concluded that these seven cells are, to date, the only ones showing signs of excessive positive plate growth.

SCR 99-0465 addressed aspects of testing and inspection, including timeliness, with corrective actions that remain appropriate for the currently observed condition. The actions of SCR 99-0465 are directly related to the observation of Notifications 10151441,10151442, 10183508, and 10183509 which identified the early stages of positive plate growth of seven cells and the need for their replacement in RE21. Ultimately, the basis for meeting the requirements of the batteries is meeting the requirements of Technical Specifications 3.8.4, 3.8.5, 3.8.6, 3.8.7, and 3.8.8 which define the batteries limiting conditions of operation. Normal surveillance, the actions of SCR 99-0465 and the above recommended compensatory actions will detect degradation before it impacts operability.

When can the requirements be met?

The requirements are currently being met and will continue to be met until normal surveillance testing indicate otherwise. Currently, sufficient predictive measures are in place, such as visual inspections, to detect degradation before the batteries are unable to perform their intended safety function. Corrective Actions of SCR 99-0465 have resulted in the development of a long-term action to replace all cells for which Part 21 event number 36073 is applicable. Following completion of these actions, the identified non-conforming condition and potential for the resultant degradation of cells will be permanently eliminated.

Can the condition abnormally degrade?

As stated above, the condition is the accelerated rate of cell degradation in the form of positive plate growth. The rate of plate growth is a function of the calcium concentration within the positive grid alloy, this was identified in the Part 21 Event number 36073. SCR 99-0465 was initiated due to the failure of a cell to meet surveillance testing requirements for voltage. As a result, the failure mechanism was identified and a number of cells were observed to have experienced unexpected cell growth. The failure mechanism was determined to be a function of the concentration of calcium in the positive grid alloy. Currently, seven cells have been identified as exhibiting indications of early cell growth. Since cell growth is a function of the calcium concentration, the seven cells currently considered growth rate will be less than those previously identified and removed. Furthermore, any future cell to experience accelerated growth will do so at a lower rate than any previously observed. Therefore while the rate of cell grow resulting from the higher than specified concentrations of calcium is greater than expected, the rate of future degradation will be bounded by that previously experienced. Thus, abnormal degradation can occur; however, sufficient predictive measures are in place to detect degradation before the batteries are unable to perform their intended safety function. The batteries that show evidence of accelerated plate growth at this time will be replaced during RE21. Upon identification of any new cells applicable portions of procedure 6.EE.601 should be performed immediately and then continued at the previously recommended weekly frequency with the other identified cells under Work Order 4256863.

**Task** REVIEW OPRV OPS MANAGER REVIEW
*Partner*
*System Status* TSCO

**Task** REVIEW OPRV 2ND SS REVIEW
*Partner*
*System Status* TSCO