Duke Energy®

DAVE BAXTER
Vice President
Oconee Nuclear Station

Duke Energy
ON01VP / 7800 Rochester Highway
Seneca, SC 29672

864-873-4460
864-873-4208 fax
dave.baxter@duke-energy.com

April 14, 2010

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555-0001

Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Site, Units 1, 2, and 3
Docket Numbers 50-269, 50-270, and 50-287
Request for Additional Information associated with the License Amendment Request to Amend Technical Specification Required Action to Permit Replacement of the 230 kV 125 Volt Switchyard Batteries
License Amendment Request No. 2006-20

In accordance with 10 CFR 50.90, Duke Energy Carolinas, LLC (Duke Energy) proposes to amend the licensing basis for Renewed Facility Operating License Nos. DPR-38, DPR-47, and DPR-55. A LAR was submitted on August 31, 2009, to the Nuclear Regulatory Commission (NRC) seeking review and approval of a change to Technical Specification (TS) 3.8.3, "DC Sources – Operating," Required Action D.1, to allow one of the two required 230 kV switchyard 125 VDC power sources (batteries) to be inoperable for up to ten (10) days for the purpose of replacing an entire battery bank and performing the required testing.

By electronic mail dated March 9, 2010, Duke Energy received a request for additional information (RAI) associated with the battery replacement. The Enclosure contains Duke Energy's responses to this RAI.

Inquiries on this proposed amendment request should be directed to Sandra Severance of the Oconee Regulatory Compliance Group at (864) 873-3466.

I declare under penalty of perjury that the foregoing is true and correct. Executed on April 14, 2010.

Sincerely,

Dave Baxter, Vice President
Oconee Nuclear Site

A001
NRR

Enclosure:
Request For Additional Information Response

Attachments:
1. One-line schematic of the switchyard 125 Volt Direct Current (VDC) system (O-802, One Line 230kV Swyd 125V DC)
2. Switchyard Battery Projected Replacement Plan

bc w/enclosure and attachments:

Mr. Luis Reyes, Regional Administrator
U. S. Nuclear Regulatory Commission, Region II
Marquis One Tower
245 Peachtree Center Ave., NE, Suite 1200
Atlanta, Georgia 30303-1257

Mr. John Stang, Project Manager
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop O-8 G9A
Washington, D. C. 20555

Mr. Andy Sabisch
Senior Resident Inspector
Oconee Nuclear Site

Mrs. Susan E. Jenkins, Manager
Infectious and Radioactive Waste Management Section
Department of Health & Environmental Control
2600 Bull Street
Columbia, SC 29201

bcc w/enclosure and attachments:

K. R. Alter
R. V. Gambrell
L. F. Vaughn
J. A. Kammer
D. W. Phelps
J. R. Stevens
J. E. Burchfield
R. L. Gill – NRI&IA
R. D. Hart – CNS
K. L. Ashe - MNS
NSRB, EC05N
ELL, ECO50
File - T.S. Working
ONS Document Management

ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION

Enclosure

RAI Responses

1.0 REQUEST FOR ADDITIONAL INFORMATION (RAI)

RAI #1

Provide a simplified one-line schematic of the switchyard 125 Volt Direct Current (VDC) system in which the battery bank(s) will be replaced.

ANSWER:

Attachment 1 contains a one-line schematic of the switchyard 125 Volt Direct Current (VDC) System

RAI #2

Describe in detail the maintenance plan/schedule to replace and test this battery bank which justifies the 10-day completion time. Provide plant operating experience that shows typical times needed to replace a battery at the Oconee Nuclear Site (this includes the station batteries). Include in the response a description of post-maintenance and surveillance testing that will be performed to return the battery to operable status.

ANSWER:

1. Describe in detail the maintenance plan/schedule to replace and test this battery bank which justifies the 10-day completion time.

   Attachment 2 contains the detailed Switchyard Battery Projected Replacement Plan, describing the maintenance plan/schedule to replace and test this battery bank. The battery replacement plan projects a planned duration of 158 hours with a worst-case contingency allotment of 68 hours for a total duration (with contingency) of 226 hours or 9.4 days. This plan is based on expected conditions and operating experience. The implementation plan developed for the actual battery replacement may vary slightly from this preliminary schedule. This plan supports the 10-day requested completion time and provides appropriate contingency allowances.

2. Provide plant operating experience that shows typical times needed to replace a battery at the Oconee Nuclear Site (this includes the station batteries).

   The requested completion time for the Switchyard Battery Replacement Plan is based on extensive feedback from experienced Maintenance and Technical Support personnel at the Oconee Nuclear Site. In 1996, the Unit 1 Power Battery was replaced. A review of that evolution showed that it required approximately 212 clock hours and 1240 labor hours to complete. Since the work was completed during an outage period, work was not continuous and, in that regard, is not comparable to the completion time, in days, requested in this submittal. The clock hours, however, is comparable to the 226 hour replacement time projected in this plan.

Although other batteries have been replaced at Oconee Nuclear Station, the level of effort was not commensurate with this effort. In those cases, physical challenges such as elevation changes requiring the use of hoists make labor hour comparisons less meaningful.

3. Include in the response a description of post-maintenance and surveillance testing that will be performed to return the battery to operable status.

   Following installation, a resistance check of the battery cell connections will be performed followed by performance of a float charge. At this point, a service test will be conducted to discharge the battery at a rate to approximate the expected load during a loss of off-site power event. Upon completion of the service test, that battery will be placed on equalize charge and monitoring for stabilization of the battery readings. IEEE Standard 450, "Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications" provides the basis for this test and surveillance.

RAI #3:

Provide a more detailed description of the compensatory measures to be enacted including more detail about measures to be taken for the availability and protection of all offsite and onsite sources and delivery paths to the plant safety systems during this maintenance evolution. Include in the response a description of actions to be taken by the transmission system operator monitoring grid conditions during this maintenance evolution.

ANSWER:

The 230 kV Switchyard 125 V Battery Replacement will be controlled by a Critical Activity Plan, as required by Duke Energy's Nuclear System Directive 213, "Risk Management". As such, it will receive increased management oversight including Plant Operations Review Committee review and approval prior to implementation. The Critical Activity Plan will define the specific actions required during the battery replacement evolution. Details, such as those requested, will be included. Responses are provided below.

1. Provide a more detailed description of the compensatory measures to be enacted.

   The Switchyard batteries will be replaced one bank at a time. The health of the in-service battery will be evaluated prior to beginning the replacement. Once good health is established, the loads will be tied together on the remaining, in-service battery which is fully capable of powering all of the loads. (Reference RAI #6 response)

2. Detail about measures to be taken for the availability and protection of all offsite sources.

Annually, each Switchyard Battery is service tested. Currently, Oconee Nuclear Station (ONS) TS 3.8.3 allows up to 72 hours to perform equalization charge after completion of a performance or service test. No grid restrictions are exercised during the performance of the Switchyard Battery Service test. Likewise, no grid restrictions are recommended during performance of the battery replacement. However, prior to the work evolution, several measures will be taken to ensure the grid is healthy. These measures include the following actions:

a. Verify the Grid Reliability Index for the week is "Green",
b. Verify the Duke Energy System Operations Center (SOC) Real Time Contingency Analysis Program is functioning by calling the Transmission Control Center (TCC) Console,
c. Notify SOC and TCC of the initiation of the work evolution, and
d. Restrict work on the Lee Emergency Power Path.

3. Detail about measures to be taken for the availability and protection of all onsite sources.

   a. Verify the Underground Path from Keowee is available,
   b. Identify the Keowee Underground and Combustion Turbine CT-5 (from Lee) as Protected Equipment , and
   c. Ensure Operations performs Operating Procedure sections associated with Removal and Restoration of the SY Battery to ensure the standby charger is aligned to the alternate power source from the in-service battery

4. Detail about measures to be taken for the availability and protection of all delivery paths to the plant safety systems during this maintenance evolution.

   a. Treat the 480 VAC Power system as a Protected Train. The Protected Train designation includes the following equipment:
      - 1TE 4160V Switchgear
      - 2TE 4160V Switchgear
      - STA Transformer feeding switchyard power 480 V panelboard SPA
      - STB Transformer feeding switchyard power 480 V panelboard SPB
      - STC Transformer feeding switchyard power 480 V panelboard SPC
      - STD Transformer feeding switchyard power 480 V panelboard SPD
      - Chargers
      - Relay House

   b. No discretionary maintenance or testing will be performed in the Standby Shutdown Facility, Emergency Feedwater System, and 230KV Relay House

5. Description of actions to be taken by the transmission system operator monitoring grid conditions during this maintenance evolution.

Because the Real Time Contingency Analysis Program is continuously running, no specific actions are required to be taken by the transmission system operator. If the grid is degraded, the plant would enter AP/1,2,3/A/1700/034, "Degraded Grid". This procedure directs Operations actions upon receipt of grid voltage or frequency alarms or notification by SOC/TCC personnel. Actions range from verifying generator output remains within the capability curve and monitoring frequency up to separating from the grid and tripping the reactor.

RAI #4:

Based on the infrequency of battery replacement and the lack of a swing/alternate battery, provide a more detailed justification for this amendment being permanent (versus one-time) (e.g., provide operating experience that shows that frequent battery replacements have caused hardship for the Oconee Nuclear Site).

ANSWER:

Oconee does not have a swing or alternate battery configuration in the 230kV switchyard; however, as detailed in RAI #6, Duke Energy has documented that one of the two 230 kV switchyard batteries is sufficient to perform the design basis function for both trains of required equipment. Not having a swing or alternate battery can complicate the response to battery issues, whether the replacement is due to end of life issues or performance problems. In 1992, a one-time TS amendment was approved when the 230kV switchyard batteries were replaced. These batteries will again require replacement due to reaching the end of their qualified life prior to the expiration of the ONS renewed license.

In addition to the planned end of life replacements, similar batteries have required replacement as a result of performance problems. In 1995, Exide FTC-23 cell problems resulted in low initial capacity. This concern resulted in replacement of all six (6) Vital and all six (6) Power batteries approximately 13 years early and on an expedited basis. In 2003, Exide 2GN-15 cell voltage and specific gravity stability problems forced replacement of the Standby Shutdown Facility (SSF) batteries approximately four (4) years early. Post seal degradation issues associated with the C&D Technologies, Incorporated batteries in the 230 kV switchyard prompted discussions on early replacement of these batteries also. Although the entire battery has not been replaced, cells have been replaced on an individual basis.

One additional battery replacement of the 230 kV switchyard batteries will be required prior to the end of the ONS renewed operating license. Additionally, future unanticipated battery cell problems could require earlier replacement of an entire battery bank and could possibly require Duke Energy to request approval of a Notice of Enforcement Discretion or an expedited License Amendment Request to permit timely battery replacement. Planning for these future battery replacements by requesting a permanent versus another one-time TS amendment is a prudent use of both NRC and Duke Energy resources.

RAI #5:

Provide the age and the results of the previous 3 performance tests for each 230 kV Switchyard 125 VDC battery.

ANSWER:

The SY1 and SY2 batteries were first placed into service at Oconee Nuclear Station in October of 1992 (17 years ago).

SY1 Battery Performance Test Results

Test Date	Results
5/30/2006	100.4%
12/27/2000	104.2%
1/26/1995	100%

SY2 Battery Performance Test Results

Test Date	Results
4/17/2006	94.6%
3/19/2001	107.2%
1/31/1995	108%

RAI #6:

Provide detailed technical information as to how the analysis was verified which showed that a single 230 kV 125 VDC battery has adequate capacity and capability to perform the design function for both trains of required equipment. Include in the response a detailed description of the basis for the 60-minute duration of the load profile and how it is bounding.

ANSWER:

Provide detailed technical information as to:

1. How the analysis was verified which showed that a single 230 kV Switchyard 125 VDC battery has adequate capacity and capability to perform the design function for both trains of required equipment.

   A formal calculation was performed to determine the worst case load profile for the 230kV Switchyard 125V DC system, the minimum battery terminal voltage during worst case operating conditions, and the worst case load voltage under the same conditions for both breaker and relay loads. This load profile is based on the assumptions that AC input power to the battery chargers is lost, one battery is inoperable, the remaining operable battery is powering both DC distribution centers (i.e., both DC trains), the remaining operable battery has 58 cells (two cells jumpered out of the bank), a temperature correction factor of 1.11, and the battery at end of life capacity (80%).

This calculation shows that load terminal voltages are adequate to ensure that the 230KV Switchyard 125Vdc system will perform its design basis function under the conditions described above.

2. A detailed description of the basis for the 60-minute duration of the load profile

   In this calculation, the load profile for the 230 kV Switchyard 125VDC system consists of three distinct time periods: 0-1 minute, 1-59 minutes, and 59-60 minutes:

   - 0-1 minute: This period includes normal loads plus a postulated 230kV switchyard isolate signal to isolate the yellow bus from the rest of the switchyard and transmission system. This is the only part of the profile that is required by the licensing basis. The battery has completed the safety function once the yellow bus is isolated and Keowee is connected to it. However, time periods beyond this first minute are desirable from a system design standpoint.
   - 1-59 minutes: This period includes only the normal operating loads.
   - 59-60 minutes: This period includes a postulated 230kV switchyard red bus differential and subsequent lockout. The load for the red bus lockout is conservatively calculated by assuming that the switchyard isolate has been previously reset and all PCBs have been closed. This means that PCBs 26 and 28 are assumed to trip on Red Bus Lockout, even though they were previously tripped by Switchyard Isolate.

   The battery voltage profile was then determined for each period of the load profile. During a switchyard isolate event, battery voltage is initially low due to the high loads associated with switchyard isolate, and then the battery voltage increases significantly one minute into the event, after switchyard isolate is complete. There is no significant change in battery voltage between one minute and 59 minutes into the event. This is because the steady state load is very small in comparison to the inrush loads. At 59 minutes into the event, the postulated red bus differential actuation again reduces the voltage. This calculation shows that load terminal voltages are adequate to ensure that the 230kV Switchyard 125VDC system will perform its design basis function under the conditions described.

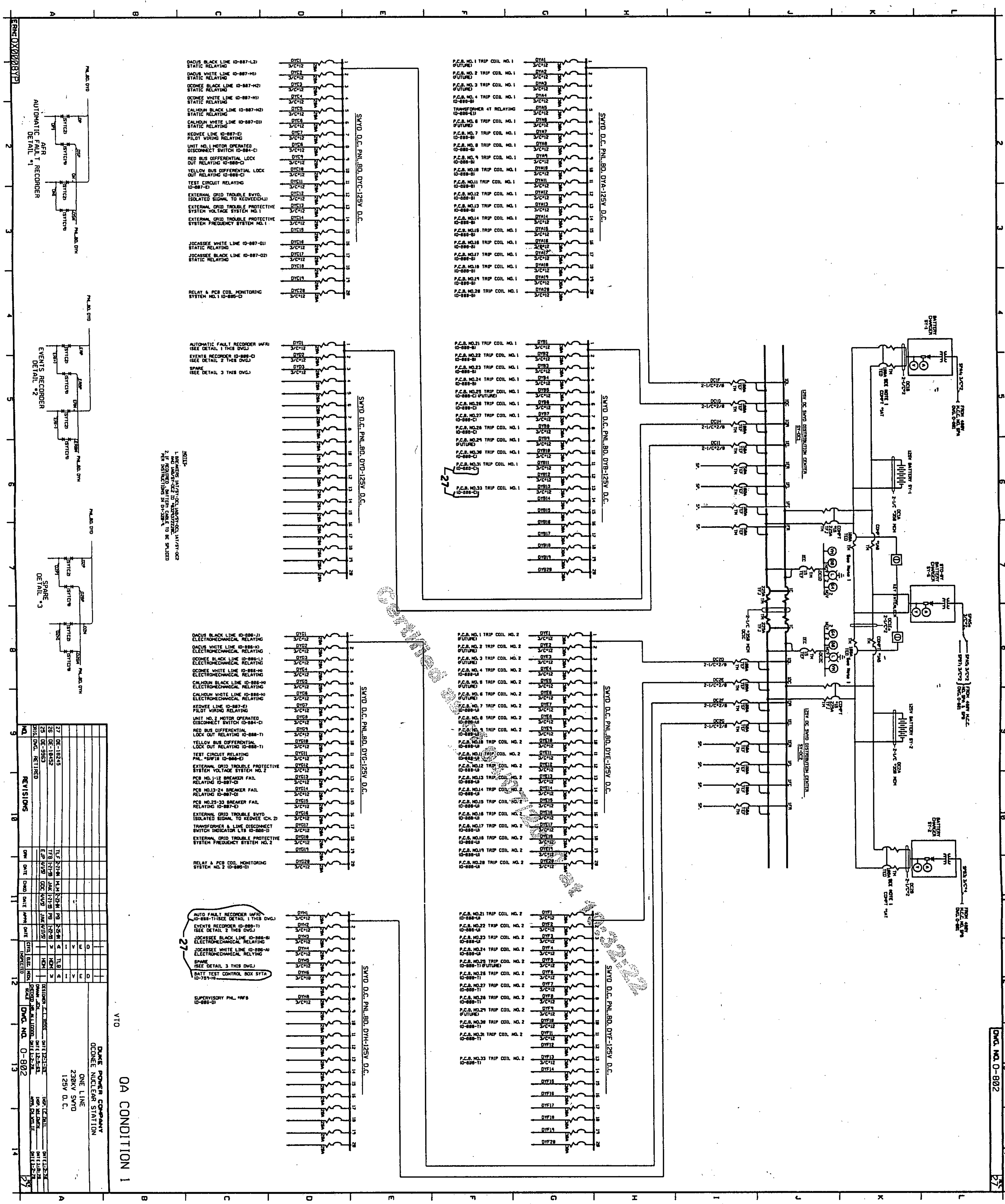
3. How it is bounding

   The voltage profile is based upon the assumption that only one of the two batteries is operable, the operable battery has 58 out of 60 cells operable, and the two distribution centers are tied together such that the one operable battery is feeding both trains. Also, the load profile assumes additional PCB operations were to take place to add conservatism. The calculation also assumes a battery aging factor of 1.25 and a temperature factor of 1.11 (i.e. the battery is at 60 degree F). System load growth is accounted for by multiplying the steady-state load by 10 percent and by including potential load based on future PCB additions.

ATTACHMENT 1

Drawing

One-line schematic of the switchyard 125 Volt Direct Current (VDC) System (O-802)



Attachment 1 - One-line 230kV Switchyard 125 VDC System

ATTACHMENT 2

Switchyard Battery Projected Replacement Plan

Switchyard Battery Projected Replacement Plan

	Plan Steps	Time Required	Requirements/Assumptions/Notes
1.	Red tag battery out-of-service	4 hours	Dependent on Operations hanging tags
2.	Disconnect cells	4 hours	Need minimum 6 personnel
3.	Remove/wrap old cells	12 hours	Need minimum of 10 personnel
4.	Inspect racks		Performed concurrently with steps #2 and #3.
5.	Stage new cells at switchyard		Performed concurrently with or prior to #2 and #3.
6.	Recoat or repair rack	24 hours	Contingency, only if necessary
7.	Clean racks, install new plastic, install and reconnect new cells and rack connections	24 hours	QC on job continuously verifying torque requirements for cell
8.	Resistance check connections	8 hours	Take readings, perform calculations, re-do connections, have Engineering at job site to perform evaluations and complete paperwork
9.	Clear red tags	4 hours	Dependent on Operations
10.	Float charge new battery	24 hours	This assumes that new battery cells were maintained continuously on single cell chargers until installation with only 24-36 hours off charger before installation. 24 hours for this activity is worst case, could be as little as 2-4 hours.
11.	Perform Service Test	8 hours	Based on experience
12.	Equalize charge	40 hours	Based on experience
13.	Stabilize battery readings	2 hours	Based on experience
14.	Final paperwork completion, review, approval	2 hours	Based on experience
15.	Operations return to service and exit LCO	2 hours	Based on experience
	Total:	**158 hours (6.6 days)**	

	Contingency Plan		**Worst case is a test set failure at the end of the service test (step 11)**
A.	Remove test equipment	4 hours	
B.	Equalize battery	40 hours	
C.	Stabilize battery	16 hours	
D.	Re-test	8 hours	
	Contingency Total:	**68 hours (2.8 days)**	
	Total Plan Time w/Contingency	**226 hours (9.4 days)**	