FPL.

February 13, 2013

L-2013-048
10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

St. Lucie Units 1 and 2
Docket Nos 50-335 and 50-389

RE: Reply to Request for Information - License Amendment Request
Station Battery Surveillance Requirement Changes

References:

1. FPL Letter L-2012-048 dated August 10, 2012, "License Amendment Request Station Battery Surveillance Requirement Changes" (ML12235A315)
2. NRC Letter dated December 31, 2012, "St. Lucie Plant, Units 1 and 2 - Request For Additional Information Regarding License Amendment Request For Station Battery Surveillances (TAC NOS. ME9297 AND ME9298) (ML12356A501)

On August 10, 2012, Florida Power & Light (FPL) submitted proposed license amendment requests (LARs) to revise the requirements of the St. Lucie Units 1 and 2 Technical Specifications (TS) related to station DC battery surveillance requirements for terminal connection resistances (Reference 1). On December 31, 2012, NRC staff requested additional information on the LARs (Reference 2). The FPL response to the staff's December 21, 2012, request is provided in the enclosure to this letter.

The original no significant hazards evaluation bounds this submittal. FPL commits to change the TS Bases as presented in the enclosure.

If you have any questions or require additional information, please contact Eric Katzman, Licensing Manager, at (772) 467-7734.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 13, 2013.

Joseph Jensen
Site Vice President
St. Lucie Plant

A001
NRR

Enclosure
RAI Reply for License Amendment Request
Station Battery Surveillance Requirement Changes

RAI Replies

Figures:

1. Inter-Cell Connection & Measurement Detail
2. Inter-Tier (or Inter-Rack) Connection & Measurement Detail
3. Positive & Negative Output Terminals & Measurement Detail
4. St. Lucie Typical Output Terminals & Inter-Tier Terminals / Cables Arrangement
5. St. Lucie Typical Terminal Plate & Cable Lugging Arrangement (Inter-Tier & Output Terminals)
6. St. Lucie Typical Inter-Cell Bus-Bar Connection Arrangement

----

ATTACHMENTS:

1. St. Lucie Units 1 and 2 Class 1E Batteries 1A, 1B, 2A and 2B Electrical Connections List
2. C&D Technologies, Inc Memos (dated October 9, 2008 & August 27, 2010), which define criteria for battery cell interconnection resistance values and the C&D catalog information on LCY-39 cell ratings.
3. TS Page Markups
4. Retyped TS Pages
5. TS Bases Markup (Information Only)

NRC Request 1:

In its letter dated August 10, 2012, the licensee proposed to add resistance value acceptance criteria for "Inter-Cell" and "Inter-Tier" battery connections in the Technical Specifications (TS) Table on Page 3/4.8-11. However, other types of station battery connections such as station battery Terminal connections and associated Terminal connection resistance acceptance criteria are not included in the proposed Unit 1 TS Surveillance Requirements (SRs) 4.8.2.3.2.b.2 and 4.8.2.3.2.c.3, and Unit 2 TS SRs 4.8.2.1.b.2, and 4.8.2.1.c.3.

a. Provide a list of all battery connections.

b. Explain why Terminal connection resistance was deleted from the existing Unit 1 TS SR 4.8.2.3.2.c.3, and Unit 2 TS SR 4.8.2.1.c.3, and not re-inserted in the proposed TS Table on Page 3/4.8-11.

c. Provide a typical drawing of the station battery cell connections arrangement showing all types of station battery connections.

St. Lucie Site Response:

a. See Attachment 1 to this enclosure for a list of battery connections for the 60-cell battery bank set used for each of the Class 1E Batteries 1A & 1B, and 2A & 2B, utilized in Units 1 and 2 respectively. This list identifies the connections, which are Inter-Cell, Inter-Tier, Inter-Rack and Output Terminal. See Figures 1 through 6 for simplified diagrams and photographs of these configurations. The connections between the two upper tiers of the battery racks, which some may refer to as "Inter-Rack" were originally identified as "Inter-Tier" for simplicity, as these connections use short-lengths of cable and have resistance values typical of Inter-Tier connections. However as requested, the "Inter-Rack" term will be named separately from the "Inter-Tier". There are 15 battery cells located on each of 4 tiers of the battery racks. As can be seen in Attachment 1, there are 56 Inter-Cell, 2 Inter-Tier, 1 Inter-Rack and 2 Output Terminals (125 VDC Positive & Negative) connections for a total of 61 equivalent connections between the 60 cells and plant output terminals to DC buses.

   The Inter-Cell connections utilize solid bus bars between two adjacent cells with bolted connections. Each cell has 3 positive posts and 3 negative posts, which are connected together in-series with the adjacent cells via bar connectors. Therefore, there are 6 bolted connections for each Inter-Cell connection (See Figures 1 & 6). While the 3 posts of each battery polarity connection are paralleled and should have the same resistance, IEEE 450 guidance states that measurements should be taken from the Left post of one cell to the Left post of the next cell, and are then repeated for Center to Center and Right to Right. Deviations between the Left, Center and Right post-to-post measurements can help indicate that one of the paralleled post to bus-bar connections is degraded.

The Inter-Tier (& Inter-Rack) connections tie the battery cell from one section of the battery rack to the next cell (electrically in-series) located on the adjacent tier of the battery rack. These connections use Terminal plates, 500 MCM cables, and crimped cable lugs to jumper the two cells together. These plates are bolted to all three posts of each cell. Measurements from the Inter-Tier (& Inter-Rack) connections are done from the Left post of one cell to the Left post of the second cell and are repeated for the Right to Right. Note that as the plate envelopes and covers the Center post, that the Center post is not accessible and cannot be measured, as is done with the Inter-Cell connections, which remain accessible (See Figures 2, 4 & 5)

The Terminal Connections provide the battery output power (+/- 125VDC nominal) to the plant DC buses, and use Terminal plates, as used for the Inter-Tier (& Inter-Rack) connections. The Terminal measurements are taken from the Left post of the cell to the Right lug connected to the outgoing cable; and from the Right post of the cell to the Left lug connected to the outgoing cable (See Figures 3 & 4)

b. The deletion of the battery connection resistance measurements from the proposed Unit 1 TS Surveillance Requirement (SRs) 4.8.2.3.2.b.2 and Unit 2 TS SRs 4.8.2.1.b.2, were based on the guidance in IEEE 450, which does not recommend quarterly (92 day) resistance measurements for the battery connections.

   The omission of the word "Terminal" from the existing Unit 1 TS SR 4.8.2.3.2.c.3, and Unit 2 TS SR 4.8.2.1.c.3 was not intended to indicate that this measurement was deleted from the Technical Specification limits, the design requirements or the existing St. Lucie IEEE 450 maintenance monitoring program. The output Terminal measurements were considered, as part of the "Inter-Cell" measurement population, in Technical Specifications, procedures and calculations. A review of the guidance provided in the last two revisions of the Combustion Engineering Owner's Group Standard Technical Specifications (NUREG 1432, Revisions 3 & 4) as referenced in the NRC.gov website, did not locate any discussion or requirements, which list or quantify the Inter-Cell or Terminal Resistance. Specifically, only a general reference to adhering to the IEEE 450 battery maintenance program was found, which contains a methodology for monitoring and controlling battery connection resistances. St. Lucie will continue to utilize the IEEE 450 methodology, as previously adopted. The intent of the original St. Lucie submittal was to remain consistent with the level of detail provided in NUREG 1432. Based on the above, the original submittal had attempted to simplify the Technical Specification text wherever possible, which led to the inadvertent deletion of the word "Terminal" from the affected Technical Specification sections. Therefore, the word "Terminal" will be re-inserted into the Unit 1 TS SR 4.8.2.3.2.c.3 and Unit 2 TS SR 4.8.2.1.c. 3 proposed License Amendment request.

c. Figures 1 through 6 provide simplified diagrams used in plant procedures and photographs of typical configurations of the St. Lucie Class 1E batteries. Design Drawings (8770-11982, 8770-11983, 8770-11984, 2998-1847, 2998-18537, & 2998-18538) have been obtained in hard-copy and scanned to provide the design details.

NRC Request 2:

Confirm that resistances for all battery connections have been considered in the DC system calculations for battery sizing and voltage drop.

St. Lucie Site Response:

The resistances of the St. Lucie safety-related batteries have been considered in the DC system calculations for sizing and voltage drop, using the battery manufacturer (C& D Technologies, Inc) criterion for ensuring that the rated performance (current and voltage) is provided by the 60-string battery bank set. This methodology concludes that each battery cell, as well as a 60-string battery bank as a unit, was tested, qualified and rated with a manufacturer's connection resistance inherent as part of its qualification. C&D Technologies have formally advised St. Lucie that as long as the St. Lucie maximum DC profile current results in less than or equal to a 33.66 mV drop between each and every cell (on average), that the battery output is qualified and guaranteed to provide the required current and at the rated voltage to the output Terminals of the battery.

For St. Lucie Units 1 & 2, this results in the allowable "average" Inter-Cell resistance (including Inter-Tier, Inter-Rack & Terminal) of a specified value dependent on the maximum profile current of that specific battery (1A, 1B, 2A, & 2B). The existing maximum calculated current values are 511 A, 518 A, 607 A, and 631 A, for the Class 1E batteries 1A, 1B. 2A and 2B, respectively. Therefore, as discussed in the original St. Lucie submittal, the maximum calculated allowable "average" interconnection resistances, based on the manufacturer criteria, are 64.61 μΩ and 53.34 μΩ, for the most limiting batteries (1B & 2B), for Units 1 and 2 respectively. The proposed 50 μΩ Technical Specification "average" limit was selected, in order to conservatively bound the most-limiting 53.34 μΩ "average" design limit for the 2B Class 1E battery. The benefit of the approach described above, is that there is no impact to the DC voltage-drop calculations when maintained below the 50 μΩ average, as the interconnection resistances are considered internal to the 60-cell battery set, versus external to the battery set. Note that the use of a 50 μΩ per cell limit provides a total allowable Class 1E battery resistance connection resistance limit of 3050 μΩ (61 x 50 μΩ).

NRC Request 3:

Provide a summary of changes that were made to the station battery sizing calculation to support this license amendment request (LAR).

St. Lucie Site Response:

Based on the vendor criterion discussed above, which is used to determine the maximum acceptable "average" Inter-Cell connection resistance, inherent in the testing, rating and qualification of the Class 1E batteries; no specific changes were required to the St. Lucie station battery sizing calculations (PSL-1FSE-05-002 [Unit 1] and PSL-2FSE-05-003 [Unit 2]). The C & D Technologies, Inc. criterion letter is referenced and attached to each of these calculations in

order to support the ETAP program battery input parameter, which set the Inter-Cell connection resistance to 0 μΩ. Since the Inter-Cell connection resistance is considered internal to the qualified battery set, no external resistance need be added to the calculations. See Attachment 2 for the C & D Technology letters provided.

NRC Request 4:

Provide a summary of the calculations including station battery connection resistance calculations that show how the values in the proposed TS Table were derived, battery design duty cycle profiles, assumptions and supporting documentation to demonstrate that:

a. The station batteries will perform their intended safety functions when operating within the proposed limits, and

b. The safe shutdown equipment will have required minimum voltage to perform their required safety functions for the postulated design basis accident and the station blackout scenarios.

St. Lucie Site Response:

St. Lucie DC battery sizing calculations, PSL-1FSE-05-002 [Unit 1] and PSL-2FSE-05-003 [Unit 2], includes an attachment (C & D Technologies, Inc. letter), which provides the basis for the methodology to determine the maximum "average" Inter-Cell resistance for our calculated maximum current profiles. The engineering evaluation, which supports this proposed Technical Specification Amendment, EC 249589 describes in detail how the Inter-Cell connection resistance limits were established. The actual field measurements for the Inter-Cell connection resistances historically run far below the vendor limit on average (i.e. 20 μΩ. to 30 μΩ range on average), which provides 'built in" margin below the Technical Specification average 50 μΩ limit. This ensures that the bounding design calculations (Unit 2, Battery 2B) with a 53 μ average limit value would not be impacted. The Inter-Cell connection resistances are intrinsic in the DC battery sizing calculation. Therefore there is no need to add external resistance values to the connection resistances that have already been analyzed by the manufacturer as integral to the battery performance. As a result, there is no impact to the Class 1E Battery sizing calculations.

NRC Request 5:

The licensee proposed to include a new parameter "Average Inter-Cell Connection" in the TS Table on Page 3/4.8-11. However, the staff did not find any definition or details of this proposed parameter in the LAR. Lack of any definition or details could create confusion in future.

a. Discuss in detail the proposed parameter "Average Inter-Cell Connection" including the definition and provide a Regulatory Commitment to include a definition and details of this new parameter in the TS Bases.

b. On Page 15 of the LAR, Attachment 1, TS Table on Page 3/4.8-11, the proposed maximum value of "Single Inter-Cell Connection" resistance is approximately 300 percent or 100 micro

b. On Page 15 of the LAR, Attachment 1, TS Table on Page 3/4.8-11, the proposed maximum value of "Single Inter-Cell Connection" resistance is approximately 300 percent or 100 micro ohms above "Average Inter-Cell Connection" resistance. Explain why the "Single Inter-Cell Connection" resistance is much higher than the "Average Inter-Cell Connection" resistance.

St. Lucie Site Response:

a. See Attachment 1 for a list of battery connections for the 60-cell battery set used for each of the Class 1E Batteries. As discussed above, the battery manufacturer (C & D Technologies) has provided a criterion for maximum "average" Inter-Cell connection resistance, based on a 33.66 mV drop per Inter-Cell connection. When expanded from a single cell to a battery bank set of 60 cells, the "average" limit term must be established to accommodate measurement variances and yet establish adequate overall margin. This "average" value applies to all 56 Inter-Cell, 2 Inter-Tier, 1 Inter-Rack and 2 battery Output Terminal connections for a total of 61 effective battery cell connections.

   This average is complicated slightly by IEEE 450 guidance, which recommends multiple connection resistance measurements between cells for battery installations with multiple positive and negative posts per cell. For instance, per IEEE 450 guidance, each "Inter-Cell" connection utilizes 3 measurements (i.e. L-L, C-C & R-R posts), each "Inter-Tier" (& Inter-Rack) connection uses 2 measurements (i.e. L-L, R-R), and each battery output Terminal uses 2 measurements (i.e. L-Right Lug, & R-Left Lug). Therefore, as only 2 measurements are taken for the 3 Inter-Tier/Inter-Rack and 2 Output Terminal connections, the 178 measurements cannot be simply summed and averaged over the total population of measurements [i.e. 178 measurements (3x56 + 2x3 + 2x2) for 60 cells including the two output Terminals]. This is specifically avoided, as the Inter-Tier measurements, which utilize jumper cables and cable lug connections, normally have greater interconnection resistance than the Inter-Tier connections, which use bus bars. Therefore, simply averaging the total sum of all 178 measurements would incorrectly skew (reduce) the average value in a non-conservative manner.

   Therefore, averaging is done for each connection first, and then averaged for the 60-cell battery bank with output connections. For instance, the Inter-Cell connection resistance measurements, between Cells 1 & 2 (L-L, C-C & R-R) would be averaged over 3 measurements for an equivalent average value for that interconnection, while the Inter-Tier connection resistance measurements between Cells 15 & 16 (L-L & R-R) would be averaged over only 2 measurements. Similarly, the output Terminal posts would also be averaged over its 2 measurements.

   As a result, with some simplification, the overall interconnection resistance for the St. Lucie 60-cell Class 1E battery bank can be described as:

Average = [(SUM IC_{1-168})/3 + (SUM IT_{1-2})/2 + (SUM IR)/2 + (SUM OT_{1-2})/2] / 61

Where;

IC = Inter-Cell Post-Post measurements through Bus-bar connections
IT = Inter-Tier Post-Post measurements through Terminal Plates, Lugs & Cables
IR = Inter-Rack Post-Post measurements through Terminal Plates, Lugs & Cables
OT = Output Terminal Post-Lug measurements on the Terminal Plate

A revised Technical Specification Basis was not provided with the original submittal, as a review of NUREG 1432, Revisions 3 & 4, found no discussion in the Surveillance Requirements or Basis for the Inter-Cell or Terminal resistances. The intent of the original submittal was to remain consistent with the level of detail provided in NUREG 1432.

However, as requested, St. Lucie will commit to provide a description of the averaging method used in the Technical Specifications Bases Section. The proposed addition to the Technical Specification Bases document is shown in Attachment 5 to this enclosure. In addition, St. Lucie proposes enhancing the Table and text in the Technical Specification Surveillance Requirements (Unit 1 TS SR 4.8.2.3.2.c.3 and Unit 2 TS SR 4.8.2.1.c.3) in the proposed License Amendment request to describe the definition of 50 μΩ per cell "average" value, as shown below and in Attachments 3 and 4:

Battery Inter-Connection Measurement Limits		
Battery Inter-Connection Type	Maximum Individual Inter-Connection Resistance	Maximum Average Inter-Connection Resistance [Battery Bank*]
Inter-Cell	≤ 150 x 10-6 ohms	≤ 50 x 10-6 ohms
Inter-Tier	≤ 200 x 10-6 ohms	
Inter-Rack	≤ 200 x 10-6 ohms	
Output Terminal	≤ 150 x 10-6 ohms	

* The battery bank average interconnection resistance limit is the average of all inter-cell, inter-tier, inter-rack and output terminal connection resistance measurements for all series connections in the battery string.

b. St. Lucie has considered that the existing 150 μΩ maximum Inter-Cell resistance Technical Specification limit, which was suggested in the various original Standard Technical Specifications and has been commonly used throughout the industry, as a value to detect cell connections, which were clearly an "outlier", and not intended to be applied to an entire battery bank. This is evident, as failure to meet this 150 μΩ Technical Specification limit, results into entry into the Limiting Condition for Operation Action (3.8.2.1), which states;

> "With one of the required battery banks inoperable, restore the Inoperable battery bank to OPERABLE status with 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours".

Therefore, as plant shutdown or "at risk" corrective measures to avoid a plant shutdown, are responses which have serious consequences; this proposed Technical Specification limit was not reduced, and should remain as originally intended. This decision was based on consideration of the degree of impact of the 150 μΩ value on connection heating and voltage drop, St. Lucie adherence to the IEEE 450 battery maintenance/monitoring program actions to control connection resistance degradation, and the risk to the operating Unit to rework a connection at a value below the 150 μΩ limit.

A 150 μΩ (0.00015 Ω) connection resistance, at a maximum current profile of 631 A would result in a less than a 60 watts of total heating across the connection (i.e. 6 post connections [with 2 separate post to bus bar interface connections per post], per Inter-Cell connection, including the loss in the conductors). This level of heating is minimal and would not result in connection failure from overheating. In addition, the voltage drop from a 150 μΩ connection resistance at 631 A is only 0.0947 V, which remains insignificant for a small population of cell connections. Similarly, after 1 minute of DC loading, the current profiles for all four Class 1E batteries drop below 300 A, which lower the heat dissipated to less than 30 W. Therefore, an Inter-Cell connection resistance of just below the 150 μΩ value (0.00015 Ω), does not represent a battery connection, which will fail to perform its function. As discussed above, the criteria that the "average" Inter-Cell resistance of less than or equal to 50 μΩ (3050 μΩ for the 60 cell battery bank), remains the more limiting factor from a design perspective. Note that the Output Terminal resistance has the same criteria as the Inter-Cell for maximum and average values.

Per the IEEE 450 program guidance, if a cell interconnection is found to be elevated above 20% above its originally installed measured baseline, such as exceeding 24 μΩ on a 20 μΩ baseline measurement, the connection degradation must be addressed. In many cases, re-torquing of the connections can correct the increased resistance without the need to disassemble the battery connections.

However, if disassembly is required for cleaning, repair or replacement of connection hardware, then the operating Unit would be subjected to increased risk. Specifically, if the battery bank circuit is opened for connection disassembly and cleaning, then that entire Class 1E DC system train must rely on the float voltage of the battery charger, and must not be subjected to any transients, which would exceed the peak current capacity of the battery charger (i.e. 315 A current limit capacity). For example, if the battery charger were to fail or if the load increases above the full load limit of the battery charger, the Unit's accident mitigation systems could trigger in fail-safe mode, resulting from a 2-out-of-4 actuation logic, and DC components could otherwise malfunction.

Similarly, for the Inter-Tier (& Inter-Rack) connections, a maximum Technical Specification resistance limit of 200 μΩ is proposed to incorporate the existing 150 μΩ value used for the Inter-Cell, and to add 50 μΩ to accommodate the additional resistance inherent in cables and cable connections versus the Inter-Cell bus-bar type connections.. At a peak current of 631 A for one minute, connection heating is less than 80 W with less a 0.126 V drop, which are also considered to have minimal impact to the battery bank performance overall. This measurement threshold level is considered more appropriate for entry into a Technical Specification Action statement for Inter-Tier connections.

NRC Request 6:

With respect to Unit 2 TS Surveillances, there appears to be a discrepancy between the TS SR numbers described in Section 1, "Summary Description," and Section 2, "Detailed Description," of the proposed LAR (Page 2 of 20, Enclosure). Confirm the correct TS SR numbers for Unit 2.

St. Lucie Site Response:

The correct Unit 2 surveillance numbers are as noted in the Summary Description section. The Detailed Description Unit 2 surveillance numbers are incorrect and should be noted as 4.8.2.1.b.2 and 4.8.2.1.c.3.

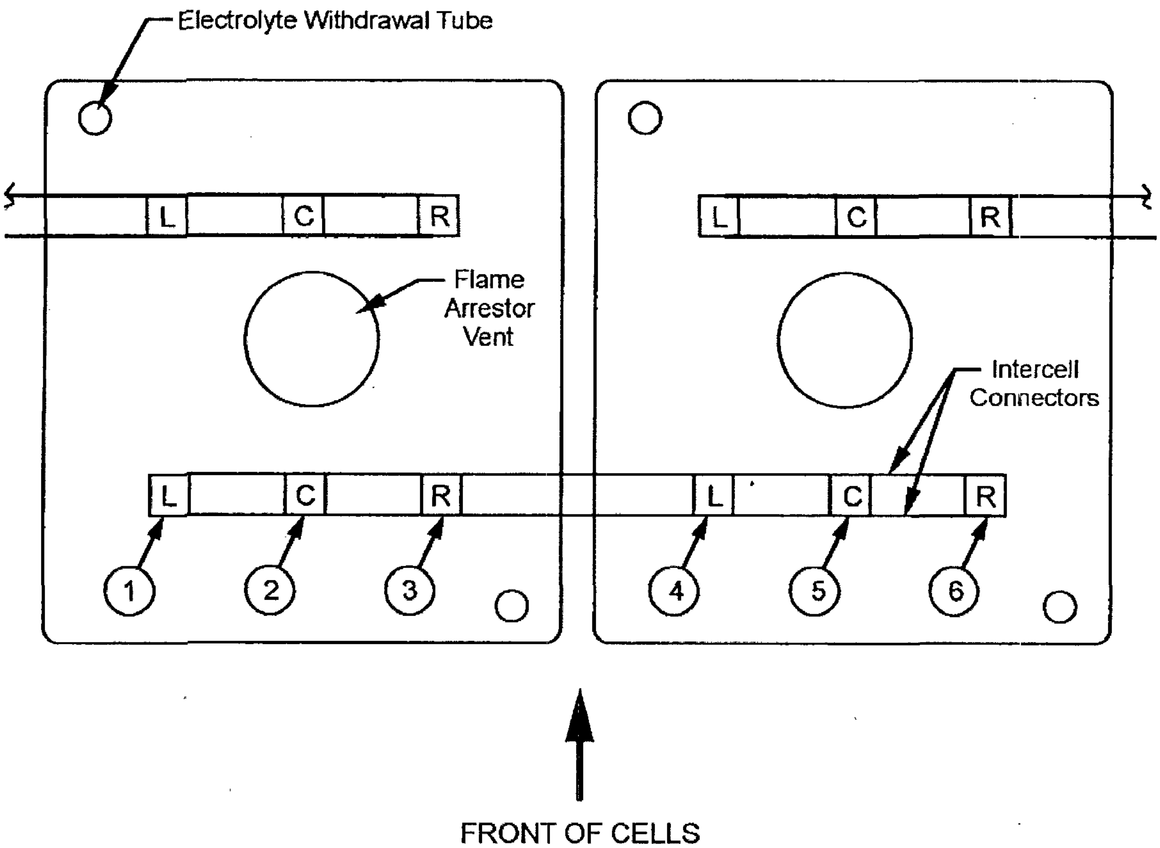
Figures:

1. Inter-Cell Connection & Measurement Detail
2. Inter-Tier (or Inter-Rack) Connection & Measurement Detail
3. Positive & Negative Output Terminals & Measurement Detail
4. St. Lucie Typical Output Terminals & Inter-Tier Terminals / Cables Arrangement
5. St. Lucie Typical Terminal Plate & Cable Lugging Arrangement (Inter-Tier & Output Terminals)
6. St. Lucie Typical Inter-Cell Bus-Bar Connection Arrangement

Fig. 1 – Inter-Cell Connection & Measurement Detail

Cells Connected with Intercell Connectors

(Page 1 of 1)



NOTE:

1. Three measurements are required for each set of cells connected with intercell connectors.

   (1) to (4) - Left Post to Adjacent Cell Left Post

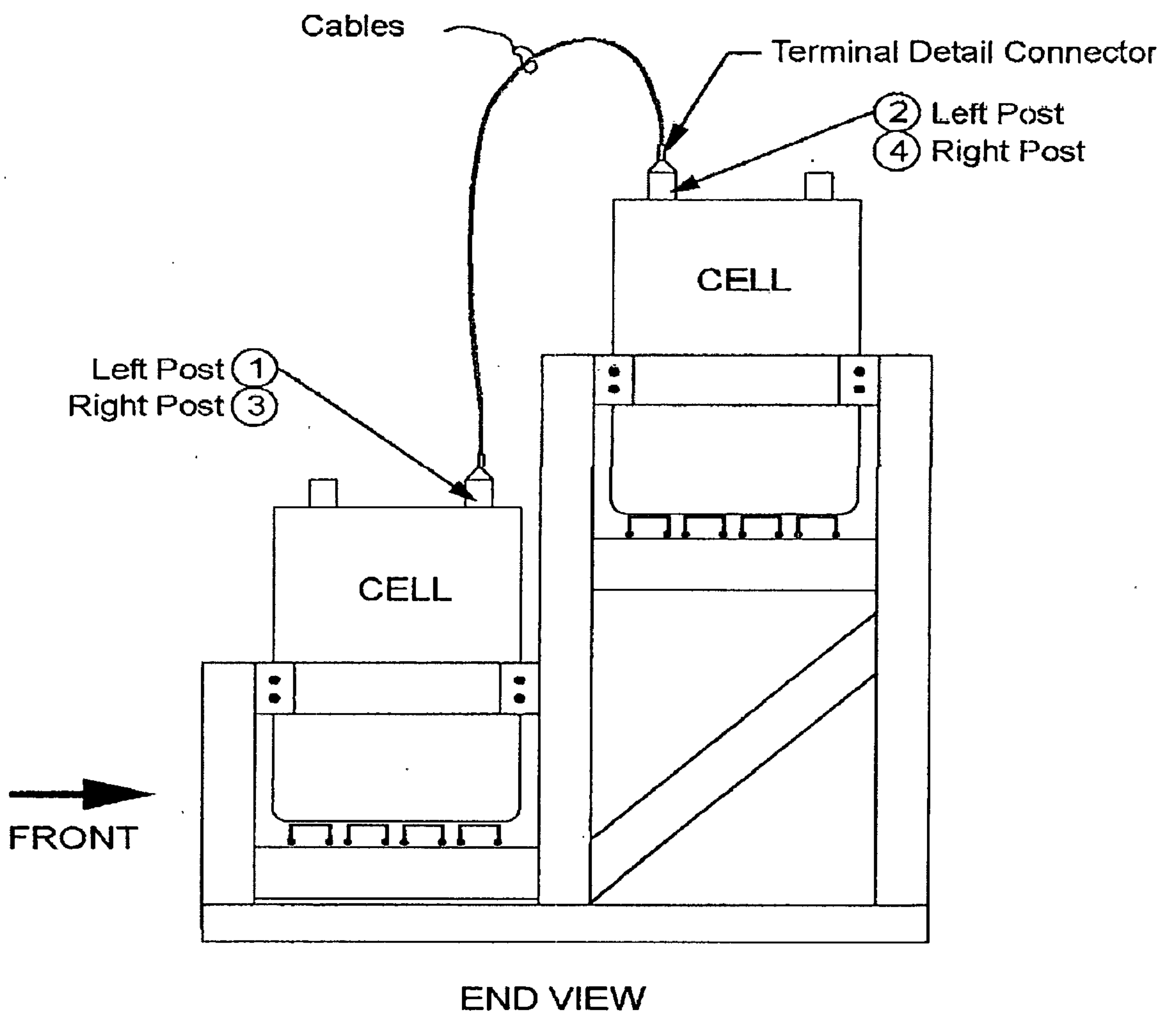
   (2) to (5) - Center Post to Adjacent Cell Center Post

   (3) to (6) - Right Post to Adjacent Cell Right Post

2. See Figure 2 for measurements at a terminal detail connector (e.g., interstep cable connections.)

Fig. 2 – Inter-Tier (or Inter-Rack) Connection & Measurement Detail

Cells Connected with Terminal Detail Connectors and Cables
(Page 1 of 1)



NOTE:

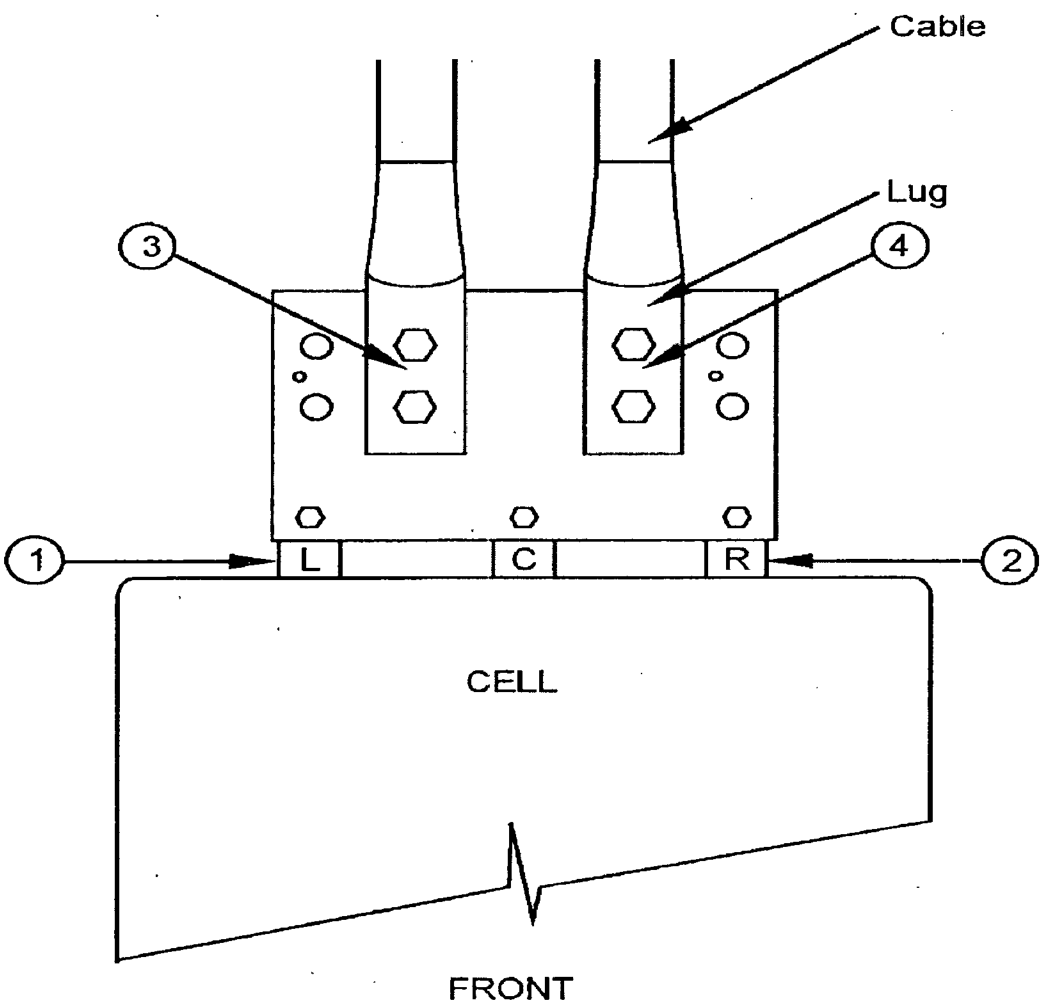
Two measurements are required,

Left Post of First Cell (1) to Right Post of Second Cell (4)

Right Post of First Cell (3) to Left Post of Second Cell (2)

Fig. 3 – Positive & Negative Output Terminals & Measurement Detail

Positive and Negative Terminals
(Page 1 of 1)



NOTE:
Two measurements are required,

(1) to (4) - Left Post to Right Lug

(2) to (3) - Right Post to Left Lug

Fig. 4 – St. Lucie Typical Output Terminals & Inter-Tier Terminals / Cables Arrangement

Fig. 5 – St. Lucie Typical Terminal Plate & Cable Lugging Arrangement (Inter-Tier & Output Terminals)

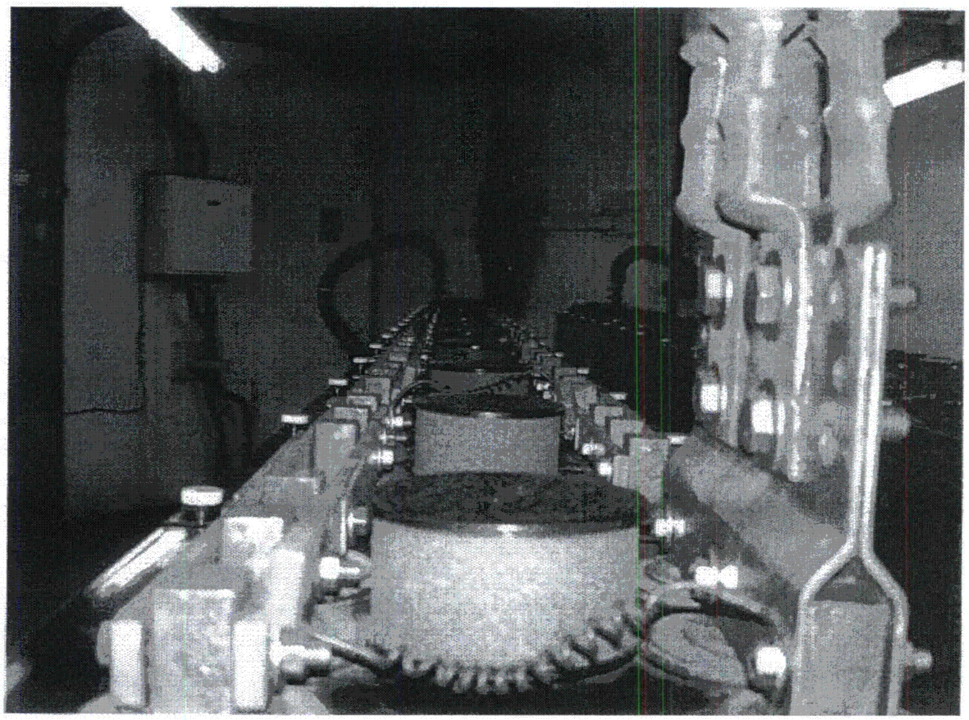
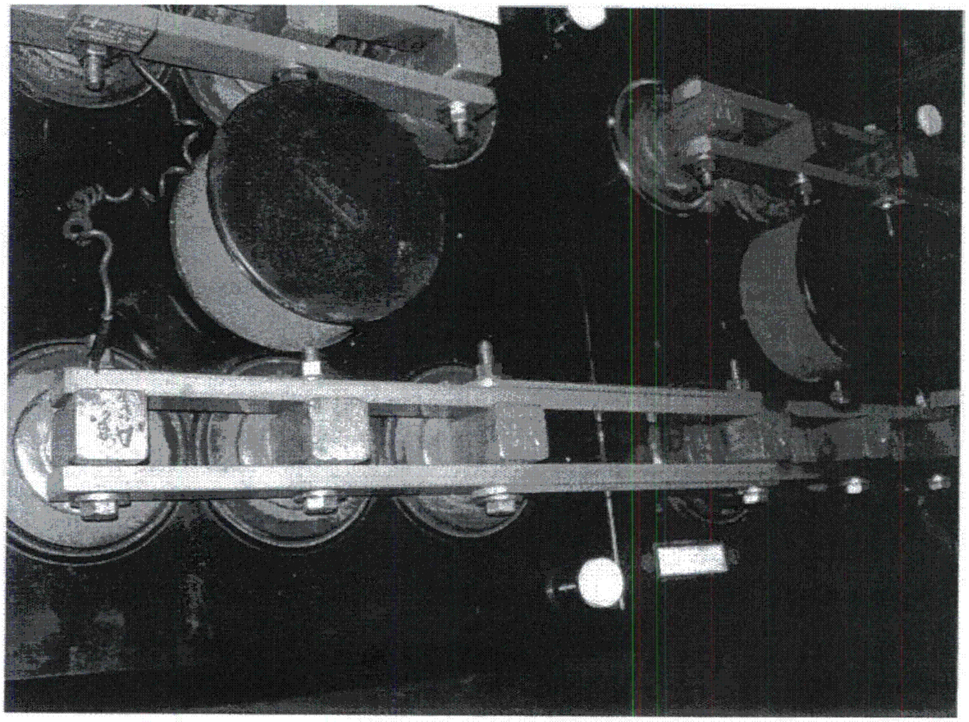


Fig. 6 – St. Lucie Typical Inter-Cell Bus-Bar Connection Arrangement



Attachment 1

St. Lucie Units 1 and 2 Class 1E Batteries 1A, 1B, 2A and 2B Electrical Connections List

125 VDC Battery Cell Inter-Connections (From & To Battery Cell #'s; Inter-Cell, Inter-Tier, Inter-Rack & Output Terminal)	Battery Connection Resistance Measurements for Inter-Cell Post to Post (Left-Left, Center-Center & Right-Right	Tech Spec Maximum Inter-Cell Connection Resistance (μΩ) [Any Given Connection]	Tech Spec Maximum "Average" Inter-Cell, Inter-tier & Terminal Connection Resistance (μΩ)
Output Terminal Postitive (+) Post Cell 1	Left Post - Right Lug	150	50
	C-C (N/A)		
	Right Post - Left Lug	150	50
1 to 2	L-L	150	50
	C-C	150	50
	R-R	150	50
2 to 3	L-L	150	50
	C-C	150	50
	R-R	150	50
3 to 4	L-L	150	50
	C-C	150	50
	R-R	150	50
4 to 5	L-L	150	50
	C-C	150	50
	R-R	150	50
5 to 6	L-L	150	50
	C-C	150	50
	R-R	150	50
6 to 7	L-L	150	50
	C-C	150	50
	R-R	150	50
7 to 8	L-L	150	50
	C-C	150	50
	R-R	150	50
8 to 9	L-L	150	50

125 VDC Battery Cell Inter-Connections (From & To Battery Cell #'s; Inter-Cell, Inter-Tier, Inter-Rack & Output Terminal)	Battery Connection Resistance Measurements for Inter-Cell Post to Post (Left-Left, Center-Center & Right-Right	Tech Spec Maximum Inter-Cell Connection Resistance (μΩ) [Any Given Connection]	Tech Spec Maximum "Average" Inter-Cell, Inter-tier & Terminal Connection Resistance (μΩ)
8 to 9 (cont'd)	C-C	150	50
	R-R	150	50
	L-L	150	50
	C-C	150	50
9 to 10	R-R	150	50
	L-L	150	50
	C-C	150	50
10 to 11	R-R	150	50
	L-L	150	50
	C-C	150	50
11 to 12	R-R	150	50
	L-L	150	50
	C-C	150	50
12 to 13	R-R	150	50
	L-L	150	50
	C-C	150	50
13 to 14	R-R	150	50
	L-L	150	50
	C-C	150	50
14 to 15	R-R	150	50
	L-L	200	50
15 to 16 (Inter-Tier Connection)	C-C (N/A)		
	R-R	200	50
	L-L	150	50
	C-C	150	50
16 to 17	R-R	150	50
	L-L	150	50
	C-C	150	50
17 to 18	R-R	150	50
	L-L	150	50
	C-C	150	50
18 to 19	R-R	150	50
	L-L	150	50
	C-C	150	50
19 to 20	R-R	150	50
	L-L	150	50
	C-C	150	50
20 to 21	R-R	150	50
21 to 22	L-L	150	50

125 VDC Battery Cell Inter-Connections (From & To Battery Cell #'s; Inter-Cell, Inter-Tier, Inter-Rack & Output Terminal)	Battery Connection Resistance Measurements for Inter-Cell Post to Post (Left-Left, Center-Center & Right-Right	Tech Spec Maximum Inter-Cell Connection Resistance (μΩ) [Any Given Connection]	Tech Spec Maximum "Average" Inter-Cell, Inter-tier & Terminal Connection Resistance (μΩ)
21 to 22 (cont'd)	C-C	150	50
	R-R	150	50
	L-L	150	50
	C-C	150	50
22 to 23	R-R	150	50
	L-L	150	50
	C-C	150	50
23 to 24	R-R	150	50
	L-L	150	50
	C-C	150	50
24 to 25	R-R	150	50
	L-L	150	50
	C-C	150	50
25 to 26	R-R	150	50
	L-L	150	50
	C-C	150	50
26 to 27	R-R	150	50
	L-L	150	50
	C-C	150	50
27 to 28	R-R	150	50
	L-L	150	50
	C-C	150	50
28 to 29	R-R	150	50
	L-L	150	50
	C-C	150	50
29 to 30	R-R	150	50
30 to 31 (Inter-Rack) Connection)	L-L	200	50
	C-C (N/A)		
	R-R	200	50
	L-L	150	50
	C-C	150	50
31 to 32	R-R	150	50
	L-L	150	50
	C-C	150	50
32 to 33	R-R	150	50
	L-L	150	50
	C-C	150	50
33 to 34	R-R	150	50

125 VDC Battery Cell Inter-Connections (From & To Battery Cell #'s; Inter-Cell, Inter-Tier, Inter-Rack & Output Terminal)	Battery Connection Resistance Measurements for Inter-Cell Post to Post (Left-Left, Center-Center & Right-Right	Tech Spec Maximum Inter-Cell Connection Resistance (μΩ) [Any Given Connection]	Tech Spec Maximum "Average" Inter-Cell, Inter-tier & Terminal Connection Resistance (μΩ)
34 to 35	L-L	150	50
	C-C	150	50
	R-R	150	50
35 to 36	L-L	150	50
	C-C	150	50
	R-R	150	50
36 to 37	L-L	150	50
	C-C	150	50
	R-R	150	50
37 to 38	L-L	150	50
	C-C	150	50
	R-R	150	50
38 to 39	L-L	150	50
	C-C	150	50
	R-R	150	50
39 to 40	L-L	150	50
	C-C	150	50
	R-R	150	50
40 to 41	L-L	150	50
	C-C	150	50
	R-R	150	50
41 to 42	L-L	150	50
	C-C	150	50
	R-R	150	50
42 to 43	L-L	150	50
	C-C	150	50
	R-R	150	50
43 to 44	L-L	150	50
	C-C	150	50
	R-R	150	50
44 to 45	L-L	150	50
	C-C	150	50
	R-R	150	50
45 to 46 (Inter-Tier Connection)	L-L	200	50
	C-C (N/A)		
	R-R	200	50
46 to 47	L-L	150	50
	C-C	150	50
	R-R	150	50

125 VDC Battery Cell Inter-Connections (From & To Battery Cell #'s; Inter-Cell, Inter-Tier, Inter-Rack & Output Terminal)	Battery Connection Resistance Measurements for Inter-Cell Post to Post (Left-Left, Center-Center & Right-Right	Tech Spec Maximum Inter-Cell Connection Resistance (μΩ) [Any Given Connection]	Tech Spec Maximum "Average" Inter-Cell, Inter-tier & Terminal Connection Resistance (μΩ)
	L-L	150	50
	C-C	150	50
47 to 48	R-R	150	50
	L-L	150	50
	C-C	150	50
48 to 49	R-R	150	50
	L-L	150	50
	C-C	150	50
49 to 50	R-R	150	50
	L-L	150	50
	C-C	150	50
50 to 51	R-R	150	50
	L-L	150	50
	C-C	150	50
51 to 52	R-R	150	50
	L-L	150	50
	C-C	150	50
52 to 53	R-R	150	50
	L-L	150	50
	C-C	150	50
53 to 54	R-R	150	50
	L-L	150	50
	C-C	150	50
54 to 55	R-R	150	50
	L-L	150	50
	C-C	150	50
55 to 56	R-R	150	50
	L-L	150	50
	C-C	150	50
56 to 57	R-R	150	50
	L-L	150	50
	C-C	150	50
57 to 58	R-R	150	50
	L-L	150	50
	C-C	150	50
58 to 59	R-R	150	50
	L-L	150	50
	C-C	150	50
59 to 60	R-R	150	50

125 VDC Battery Cell Inter-Connections (From & To Battery Cell #'s; Inter-Cell, Inter-Tier, Inter-Rack & Output Terminal)	Battery Connection Resistance Measurements for Inter-Cell Post to Post (Left-Left, Center-Center & Right-Right	Tech Spec Maximum Inter-Cell Connection Resistance (μΩ) [Any Given Connection]	Tech Spec Maximum "Average" Inter-Cell, Inter-tier & Terminal Connection Resistance (μΩ)
Output Terminal Negative (-) Post Cell 60	Left Post - Right Lug	150	50
	C-C (N/A)		
	Right Post - Left Lug	150	50

Total Allowable Technical Specification Battery Inter-Connection & Terminal Connection Resistance for a 60 Cell Battery String @ 50 μΩ for 61 Connections = 3050 (μΩ)*

*NOTE: There are 61 effective battery cell interconnections for a 60 cell string battery (56 inter-cell, 2 inter-tier, 1 inter-rack, & 2 output terminal). However, per IEEE 450 guidance and as shown above, there are multiple readings taken for each of the 61 inter-connections, resulting in 178 total measurements (168 inter-cell, 4 inter-tier, 2 inter-rack & 4 output terminal). The 50 μΩ Average is based on 61 battery inter-connections

C&D TECHNOLOGIES, INC
Power Solutions

Nuclear Product Manager
1400 Union Meeting Road
Blue Bell, PA 19422
Phone: (215) 775-1314
Fax: (215) 619-7887

October 9, 2008

Mr. Rick Raldiris
FP&L – St. Lucie Nuclear Plant

Subject: LCY-39 Connection Resistance Information

Dear Rick:

I have reviewed your data and information regarding the connectors on your Units 1 and 2 battery strings each consisting of 60 ea. LCY-39 cells.

Between two adjacent cells, there are 2 ea. PK02627 6-hole connectors and 2 ea. PK02635 2-hole connectors. The resistance of the connectors is calculated to extend between one post of one cell to the same relative post on the adjacent cell. Each cell has 3 posts per polarity, so there are 6 posts connected using the 4 connectors noted. If these posts are labeled A, B, C, D, E, F, left to right, then the resistance would be between A and D, or B and E or C and F. This corresponds with the connection resistance readings that are taken as part of your maintenance program.

The resistance of this connection group is calculated to be 11.042 micro-ohms. Note that this value does not include the resistance of the junction between the connectors and the posts.

The battery is rated to supply 3048 amps for 1 minute to 1.75 volts per cell using these connectors. The voltage drop across the connectors based on this resistance is then 3048 amps x 11.042 micro-ohms = 33.66 mV (which is close to our target of 30 mV for voltage drop across connectors). Our battery performance data is based on tests that used these connectors, so a voltage drop of 33.66 mV is bracketed by our discharge data.

At your facility, the maximum discharge current is 671 amps. In order to keep the voltage drop due to the connectors below 33.66 mV, the resistance of the connectors should be kept below 50.1 micro-ohms. During other load periods,

(Continued)

lower load currents would produce lower voltage drops, so the 671 amp load this would be considered the worst case requiring the lowest resistance value for the connectors.

The use of this ceiling value is considered conservative, since it would be compared to the connection resistance as read with the DLRO meter, which includes the interface resistance.

Maintaining your connection resistances below an average value of 50.1 micro-ohm ceiling value keeps the batteries bounded by the battery performance data that was used to qualify the cells. Of course, the connection resistance readings should be maintained within 20% of the base line resistance values determined during installation for optimum performance of the battery system.

I hope that this information is helpful to meet your needs.

Regards,

C&D TECHNOLOGIES

Larry A. Carson

Larry A. Carson
Nuclear Product Manager

C&D TECHNOLOGIES, INC.
Power Solutions

1400 Union Meeting Road
Blue Bell, PA 19422
Phone: (215) 775-1314
Fax: (215) 619-7887

Sent via Email to: Ayodele.Ishola-Salawu@fpl.com

August 27, 2010

Mr. Ayodele Ishola-Salawu
Florida Power & Light
Electrical Design/Engineering
St. Lucie Plant

Subject: Battery Connector Resistance

Dear Mr. Ishola-Salawu:

The following information confirms our conversation this morning.

The connectors supplied with C&D batteries used in nuclear applications (KCR, LCR, LCY types) are designed so that the maximum voltage drop is 30 milli-volts when the battery is being discharged at the one minute rate.

The published battery discharge ratings include the voltage drop of the inter-cell lead-plated connectors (not the cable connectors). The base line resistance values of the connectors determined when the batteries are installed can be considered to be included in the battery performance ratings.

Please do not hesitate to contact me if you need any further information.

Regards,

Larry A. Carson

Larry A. Carson
Nuclear Product Manager
C&D Technologies, Inc.
Direct: 215-775-1314
lcarson@cdtechno.com

C & D Technologies Technical Publication Excerpt Showing Cell Rating Includes Consideration of Connector Voltage Drop

LCY-39 Cells Used at St. Lucie Units 1 & 2

C&D TECHNOLOGIES
Power Solutions

12-334

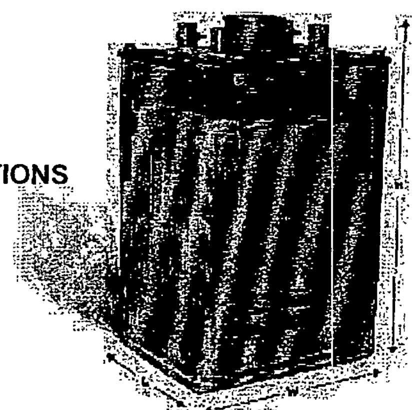
C&D® FLOODED SG&C

LCR AND LCY LEAD-CALCIUM
LAR LEAD-ANTIMONY

FOR SWITCHGEAR AND CONTROL APPLICATIONS

Capacities from 900 to 2400 Ampere-hours

C&D Technologies flooded batteries are engineered to provide superior performance and reliability over the life of the product. These batteries are designed using proprietary techniques and quality components and materials for reduced maintenance and extended battery life.



One-Minute Rating at 3048A for LCY-39 Cell "Includes Connector Voltage Drop"

RATINGS TABLE: AMPERES

		Ampere-hours	Nominal Rates @ 77 F (25 C) and 1.215 Specific Gravity (includes connector voltage drop)									
			Amperes									
FV/Cell	Models	8 hr	1 min	15 min	30 min	1 hr	2 hr	3 hr	4 hr	5 hr	8 hr	12 hr
1.75	2LCR/2LAR-13	900	843	743	633	460	301	231	189	161	113	81
	2LCR/2LAR-15	1050	984	867	739	537	352	269	220	188	131	95
	LCR/LAR-13	900	882	723	603	456	312	240	195	165	113	80
	LCR/LAR-15	1050	1029	844	704	532	364	280	228	193	132	93
	LCR/LAR-17	1200	1176	964	804	608	416	320	260	220	151	107
	LCR/LAR-19	1350	1438	1152	942	699	472	362	294	249	171	121
	LCR/LAR-21	1500	1598	1280	1047	776	525	402	327	276	190	134
	LCR/LAR-23	1650	1668	1371	1137	849	575	440	358	303	207	147
	LCR/LAR-25	1800	1800	1457	1212	915	626	480	391	330	226	159
	LCR/LAR-27	1950	1889	1566	1303	977	665	512	418	354	244	174
	LCR/LAR-29	2030	1984	1661	1388	1038	702	537	437	370	254	180
	LCR/LAR-31	2175	2106	1734	1449	1095	749	575	469	396	272	192
	LCR/LAR-33	2320	2235	1841	1541	1167	799	614	500	423	290	205
	LCY-35	2147	2727	2065	1610	1146	757	575	466	393	268	189
	LCY-37	2274	2888	2186	1705	1213	802	609	494	416	284	200
	LCY-39	2400	3048	2308	1800	1281	846	642	521	439	300	212

TS Markups

Unit 1

Page 3/4 8-11

Unit 2

Page 3/4 8-11

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 92 days and within 7 days after a battery discharge with battery terminal voltage below 110 volts, or battery overcharge with battery terminal voltage above 150 volts, by verifying that:

1. The parameters in Table 4.8-2 meet the Category B limits,

2. There is no visible corrosion at either terminals or connectors, ~~or the connection resistance of these items is less than 150 x 10^{-6} ohms~~; and

3. The average electrolyte temperature of 10% (60 cells total) of connected cells is above 50°F.

c. At least once per 18 months by verifying that:

1. The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration,

2. The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material,

3. ~~The resistance of each cell-to-cell and terminal connection is less than or equal to 150 x 10^{-6} ohms, and~~

replace with insert

4. The battery charger will supply at least 300 amperes at 140 volts for at least 6 hours.

d. At least once per 18 months, during shutdown, by verifying that the battery capacity is adequate to supply and maintain in OPERABLE status all of the actual or simulated emergency loads for the design duty cycle when the battery is subjected to a battery service test.

e. At least once per 60 months, during shutdown, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. This performance discharge test may be performed in lieu of the battery service test required by Surveillance Requirement 4.8.2.3.2.d.

f. Annual performance discharge tests of battery capacity shall be given to any battery that shows signs of degradation or has reached 85% of the service life expected for the application. Degradation is indicated when the battery capacity drops more than 10% of rated capacity from its average on previous performance tests, or is below 90% of the manufacturer's rating.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 92 days and within 7 days after a battery discharge with battery terminal voltage below 110 volts, or battery overcharge with battery terminal voltage above 150 volts, by verifying that:

1. The parameters in Table 4.8-2 meet the Category B limits,

2. There is no visible corrosion at either terminals or connectors, ~~or the connection resistance of these items is less than 150×10^{-6} ohms,~~ and

3. The average electrolyte temperature of 10% (60 cells total) of connected cells is above 50°F.

c. At least once per 18 months by verifying that:

1. The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration,

2. The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material,

3. ~~The resistance of each cell-to-cell and terminal connection is less than or equal to 150×10^{-6} ohms, and~~

4. The battery charger will supply at least 300 amperes at 140 volts for at least 6 hours.

replace with insert

d. At least once per 18 months, during shutdown, by verifying that the battery capacity is adequate to supply and maintain in OPERABLE status all of the actual or simulated emergency loads for the design duty cycle when the battery is subjected to a battery service test.

e. At least once per 60 months, during shutdown, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. This performance discharge test may be performed in lieu of the battery service test required by Surveillance Requirement 4.8.2.1d.

f. Annual performance discharge tests of battery capacity shall be given to any battery that shows signs of degradation or has reached 85% of the service life expected for the application. Degradation is indicated when the battery capacity drops more than 10% of rated capacity from its average on previous performance tests, or is below 90% of the manufacturer's rating.

Insert for Unit 1 and 2 TS Page 3/4.8-11:

Battery cell inter-connection resistance values are maintained at the values shown below:

Battery Inter-Connection Measurement Limits		
Battery Inter-Connection Type	Maximum Individual Inter-Connection Resistance	Maximum Average Inter-Connection Resistance [Battery Bank*]
Inter-Cell	≤ 150 x 10-6 ohms	≤ 50 x 10-6 ohms
Inter-Tier	≤ 200 x 10-6 ohms	
Inter-Rack	≤ 200 x 10-6 ohms	
Output Terminal	≤ 150 x 10-6 ohms	

* The battery bank average interconnection resistance limit is the average of all inter-cell, inter-tier, inter-rack and output terminal connection resistance measurements for all series connections in the battery string

and,

Word Processed TS

Unit 1

Page 3/4 8-11
Page 3/4 8-11a

Unit 2

Page 3/4 8-11
Page 3/4 8-11a

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 92 days and within 7 days after a battery discharge with battery terminal voltage below 110 volts, or battery overcharge with battery terminal voltage above 150 volts, by verifying that:

1. The parameters in Table 4.8-2 meet the Category B limits,

2. There is no visible corrosion at either terminals or connectors and

3. The average electrolyte temperature of 10% (60 cells total) of connected cells is above 50°F.

c. At least once per 18 months by verifying that:

1. The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration,

2. The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material,

3. Battery cell inter-connection resistance values are maintained at the values below:

Battery Inter-Connection Measurement Limits		
Battery Inter-Connection Type	Maximum Individual Inter-Connection Resistance	Maximum Average Inter-Connection Resistance [Battery Bank*]
Inter-Cell	≤ 150 x 10-6 ohms	≤ 50 x 10-6 ohms
Inter-Tier	≤ 200 x 10-6 ohms	
Inter-Rack	≤ 200 x 10-6 ohms	
Output Terminal	≤ 150 x 10-6 ohms	

* The battery bank average interconnection resistance limit is the average of all inter-cell, inter-tier, inter-rack and output terminal connection resistance measurements for all series connections in the battery string

and,

4. The battery charger will supply at least 300 amperes at 140 volts for at least 6 hours.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

d. At least once per 18 months, during shutdown, by verifying that the battery capacity is adequate to supply and maintain in OPERABLE status all of the actual or simulated emergency loads for the design duty cycle when the battery is subjected to a battery service test.

e. At least once per 60 months, during shutdown, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. This performance discharge test may be performed in lieu of the battery service test required by Surveillance Requirement 4.8.2.3.2.d.

f. Annual performance discharge tests of battery capacity shall be given to any battery that shows signs of degradation or has reached 85% of the service life expected for the application. Degradation is indicated when the battery capacity drops more than 10% of rated capacity from its average on previous performance tests, or is below 90% of the manufacturer's rating.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 92 days and within 7 days after a battery discharge with battery terminal voltage below 110 volts, or battery overcharge with battery terminal voltage above 150 volts, by verifying that:

1. The parameters in Table 4.8-2 meet the Category B limits,

2. There is no visible corrosion at either terminals or connectors, and

3. The average electrolyte temperature of 10% (60 cells total) of connected cells is above 50°F.

c. At least once per 18 months by verifying that:

1. The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration,

2. The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material,

3. Battery cell inter-connection resistance values are maintained at the values below:

Battery Inter-Connection Measurement Limits		
Battery Inter-Connection Type	Maximum Individual Inter-Connection Resistance	Maximum Average Inter-Connection Resistance [Battery Bank*]
Inter-Cell	≤ 150 x 10-6 ohms	≤ 50 x 10-6 ohms
Inter-Tier	≤ 200 x 10-6 ohms	
Inter-Rack	≤ 200 x 10-6 ohms	
Output Terminal	≤ 150 x 10-6 ohms	

*The battery bank average interconnection resistance limit is the average of all inter-cell, inter-tier, inter-rack and output terminal connection resistance measurements for all series connections in the battery string

and,

4. The battery charger will supply at least 300 amperes at 140 volts for at least 6 hours.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

d. At least once per 18 months, during shutdown, by verifying that the battery capacity is adequate to supply and maintain in OPERABLE status all of the actual or simulated emergency loads for the design duty cycle when the battery is subjected to a battery service test.

e. At least once per 60 months, during shutdown, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. This performance discharge test may be performed in lieu of the battery service test required by Surveillance Requirement 4.8.2.1d.

f. Annual performance discharge tests of battery capacity shall be given to any battery that shows signs of degradation or has reached 85% of the service life expected for the application. Degradation is indicated when the battery capacity drops more than 10% of rated capacity from its average on previous performance tests, or is below 90% of the manufacturer's rating.

Attachment 5

TS Bases Markup (Information Only)

SECTION NO.: 3/4.8 REVISION NO.: 3	TITLE: TECHNICAL SPECIFICATIONS BASES ATTACHMENT 10 OF ADM-25.04 ELECTRICAL POWER SYSTEMS ST. LUCIE UNIT 1	PAGE: 4 of 6

3/4.8 ELECTRICAL POWER SYSTEMS (continued)

BASES (continued)

TS 3.8.1.1, ACTION "b" provides an allowed outage/action completion time (AOT) of up to 14 days toto restore a single inoperable diesel generator to operable status. This AOT is based on the findings of a deterministic and probabilistic safety analysis and is referred to as a "risk-informed" AOT. Entry into this action requires that a risk assessment be performed in accordance with the Configuration Risk Management Program (CRMP), which is described in the Administrative Procedure that implements the Maintenance Rule pursuant to 10 CFR 50.65.

All EDG inoperabilities must be investigated for common-cause failures regardless of how long the EDG inoperability persists. When one diesel generator is inoperable, required ACTIONS 3.8.1.1.b and 3.8.1.1.c provide an allowance to avoid unnecessary testing of EDGs. If it can be determined that the cause of the inoperable EDG does not exist on the remaining OPERABLE EDG, then SR 4.8.1.1.2.a.4 does not have to be performed. Eight (8) hours is reasonable to confirm that the OPERABLE EDG is not affected by the same problem as the inoperable EDG. If it cannot otherwise be determined that the cause of the initial inoperable EDG does not exist on the remaining EDG, then satisfactory performance of SR 4.8.1.1.2.a.4 suffices to provide assurance of continued OPERABILITY of that EDG. If the cause of the initial inoperability exists on the remaining OPERABLE EDG, that EDG would also be declared inoperable upon discovery, and ACTION 3.8.1.1.e would be entered. Once the failure is repaired (on either EDG), the common-cause failure no longer exists.

Ambient conditions are the normal standby conditions for the diesel engines. Any normally running warmup systems should be in service and operating, and manufacturer's recommendations for engine oil and water temperatures and other parameters should be followed.

The OPERABILITY of the minimum specified A.C. and D.C. power sources and associated distribution systems during shutdown and refueling ensures that 1) the facility can be maintained in the shutdown or refueling condition for extended time periods and 2) sufficient instrumentation and control capability is available for monitoring and maintaining the facility status.

Insert

SECTION NO.: 3/4.8	TITLE: TECHNICAL SPECIFICATIONS BASES ATTACHMENT 10 OF ADM-25.04 ELECTRICAL POWER SYSTEMS ST. LUCIE UNIT 2	PAGE: 5 of 8
REVISION NO.: 3		

3/4.8 ELECTRICAL POWER SYSTEMS (continued)

BASES (continued)

3/4.8.1, 3/4.8.2 and 3/4.8.3 A.C. SOURCES, D.C. SOURCES and ONSITE POWER DISTRIBUTION SYSTEMS (continued)

The OPERABILITY of the minimum specified A.C. and D.C. power sources and associated distribution systems during shutdown and refueling ensures that 1) the facility can be maintained in the shutdown or refueling condition for extended time periods and 2) sufficient instrumentation and control capability is available for monitoring and maintaining the unit status.

Insert

4.8.1.1.2.c requires verification that the fuel oil properties of new and stored fuel oil are tested in accordance with, and maintained within the limits of the Diesel Fuel Oil Program.

The tests listed below are a means of determining whether new fuel oil is of the appropriate grade and has not been contaminated with substances that would have an immediate, detrimental impact on diesel engine combustion. If results from these tests are within acceptable limits, the fuel oil may be added to the storage tanks without concern for contaminating the entire volume of fuel oil in the storage tanks. These tests are to be conducted prior to adding the new fuel to the storage tank(s), but in no case is the time between receipt of new fuel and conducting the tests to exceed 31 days. The tests, limits, and applicable ASTM Standards are as follows:

a. Sample the new fuel oil in accordance with ASTM D4057,

b. Verify in accordance with the tests specified in ASTM D975 that the sample has an absolute specific gravity at 60/60°F of ≥ 0.83 and ≤ 0.89, or an API gravity at 60°F of ≥ 27° and ≤ 39° when tested in accordance with ASTM D1298, a kinematic viscosity at 40°C of ≥ 1.9 centistokes and ≤ 4.1 centistokes, and a flash point ≥ 125°F, and

c. Verify that the new fuel oil has a clear and bright appearance with proper color when tested in accordance with ASTM D4176 or a water and sediment content within limits when tested in accordance with ASTM D2709.

Failure to meet any of the above limits is cause for rejecting the new fuel oil, but does not represent a failure to meet the LCO concern since the fuel oil is not added to the storage tanks.

Insert:

The Surveillance Requirements for demonstrating the OPERABILTY of the DC system battery cell interconnection resistances are based on criteria recommended by the manufacturer. The table contained in TSSR 4.8.2.1.c.3 is provided to define the maximum individual and maximum average allowable values for battery cell interconnection resistances.

The maximum individual battery cell interconnection resistance values are based on the negligible impact of voltage drop and connection heating, during peak DC system load conditions. A maximum individual battery interconnection resistance value of ≤ 150 x 10-6 ohms is used for connections, which use inter-cell (bus-bar type) connections and for the battery set output terminal connections. The maximum individual battery interconnection resistance value of ≤ 200 x 10-6 ohms is used for the inter-tier and inter-rack connections, which are subject to additional resistance of the cables used to extend between the different level tiers of each battery rack and of the adjacent battery rack.

The maximum average battery cell interconnection resistance value of ≤ 50 x 10-6 ohms is the average of the interconnection resistance limit for all inter-cell, inter-tier, inter-rack and output terminals in the series-connected battery bank string. The ≤ 50 x 10-6 ohms criteria was selected in order to ensure that the battery cell interconnection voltage drop does not exceed the vendor criteria limit of less than 33.66 mV (average) for each battery cell interconnection, during the maximum design current load profile. The battery manufacturer has rated the battery bank set for full rated output, given adherence to limiting the average interconnection resistance to less than 33.66 mV drop between cells. For battery cell interconnections, which are monitored via multiple measurement points between two adjacent cells, these measurements must first be averaged for the connection between the affected adjacent cells, before averaging the values for all cells used in the full battery bank set.