



## Nebraska Public Power District

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NLS2011087  
August 31, 2011

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

**Subject:** Response to Nuclear Regulatory Commission Request for Additional Information  
Re: Non-Conservative Battery Terminal Voltage and Specific Gravity in  
Technical Specification Surveillance Requirements (TAC No. ME4974)  
Cooper Nuclear Station, Docket No. 50-298, DPR-46

- References:**
1. E-mail from Lynnea Wilkins, U. S. Nuclear Regulatory Commission, dated June 15, 2011, "Draft RAI Response to ME4974, Battery Terminal Voltages & Specific Gravities"
  2. Letter from Brian J. O'Grady, Nebraska Public Power District, to the U.S. Nuclear Regulatory Commission, dated October 29, 2010, "Non-Conservative Battery Terminal Voltage and Specific Gravity in Technical Specification Surveillance Requirements"

Dear Sir or Madam:

The purpose of this letter is for Nebraska Public Power District to submit a vendor engineering estimate requested by the Nuclear Regulatory Commission (NRC) (Reference 1). The requested information is in support of NRC's review of a license amendment request (LAR) for the Cooper Nuclear Station (CNS) facility operating license and technical specifications to correct non-conservative values of battery terminal voltage and specific gravity (Reference 2).

Provided as an enclosure to this letter is Appendix R excerpted from CNS Calculation NEDC 87-131A Revision 10 (typical of calculations NEDC 87-131B, C and D for 250 volt (v) and 125v batteries). These excerpted pages are a 1992 Memorandum with attachments from C&D Charter Power Systems to Entergy Operations, Inc. answering questions for the Waterford Unit 3 LCUN-33 type batteries, and 2009 e-mails confirming the applicability of the information to CNS LCR-25 batteries. These were used by CNS in the load and voltage studies as the engineering estimate provided by battery manufacturer C&D Charter Power System, Inc. to explain the battery de-rating of 96% to quantify the end of life performance reduction for a lead calcium type battery such as the LCR-25 D841 type used at CNS.

**COOPER NUCLEAR STATION**

P.O. Box 98 / Brownville, NE 68321-0098  
**Telephone:** (402) 825-3811 / **Fax:** (402) 825-5211  
www.nppd.com

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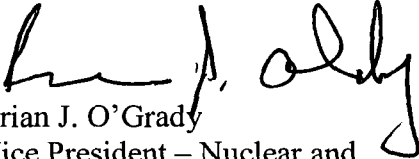
No regulatory commitments are made in this submittal. The information submitted herein does not change the conclusions or the basis of the no significant hazards consideration evaluation provided with Reference 2.

If you have any questions concerning this matter, please contact David Van Der Kamp, Licensing Manager, at (402) 825-2904.

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

Executed on 8/31/2011  
(date)

Sincerely,

  
Brian J. O'Grady  
Vice President – Nuclear and  
Chief Nuclear Officer

/em

Enclosure

cc: Regional Administrator w/ enclosure  
USNRC - Region IV

Cooper Project Manager w/ enclosure  
USNRC - NRR Project Directorate IV-1

Senior Resident Inspector w/ enclosure  
USNRC - CNS

Nebraska Health and Human Services w/ enclosure  
Department of Regulation and Licensure

NPG Distribution w/ enclosure

CNS Records w/ enclosure

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**Enclosure**

**Excerpt from NEDC 87-131A, Rev 10,  
250 VDC Division 1 Load and Voltage Study**

**Appendix R,  
Letter from G. Walker (C&D) and  
Accompanying E-Mails of 2009 Confirming Continued Applicability**



CHARTER POWER SYSTEMS, INC.

Plymouth Meeting, Pennsylvania

**TO:** John McKernan - Entergy Operations, Inc.

**FROM:** Graham Walker

**DATE:** 25 August 1992

**SUBJECT:** P.O. No. WPO47434  
Louisiana Power & Light Co.  
Waterford 3 Nuclear  
125 Volt Class 1E Batteries

**REFERENCE:** 19 August 1992 Memo  
Discharge Ratings of LCUN-33 Cells

Your questions, as presented in the referenced memo, are repeated as follows: "The LCUN-33 cells being purchased by Entergy Operations, Inc. have their discharge curves based on a temperature of 77°F and a specific gravity of 1.215. Entergy requests correction factors for all discharge curves for the following conditions:

	<u>Average of all cells</u>	<u>Lowest cell</u>
1.	1.205 sp.gr.	1.195 sp.gr.
2.	1.195 sp.gr.	1.175 sp.gr.

We also request information on any other reasons that would influence the published ratings other than temperature (per IEEE-485) and specific gravity as requested above."

**C&D Response:**

The variation in battery performance due to differences in electrolyte strength is dependant on two (2) conditions.

**Case 1:** The battery, or battery cell, is fully charged, but due to other causes has a specific gravity less than nominal.

**Case 2:** The battery, or battery cell, is partially discharged due to the charger being out of service or when system loads have exceeded the rating of the charger.

Since there is little or no test data for either Case 1 or Case 2, the following tables of performance reduction is our best engineering estimates.

28 August 1992  
John McKaman  
Page 2

**CASE 1:**

<u>Fully Charged Specific Gravity</u>	<u>Rated Performance</u>			
	<u>8 Hr.</u>	<u>4 Hr.</u>	<u>1 Hr.</u>	<u>1 Min.</u>
1.215	100%	100%	100%	100%
1.205	98%	98%	97%	97%
1.195	93%	93%	94%	95%
1.175	82%	82%	83%	85%

**CASE 2:**

<u>Specific Gravity</u>	<u>Performance Reduction</u>			
	<u>8 Hr.</u>	<u>4 Hr.</u>	<u>1 Hr.</u>	<u>1 Min.</u>
1.215	100%	100%	100%	100%
1.205	82%	82%	82%	82%
1.195	85%	86%	88%	88%
1.175	70%	70%	70%	70%

In response to the second part of your question, there are several conditions (other than temperature) that impact battery performance, or more accurately, battery terminal voltage.

- 1) High resistance connections between battery cells
- 2) Long cable runs between battery racks
- 3) Battery age and plate condition (i.e., loss of active material due to shedding and/or positive plate grid growth/corrosion)
- 4) Insufficient charging current/voltage resulting in sulfated plates
- 5) Electrolyte level below the low level indicator (typically this condition will impact performance for discharges one hour and longer)

I trust the above is clear and concise. If you have any questions, please do not hesitate to call me.



Graham Walker  
Manager, Applications Engineering  
C&D Charter Power Systems, Inc.

Proprietary Drawing Removed

**Gocek, Steve W.**

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**From:** Archer, Phyllis [PArcher@cdtechno.com]  
**Sent:** Friday, July 24, 2009 1:47 PM  
**To:** Van Winkle, Marshall B.  
**Cc:** Gocek, Steve W.; Bysfield, G. A.; Rexroad, Raymond A.; Dickerson, Matthew J.; Carson, Larry; Williamson, Al; Floyd, Kyle D.  
**Subject:** Letter from Graham Walker to John McKema of Entergy dated 25 August 1992

Hello,

This is to confirm that the values given in table for Case 1 of the subject letter can be applied to the LCR-25.

Case 1 values are for a fully charged battery or battery cell where for some unspecified reason the specific gravity is less than normal.

Note that the same caveat applies, i.e. there is little or no data so the performance reduction is based on our best engineering judgment.

Regards,

Phyllis Archer

Applications Engineer  
C&D Technologies, Inc

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**From:** Van Winkle, Marshall B. [mailto:mbvanwi@nppd.com]  
**Sent:** Wednesday, July 15, 2009 2:13 PM  
**To:** Archer, Phyllis  
**Cc:** Gocek, Steve W.; Bysfield, G. A.; Rexroad, Raymond A.; Dickerson, Matthew J.  
**Subject:** RE: Battery Specific Gravity Question

We obtained a letter from Graham that describes the relationship between battery performance and specific gravity for the LCUN-33. Does this also apply to the LCR-25? See attached. Also, can I deduce that the specific gravity values in the tables are based on electrolyte level at the low level indicator? It would seem so based on bullet 5) in the letter.

**Marshall Van Winkle**  
Electrical Design Engineering Supervisor  
Cooper Nuclear Station  
72676 648A Avenue  
Brownville, NE 68321  
ph: (402) 825-2906  
fax: (402) 825-5099

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**From:** Archer, Phyllis [mailto:PArcher@cdtechno.com]  
**Sent:** Tuesday, July 14, 2009 4:32 PM  
**To:** Gocek, Steve W.  
**Cc:** Van Winkle, Marshall B.; Carson, Larry  
**Subject:** RE: Battery Specific Gravity Question

Hello,

Specific gravity does not decrease as a function of battery age so ,I think, there are two main reasons why the battery would possibly be at 1.190, or 1.195 average specific gravity.

The first is that the electrolyte has been removed and replaced with water—in which case the sp. gr. should be adjusted. The second is that the battery is either discharging or recharging. If recharging ,the gravity will lag behind the state of charge and is not indicative of battery capacity until fully mixed.

I am not sure what condition you are trying to address.

Regards,

Phyllis Archer

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**From:** Gocek, Steve W. [mailto:swgocek@nppd.com]  
**Sent:** Tuesday, July 14, 2009 4:45 PM  
**To:** Archer, Phyllis  
**Cc:** Van Winkle, Marshall B.  
**Subject:** Battery Specific Gravity Question

Ms. Archer,

I was part of the group that spoke with you earlier this afternoon on specific gravity ratings.

One possible way to evaluate the lower than nominal specific gravity question may be the following:

Is it possible to conclude?

- An electrolyte level is at or above the Min Level for the battery, with a specific gravity of 0.020 less than rated (allow by our Tech Specs). The volume of acid present in the electrolyte is greater than or equal to an electrolyte level above the top of the plates at nominal specific gravity?
- If you could conclude the above, would the battery still perform as depicted by the battery curve?

Steven W. Gocek  
Electrical Design Engineer  
Design Engineering Department  
72676 648A Avenue  
Brownville, NE 68321  
☎ (402) 825-5021  
☎ (402) 825-5099  
✉ [swgocek@nppd.com](mailto:swgocek@nppd.com)



Correspondence Number: NLS2011087

The following table identifies those actions committed to by Nebraska Public Power District (NPPD) in this document. Any other actions discussed in the submittal represent intended or planned actions by NPPD. They are described for information only and are not regulatory commitments. Please notify the Licensing Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITMENT NUMBER	COMMITTED DATE OR OUTAGE
None		