**Docket Optical System - Comments for Docket No. 08-AAER-1B**

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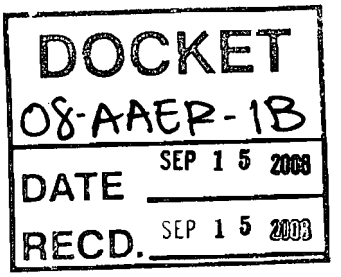
**To:** <Docket@energy.state.ca.us>
**Date:** 9/15/2008 1:05 PM
**Subject:** Comments for Docket No. 08-AAER-1B
**CC:** "Ayrton, George" <George.Ayrton@enersys.com>, "Munton, Steve" <Steve.Munton@enersys.com>, "Swavely, Shawn" <Shawn.Swavely@enersys.com>, "Beck, Daniel" <Daniel.Beck@enersys.com>
**Attachments:** Energy Efficiency Battery Charger System Test ProcedureV2.1.4_FinalResponse 9-15-08.doc

California Energy Commission
Docket No. 08-AAER-1B
Docket Unit
1516 Ninth Street, Mail Station 4
Sacramento, California 95814-5504




Dear Sirs:

EnerSys, a manufacturer of industrial battery and charger systems for use in fork lift trucks, airport ground support equipment, and mining equipment, would like to submit the attached comments for consideration related to Documents Incorporated by Reference, ECOS Consulting, Energy Efficiency Battery Charger System Test Procedure, Version 2.1.4, August 1, 2008.

Although the Proposed Amendments to the Appliance Efficiency Regulations (Express Terms), Section 1602 Definitions, (w) Battery Charger Systems do not appear to address non-consumer grade battery and charger systems, the proposed Test Procedure referenced above directly cites test methods for "lift Trucks (forklifts) and airport electric ground support equipment (EGSE). Therefore, EnerSys would like to provide comments relating to the test procedures for your consideration.

Thank you.

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**PROPOSED AMENDMENTS TO**
**APPLIANCE EFFICIENCY REGULATIONS**
**(EXPRESS TERMS)**
**CALIFORNIA CODE OF REGULATIONS, TITLE 20,**
**SECTIONS 1601 THROUGH 1608**
**August 29, 2008**
**2008 Appliance Efficiency Rulemaking, Phase I, Part B**
**Docket Number 08-AAER-1B**
**45-DAY LANGUAGE**
**Publication Number CEC-400-2008-021 45 DAY**

**Comments related to Documents Incorporated by Reference, ECOS Consulting, Energy Efficiency Battery Charger System Test Procedure Version 2.1.4, August 1, 2008.**

**References (Page 3)**

- Battery Council International, *Standard for Deep Cycle Fast/Battery Chargers*, BCIS-18 Rev. 2006-04 was not sited as a reference. We recommend reviewing this document which includes industry accepted standards on industrial charger efficiency.

**Definitions (Page 6)**

- The definition refers to the "rated charge capacity of the battery". Charge capacity of batteries is not an accurate description of the battery's capacity rating and will lead to confusion due to the use of Charge in many different contexts in the document. A battery is rated according to the amount of amperes over a standard number of hours. We suggest the term "charge capacity" be replaced with "rated capacity". This change should be implemented throughout the document wherever "charge capacity" is referred to in relation to the battery's rated capacity.}
- We are concerned that the example used to explain how to determine C rate may lead the reader to conclude that "one –C" is the accepted or common discharge batteries. Also, the definition given in the Definitions section conflict with the use of the C rate under III Test Procedure Part 2, C, 1), which includes references to discharge rates of "$C_6/6$ for lift truck batteries and $C_5/5$ for golf cart-type batteries". We recommend using the industry accepted standard for depicting the charge and discharge rates of batteries by placing the charge rating before the "C" and indicating the discharge rating by using a subscript after the "C". thus a charge rate of 20% with a discharge rating of 6 hours would be written "$0.2C_6$". We also recommend using this example and not the "one-C" currently used to explain the determination of C rate in the Definitions.

- S. Equalization

- The use of the word "optimum" can imply many different conditions. We suggest the word "optimum" be replaced by "normal" or "full".

- X. Measured Capacity **(Page 7)**
  - Please include the acronym AH to refer to ampere-hours. This is an industry accepted acronym and should be used throughout this document.

- II. Rated Energy Capacity **(Page 8)**
  - The definition indicates the use of a "rated battery voltage". Using the rated battery voltage will give an inflated energy capacity rating for the battery because over the course of battery discharge, the voltage can range from 2.11 volts per cell to 1.7 volts per cell when fully discharged. The rated voltage for a Lead Acid battery is 2 volts per cell. Since the voltage is below the rated voltage for most of a discharge and varies greatly depending on discharge rate and time duration the rated capacity is usually given in terms of average discharge voltage for the rate.

**Part 2:**

**I.) Standard Test Conditions (Page 24)**

- A. Measuring Equipment
  - #1 Please clarify the term "cycle" used in this reference. Does this mean 128 samples per frequency cycle or a charging cycle?

**III.) Test Procedure: Part 2 (Page 27)**

- B. Test Data **(Page 27)**
  - Battery Data – we recommend taking specific gravity readings at start and finish of discharge. This will confirm the state of charge of the battery prior to beginning the recharge cycle.
- C. Battery Discharge/Recharge Sequence **(Page 27)**
  - A fully discharged (100% DOD) is not a recommended practice by any battery manufacturer and is not a common practice. Discharging a battery to 100% DOD on a consistent basis will quickly cause irreversible damage to the battery and significantly shorten the cycle life of the battery. Discharging to final voltage will also add inconsistency to the results because the battery condition will be more of a factor on the results since the AH's removed during the discharge will be different. IN order to provide practicle results from this test standard, we recommend using 20%, 50% and 80% for the three levels of battery discharge. Using these levels will assure that every test has the same AH's removed prior to recharge ~~also significantly reduce the testing time~~

~~required to recharge the battery,~~ and preserve the test battery in good condition throughout the entire testing term.

- 1) Battery Discharge **(Page 28)**
  - The use of the terminology "measured battery capacity" is inconsistent with the terminology used in the definitions section of this document and incorrect. It should be 40% of rated capacity since it should be based on rating not measured. We recommend for both bullets within this section, "measured charge capacity" should be replaced with the previously defined "~~measured~~ Rated capacity". ~~Aslo~~ Also, the bullets indicate the battery voltage readings can be determined by "voltage reading on the vehicle gauge". Since the test procedures under C(1) Battery Discharge indicate the use of a battery cycler or load bank, the use of a vehicle gauge is not practical or consistent.
- 2) Battery Recharge **(Page 28)**
  - By defining the precise intervals of 5 minutes, one hour , three hours and five hours for recording the AC and DC power, power factor, current THD, and voltage THD, a manufacturer could develop charge firmware that could change the charge power during these intervals and artificially improve the results for their charger. Also, some chargers will emit a higher DC charge pulse lasting milliseconds throughout the charge cycle. These pulses are used for diagonostic purposes and improve the charger's energy efficiency by limiting the overcharging of batteries. If a reading is taken coincident with this DC pulse, ~~an~~ high DC KW data point will be measured which will result in a poor power conversion efficiency based on the given definition of Power Conversion Efficiency provided earlier in this document. We recommend taking these readings at one minute intervals during the entire charge cycle. This will allow for a more relevant "average" power conversion efficiency, power factor, and THD, which has much more impact on the end-users electric bill.
  - Measurement of DC current below 2% of the battery's rated capacity to verify a complete recharge is not realistic. Many charge algorithms will stop charging prior to this level of DC current output.

**IV.) Reporting Requirements (Page 29)**

- A.) Task List **(Page 29)**
  - For reasons provided in our comments under Part 2, Section III, 2) above, we recommend using average conversion efficiency.
- C.) Charging Parameters **(Page 29)**
  - Power Conversion Efficiency
    - The statement "In general, the power conversion efficiency should be relatively constant throughout the charge" is incorrect. We have demonstrated in all technologies used in

industrial applications that conversion efficiencies across the charge cycle can vary by 10 points or more.

- Power Factor
  - Power Factor definition is inconsistent with definition of Power Factor under Definitions.