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California Energy Commission
Dockets Office, MS-4
Re: Docket No. 09-AAER-2
1516 Ninth Street
Sacramento, CA 95814-5512
docket@energy.state.ca.us

RE: Written comments to the 2011 Appliance Efficiency Rulemaking Proposed Efficiency Standards for Battery Chargers and Lighting Controls, Phase 2
Docket #09-AAER-2

Dear Sirs:

Thank you for the opportunity to comment on the Draft Staff Report (Staff Analysis of Battery Charger Standards) issued by the California Energy Commission on February 22nd, 2011, and discussed during the Staff Workshop held on March 3, 2011.

EnerSys is the world's largest industrial battery and charger manufacturer offering a broad line of batteries and chargers for electric lift trucks, mining, railroad, and airport ground support equipment. Our EnForcer line of industrial chargers is the market share leader in the markets we serve throughout North America. This line of industrial chargers includes charging technologies such as Ferro-resonant, silicon controlled rectifier (SCR), high frequency insulated gate bipolar transistor (IGBT) and metal-oxide–semiconductor field effect transistor (MOSFET), as well as application specific products to charge lead acid batteries in standard, opportunity, and fast charge applications.

Due to the limited time provided by the Commission to provide an in-depth and more detailed written response to the Draft Staff Report, EnerSys is providing a general response. We anticipate a more detailed response during the pending 45-day review period upon notice of the proposed permanent regulations. Our comments are mainly related to "large battery chargers" as defined in the Staff Report as "those which draw peak power of 2 kW or more"; however our product lines include chargers that would fall in the "small battery charger" definition.

The first observation is referenced throughout the Staff Report, and is used to argue against many commenters' suggestion that the Commission delay the adoption of state efficiency standards until the Environmental Protection Agency has completed its

revision of Version 1.0 ENERGY STAR® specification for Battery Charging Systems (BCS). Page 8 of the draft report states:

"Energy Commission staff considered the ENERGY STAR specification as a potential model for California standards but concluded that it does not take advantage of a large portion of the potential energy savings due to its limited scope in both covered products and in covered modes of operation".

In an announcement made on March 9, 2010, and later updated in a letter dated October 27, 2010, the EPA outlined four goals for the revised ENERGY STAR specification, including:

- Expand the scope of products covered: EPA intends to expand the scope of the battery charger specification to include large battery chargers for industrial as well as golf car applications.
- Address active/charge mode: EPA intends to evaluate the performance of battery chargers in active mode.
- Work closely with DOE on coordinated Federal test procedure: EPA is following the DOE battery charger test procedure rulemaking and intends to reference the test procedure for testing of small battery chargers when it is finalized. EPA intends to reference Part 2 of the CEC test procedure for testing large (industrial) chargers.

EnerSys would argue that based on the EPA's statement, the scope of the EPA ENERGY STAR specification revisions will include both "consumer and non-consumer" battery chargers. Also, since the EPA's stated goals recommend referencing the same test procedure adopted by the Commission on December 3, 2008, it would appear the EPA ENERGY STAR specifications will likely be consistent with the regulated metrics (24 hour, maintenance, power factor, and no battery mode) and product categories as proposed by the Commission staff. EPA's timeline (as revised in a letter dated October 27, 2010) is to issue Final Draft specifications within 4 weeks of release of DOE NOPR, and issue Final specification within 1 week of DOE final rule. Commission staff in this Staff Report estimates the by July of 2011, the DOE regulatory proposals will be available. An interesting difference between the direction of the Commission and the EPA standard development is the testing verification process proposed by the Commission would not require third-party certification, while the EPA would require third-party testing. Therefore, the development of a parallel set of rulemakings at the state and federal level with essentially the same timeline for the same products appears to not only be a inefficient use of the Commission's resources, but could add to the complexity to the ability of manufacturer to comply with certification requirements and timelines.

Another point of concern with the Proposed Regulations in the Staff Report is the undefined level of product testing that will be required. The Energy Efficiency Battery Charger System Test Procedure V2.2 Part 2, Section II B indicates:

"If the charger is capable of charging a range of battery sizes, test both the highest and lowest capacity values, as well as the highest and lowest voltage levels for the battery, if applicable. If the charger has multiple charging profile options, each charging profile shall be tested. This means if the charger is capable of charging multiple battery capacities for each charge profile, each profile shall be tested with both the highest and lowest battery capacities, as well as the highest and lowest voltage levels for the battery if applicable".

This would require, for each of the 36 models in the EnerSys three phase SCR model line, 8 test routines to cover the low and high DC voltage levels, the low and high battery capacity levels for each voltage level, and the VRLA and flooded profiles for each capacity level. Each test routine requires a "Discharge/Recharge Sequences" (estimated 2 days), and a "Battery Maintenance Charge Test" including a 72 hour duration test (estimated 3 days). The result is 40 days of testing for each model (5 days/test routine, 8 test routines), resulting in 288 days of testing for the EnerSys SCR product line alone. This time estimate does not consider the "Battery Conditioning" as required by the testing procedure when a battery has not been used in testing within 24 hours (estimated 2 days). We have 51 Ferro-resonant models, and 40 high frequency models. Assuming we had the internal capability to continuously and simultaneously run this type of testing routines, the time, resources, and cost would be prohibitive. At the very least, these costs would have to be recovered through pricing action.

EnerSys would like the Commission to consider adopting testing requirement based on "Product Families" that would allow for the testing of a "typical" power configuration within each product family of chargers. A typical configuration would represent a model with high volume sales which contains the same base components found within the product family it represents. Therefore, instead of 288 days of testing for our SCR line in the example above, 40 days of testing would be required.

Another point of concern is the Large Charger Proposed Regulation metrics outlined on Table 3 in the Staff Report, and the Small Charger Proposed Regulation metrics outlined on Table 4. In the report, Staff provides a chart (Figure 1) to support the feasibility of the proposed metrics, contending "battery chargers on the market today already meet the proposed standards". However, as will be explained below, meeting the proposed standards will have offsetting, detrimental impacts on the lead acid battery, and for that reason, some industrial chargers sold today are not acceptable to charge EnerSys batteries.

Charge Return Factor (Crf)

This metric does not take into consideration the impact the limitation on overcharge has on the condition of the battery. The reason for overcharge in a flooded lead acid battery is to prevent the stratification of the electrolyte in the cell by introducing "gassing" which effectively mixes the electrolyte resulting in a homogonous specific gravity through out the cell upon charge completion. When the electrolyte remains stratified, battery cycle life will suffer due to sulfation of the bottom of the plate and electrical shorts at the top of the plate. Both sulfation and electrical shorts are two of the main failure causes identified

in applications that neglect completely re-charging the battery. This situation is exaggerated with higher electrolyte specific gravities found in higher performance lead acid batteries. Due to the additional "weight" of the higher gravity electrolyte, it takes more recharge time to properly mix the electrolyte to avoid stratification issues. EnerSys believes the Tier 1 maximum Crf metric of 1.15 Crf for 100% and 80% DoD and 1.20 Crf for 40% DoD batteries is acceptable, but the Tier 2 maximum Crf levels of 1.10 and 1.15 respectively will lead to short life battery issues due to sulfation. We also note that V2.2 of the test procedure (part 2) does not consider an equalization charge in the calculation of the Crf, manufacturers could meet Tier 2 Crf metrics and apply an equalize charge after every complete charge to prevent stratification. However, this practice would be contrary to the intent of the Commission's proposed standards to reduce energy use.

Power Factor
We continue to investigate our ability to meet this metric, but initial evaluation suggests the cost to achieve the tier 2 metric with our current high frequency chargers (0.92 power factors) will be hundreds of dollars. The benefit of increasing the power factor to meet the regulated value of 0.95 would require complete redesign of our current charger and would not significantly reduce the amount of energy losses associated. We question whether the additional cost to raise the power factor 3 points is worth the cost. This requirement will eliminate SCR and Ferro-resonant chargers from the California market.

Maintenance Power
In order to meet the tier 2 metric for maintenance power the charger will need to be completely isolated from the AC power circuit. This could result in batteries being subject to self discharge issues especially in seasonal or cyclical operations when there is significant down time between usage cycles.

No battery Power
In order to meet the tier 2 metric, the charger will need to be completely isolated from the AC power circuit. This will be an issue in large battery changing systems when a system operator selects fully charged batteries to replace a spent battery in a lift truck. Typically, the changing system operator depends on the display to indicate when a battery is ready to use.

Some charger models within a product family will fall under the definition of Small Charger. Small Chargers are subject to significantly lower maximum power thresholds for Maintenance Power and No Battery Power than Large Chargers. Since the chargers in a family share many of the same design components that impact power use in Maintenance or No Battery modes, the smaller chargers within a family would either determine the maximum thresholds of power allowable in Maintenance or No Battery mode for the entire product family, or the smaller charger models would be dropped due to the considerable redesign effort required to meet the lower power thresholds for these low volume units. We suggest that consideration be given that would allow Small Charger models within a family of chargers dominated by Large Chargers to use the Large Charger standards for Maintenance and No Power modes.

Finally, over the past several years since ENS has introduced energy efficient high frequency charger within our North American markets, we have seen a very quick transition to the more efficient models. Market forces have proven effective in increasing the number of higher efficiency HF chargers sold over the past 5 years which currently exceed 70% of our three phase charger units sold. Given relatively high electricity rates, a higher proportion of HF charger unit sales are expected in California. The position of EnerSys is that market forces are already dictating the rapid acceptance of high efficiency industrial chargers, and therefore any further regulation for large industrial chargers as proposed in this Staff Report is unnecessary and would only lead to higher product costs.

Sincerely,

Stephen Spaar
Americas Marketing Director
EnerSys