Codes and Standards Enhancement (CASE) Initiative For PY2011: Title 20 Standards Development

Title:

Comment Letter in Response
To October 7, 2011 45-day language
For Battery Charger System Energy Efficiency Standards
(Docket Number Docket 09-AAER-2)

Prepared for:

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November 21, 2011

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California Energy Commission
Dockets Office, MS-4
1516 Ninth Street, MS-25
Sacramento, CA 95814-5512

November 21, 2011

RE: Battery Charger System Energy Efficiency Standards (Docket Number Docket 09-AAER-2)

Dear Commissioners:

California's investor-owned utilities (IOUs) strongly support the California Energy Commission's (CEC) battery charger systems standards proposed in the 45-day language. This opportunity to make many battery-using plug loads more efficient, could save Californians more than 2 billion kWh per year and reduce electricity bills by $300 million per year once the measure is fully implemented.[1]

The IOUs have no suggested changes to the 45-day language proposed by the CEC, but would like to respond to a number of stakeholder concerns expressed in the written comments and at the hearing on October 24, 2011.

1. STAKEHOLDER CONCERN: The CEC should not proceed because the U.S. Department of Energy (DOE) already plans to create a mandatory standard for battery chargers.

IOU RESPONSE: Californians will see many benefits from moving forward with a battery charger standard ahead of the DOE.

The DOE does plan to require the improved efficiency of consumer battery chargers, but California will see many benefits moving forward with the CEC's proposed standard ahead of the U.S. federal standard. If the DOE adopts a similar level of stringency for consumer chargers, energy savings for Californians will not decrease after federal standard adoption. In addition, every year of compliant consumer battery charger sales in California before the federal standard compliance date will save energy for Californians that would not be possible under the federal standard alone. One year of consumer sales could reduce energy consumption by approximately 300 million kWh during the first year of operation of the battery charger systems sold. This first year of consumer sales would save 2 billion kWh over the lifetime of the chargers, reducing lifetime electric utility bills for consumers by a total of $300 million. Lastly, industrial and commercial battery chargers are not included in DOE's measure, and are expected to provide

[1] Annual savings for consumer products are subject to change after compliance date of DOE battery charger regulations. If DOE adopts a standard with a similar level of stringency to the CEC, this level of annual savings would be retained.

continuous savings to California businesses of about $50 million per year on their electric bills, reducing state energy consumption by 400 million kWh per year.

2. STAKEHOLDER CONCERN: Current uninterruptible power supply (UPS) systems cannot meet the standard because of under-voltage correction function and other functions found in standby UPSs.

IOU RESPONSE: The under-voltage function can be switched off and extra UPS functions can be in standby for the testing, making compliance under the current proposed language feasible.

IOU research suggests that the UPS under-voltage function is a relatively uncommon feature for standby UPSs, as it adds extra cost to consumers. Although not common practice now, the under-voltage function can be designed to be turned off with a switch. This would ensure that the energy use associated with this extra functionality would not be counted as part of the test for battery charger efficiency and the standby UPSs could meet the requirements proposed.

In an IOU survey of standby UPS products, only the following "extra functions" were shown to be found: USB interface, RS232 interface, LED status interface, and building wiring fault detection circuitry. There are solutions to reducing the power use of many of these functions. The on-off switch that is used to control the output of the UPS can also be used to control power to most of these functions, either directly, by powering these functions from the UPS output, or indirectly through the use of simple FET switching of the DC power to these functions. The building wiring fault detection circuitry can remain connected to the incoming line without drawing significant power. The levels that are presented in the standard are meant to accommodate standby levels of other non-battery charger functions. Many other products have additional functions and can still meet the proposed limits.

3. STAKEHOLDER CONCERN: The compliance timeframe should be extended for consumer products that currently have low compliance rates with the proposed standard.

IOU RESPONSE: Manufacturers have been given significant time to anticipate and plan for design changes associated with the battery charger efficiency standard. Incremental costs associated with redesign and testing are low on a per-product basis, making compliance very cost-effective for Californians.

As reviewed on slide five of the IOU presentation given in the March 3, 2011 CEC workshop on Title 20 battery charger systems, manufacturers have had significant opportunity to anticipate needed design changes to their battery charger systems and make plans to enable product compliance:

- Since 2003, there has been significant outreach to manufacturers through trade press and industry conferences.
- The DOE was required to consider energy efficiency standards for consumer chargers in the Energy and Policy Act of 2005, and has had active rulemaking proceedings to develop the test procedure and standard since 2006.
- The CEC, which completed a rule on the battery charger test procedure in 2008, and had its first standards workshop one year ago in October 2010.

The research, test procedure, and policy effort, which has been supported by the California PIER program and the IOUs of California, has been underway with significant stakeholder engagement for nearly a decade. Therefore, manufacturers have had time to anticipate and plan for the needed design changes to enable compliance with the standard.

In addition, many products covered by the standard, like the standby UPS products have very similar topology and the same types of redesign technologies could apply across the significant portions of the product lines. Because consumer products are sold in large numbers, even with additional cost associated with redesign and testing, the per-product incremental cost would be low, making compliance for this category of products cost-effective.

4. STAKEHOLDER CONCERN: Small mobile computer systems should have less stringent requirements for low power mode and active mode due to extra functions in off mode.

IOU RESPONSE: The IOU technical team can find no evidence that extra functions in small mobile computing systems use significant power. A less stringent level for small computer systems is not warranted.

The IOU technical team has found no evidence that the extra functions described for less than 50 Wh battery size mobile computing systems outlined by ITI in its comments need significant power during the course of the battery charger test. All of the November 2011 IOU measurements of six newly-released small computer systems meet the low power mode requirements in the 45-day language (Table 1 below).

Computer Type	Battery Capacity (Wh)	Measured maintenance plus no battery (W)	45-day language level required (1 + 0.0021*E_b) (W)	Percent below proposed standard
Slate	26	0.46	1.06	57%
Netbook	27	0.76	1.06	28%
Laptop (tablet)	44	0.55	1.09	51%
Laptop	55	0.53	1.12	52%
Laptop	63	0.82	1.13	27%
Laptop	66	0.51	1.14	56%

Table 1. Maintenance plus no battery values for six newly released computing devices less than 50 Wh and slightly above. All the products tested meet the proposed 45-day language by a significant margin. All testing was conducted in November 2011.

The team examined data from three other laptop 24-hour charge cycles and in no case were the devices seen to “wake up, manage the battery, or conduct auxiliary functions” as claimed by ITI in its written comments. Figure 1 is a 24-hour test of a 2010 netbook. This test is indicative of laptop and netbook behavior observed generally in review of the 24 hour battery charge and maintenance data.

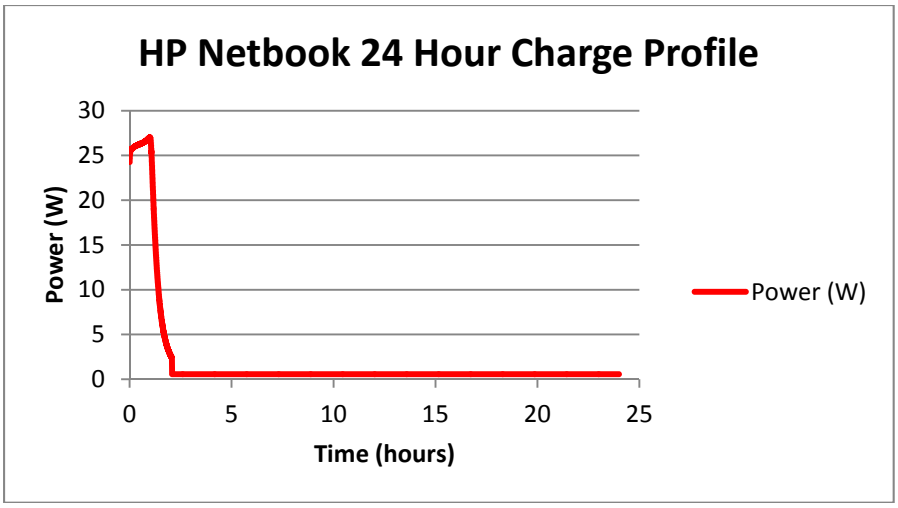

Figure 1. This 2010 netbook passes the 24 hour requirement presented in CEC 45-day language, and was not seen to "wake up, manage the battery, or conduct auxiliary functions." No behavior of this type was observed.

This most recent data collection effort and additional analysis confirms the conclusion presented by the IOUs in the original CASE report[2], and supports the adoption of the current 45-day language. The IOUs have also analyzed publically available data, including data published on manufacturers' websites, which further suggests that a significant portion of available products currently meet the levels proposed in the 45-day language. Unfortunately, the data shared by ITI in its comments include computer systems that go back to 2008, so the distribution of power in low power modes is not representative of the current technology and market, and may be misleading. Note in the data set shown by ITI that a number of products do meet the Lot 6 EuP requirements set for January 1, 2013, suggesting that the 45-day language levels are feasible for the newest generation of products currently being sold.

5. STAKEHOLDER CONCERN: Marking requirements should be changed or dropped because of extra burden on manufacturers, redundancy with other consumer marks, and the possibility of preemption by the DOE.

IOU RESPONSE: The proposed mark has significant value for the purposes of compliance, and follows the precedent set by the external power supply mark originally spearheaded by the CEC.

The mark is intended to help support compliance, not influence consumer behavior and is therefore not redundant to have it in place with other consumer-focused marks. A mark that indicates compliance helps third-party stakeholders and the CEC easily identify non-compliant products. CEC led the way to create an international mark for external power supplies, and it is now adopted world-wide and referenced by multiple jurisdictions. Given this precedent, and the possibility associated with a similar international scheme for battery chargers, DOE is likely to consider the advantages of the mark and possibly adopt it as well.

[2] Original data included 5 laptops and 2 netbooks.

6. STAKEHOLDER CONCERN: USB devices should be given extra allowance because they are inherently less efficient and cannot meet the standard.

IOU RESPONSE: 5 volt USB chargers intended to be used solely with USB port power sources are subjected to a less stringent standard than battery chargers intended for use with a wall outlet.

Under the proposed 45-day language, devices that are solely intended to be charged using the USB 5 volt standard need to meet the same efficiency requirements as wall-plug power source devices. However, it is easier for them to meet the standard because losses associated with converting wall-plug voltage alternating current (ac) to lower voltage direct current (dc) are not included in the measurement of the product. These losses are incurred by the power source providing the USB power. If voltage reductions are needed to reduce 5 volts dc to an even lower voltage, then the losses are small compared to the losses that would be associated with dropping to a low voltage from the wall plug ac source.

7. STAKEHOLDER CONCERN: Emergency egress lighting and other battery backup lighting applications should be exempted from the standard due to life-safety concerns and lack of data.

IOU RESPONSE: This battery charger end use has been studied by the IOU technical team, and should remain in the scope of the 45-day language proposal.

A typical egress lighting system consists of a battery charger, a battery, DC lamps, and a load transfer circuit to connect the lamps to the battery when the power fails. The load transfer circuit, which is unique to battery-back-up type applications such as UPSs and emergency egress lighting systems, can be a transistor that is turned on when the incoming power fails. The load transfer circuitry consists of two parts, power sensing and load switching. The load switching circuit draws 0.011 W and a well-designed power sensing circuit draws 0.015 W or less, giving a total of 0.025 W draw for the load transfer circuitry unique to this battery charger product (Figure 2).

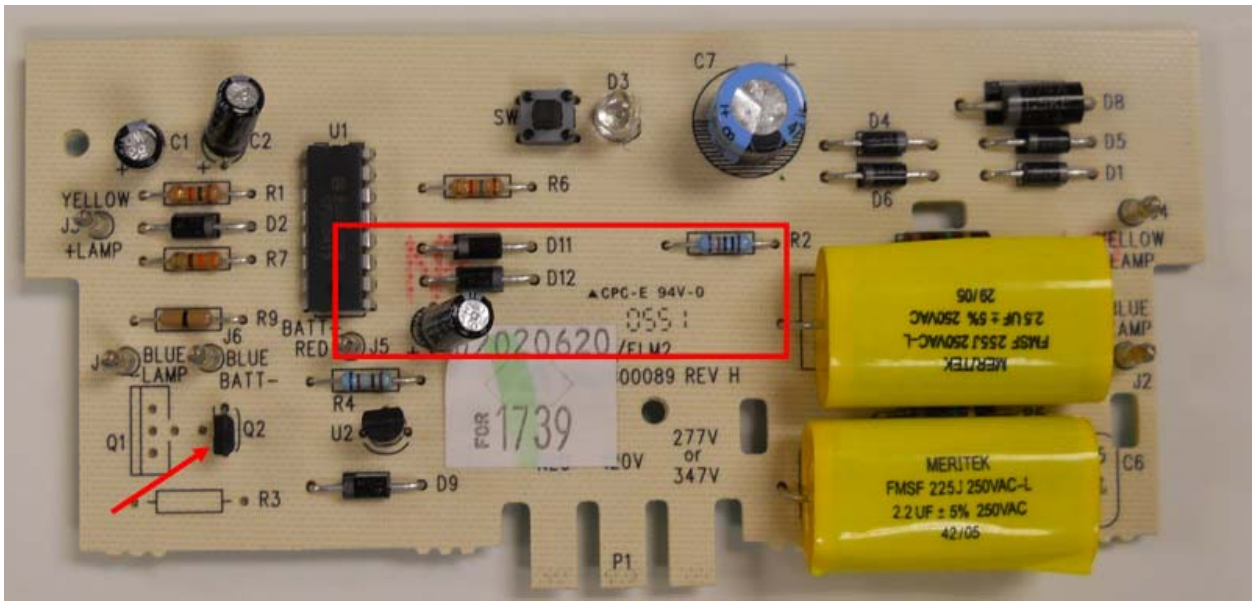

Figure 2. The circuit board shown is from a typical egress lighting unit. The parts of the circuit that are involved in detecting power failure are outlined in red, and the arrow points to the transistor that connects the lamps to the battery. This type of circuit is unique to battery-backup type applications, and draws no more than 0.025 W when the lamps are off.

As part of the pre-rulemaking process, the IOUs provided full efficiency test data on one emergency egress system, and examined the design and application of two others. From the test and examinations, the IOU technical team concluded that the topologies and technologies were very similar to other battery charger systems also covered by the scope of the proposed standard. Technologies found in other non-emergency egress markets were transferable to these systems. Solutions to reduce battery maintenance power are available from many component suppliers. (See "Designing Battery Charger Systems for Improved Energy Efficiency A Technical Primer.")

For example, our evaluation of an emergency egress lighting unit revealed it uses a very elementary, low efficiency, linear power supply design in its charger. Of the 1.5 W of fixed electric losses for this unit, over 1.1 W is dissipated in a single component[3] that is part of ac-dc power conversion. Figure 3 illustrates this visually. Replacing this linear ac-dc power supply with readily-available switch mode technology would cost effectively reduce the losses incurred during operation of battery maintenance mode, the primary mode for this system.

[3] Zener diode

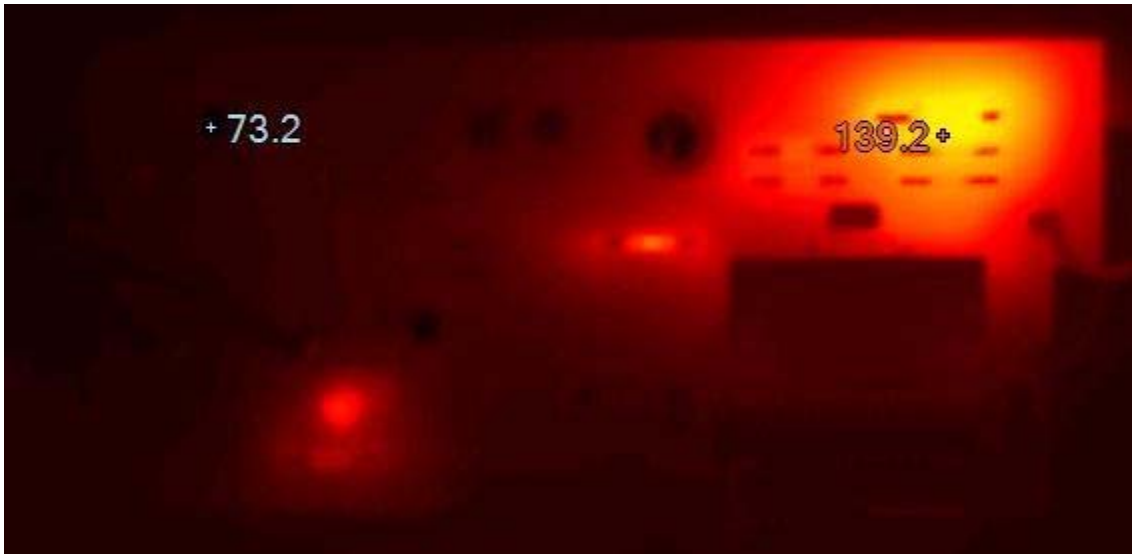

Figure 3. This thermal infrared photo illustrates the heat generated by the inefficient ac-dc power supply (bright yellow spot in the upper right corner). The numbers on the photo are the Fahrenheit surface temperature. The load transfer burden of 0.025 W is quite small compared to the inefficiency of the simple linear supply in this product.

Unlike most lighting applications used in California, the majority of the energy consumed for egress lighting is to charge the battery, which is used in the event of a power outage to enable safe building exit. This standard does not impact the type, amount, or quality of the light used with emergency egress applications, and instead only ensures that the battery used to power the light in the event of an outage is maintained in an efficient way. Given the high levels of battery maintenance power that we observe today, and the 24 hour nature of the duty cycle for these products, silicon charge control solutions are more than cost effective. The savings associated with this product is estimated to be 37 GWh per year in California. These products will be allowed 5 years to comply, giving manufacturers of these important life-safety devices significant time to redesign products.

8. STAKEHOLDER CONCERN: "Loosely coupled inductive" pad chargers are not yet commercially available, so the CEC could not have studied them and they should be exempted.

IOU RESPONSE: The IOU technical team has studied pad chargers, including loosely coupled pad chargers, and recommend that they be included in the scope of the standard as proposed in the 45-day language (slide 18 in the IOU March 3, 2011 presentation).

Chargers that enable consumers to set a mobile device down on a pad for recharging, rather than using a plug-in cord are available in the market today as aftermarket devices for mobile devices, such as cell phones. Two different technical solutions have been offered to pad charging: "loosely coupled inductive" and direct conductive contact (see Figure 4).

Figure 4: On the left, a "loosely couple inductive" pad charging solution. On the right, is a direct conductive contact pad charging solution.

The IOU consultant team studied both of these types of technical solutions to pad charging by purchasing and evaluating current products. We concluded that the proposed battery charger standard would not limit the pad charging functionality, especially since inductive coupling was not required to deliver the pad charger functionality.

Inductive pad chargers are in contrast with tightly coupled inductive chargers used with cordless toothbrushes that must ensure safety in a wet environment (such as a bathroom). As a result, the IOU team supports the special standard for these products, where safety is an important consideration and there are no other technical solutions. The 45-day standard language will enable technological innovation to continue, while ensuring that efficiency is considered in design and implementation of the pad charging technology.

9. STAKEHOLDER CONCERN: Patents for automotive chargers would limit the ability of manufacturers to meet the standard without licensing.

IOU RESPONSE: There are many technical avenues for automotive charger compliance that would not be blocked by the patent.

Technical investigation of the patent suggests that it is not broad enough to block all technological avenues of compliance. For example, one could employ a small switch-mode power supply for trickle mode and a large linear power supply for engine start mode. This would meet the standard and likely circumvent the patent.

10. STAKEHOLDER CONCERN: Costs associated with automotive charger compliance are too high.

IOU RESPONSE: Benefits to consumers for this product category are much greater than the costs.

- The increased costs associated with this product group are estimated to be $24.00 per unit for the consumer. For every dollar of upfront cost incurred by the consumer, the consumer will see $16.00 of energy savings on his/her electric bill.

- The manufacturer-provided data in the docket suggests a range of price premiums between approximately $12 and $70 with a non-market weighted average of about $30. This is consistent with the costs presented by the IOUs: $24.00
- The energy savings associated with this product category (auto-marine-RV) is estimated to be 570 GWh per year after full implementation (entire stock turnover). This includes casual home users and other more frequent users found in marinas and automotive shops.

Thank you for the opportunity to provide comment on this important initiative.

Sincerely,

Pacific Gas and Electric Company
San Diego Gas & Electric
Southern California Edison
Southern California Gas Company