March 30, 2011

Ms. Katharine Kaplan
U.S. Environmental Protection Agency
ENERGY STAR Program
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RE: Draft 1, Version 2.0 Specification for Battery Charging Systems released December 7, 2010

Dear Ms. Kaplan,

This letter comprises the joint response of the Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), the Southern California Gas Company (SCGC), and San Diego Gas and Electric (SDGE) to the request made by the U.S. EPA ENERGY STAR Program for comments on Battery Charger Draft 1, Version 2.0 Specification for Battery Charging Systems (BCS) released December 7, 2010.

The undersigned utility signatories of this letter, hereafter referred to as the California Investor-Owned Utilities (IOUs), represent some of the largest utility companies in the western United States. As energy companies, we understand the potential of appliance energy efficiency labeling programs to cut costs and reduce energy consumption while maintaining or increasing consumer utility of the products. The resulting energy savings are one of the resources we count on in meeting future energy needs and have already saved our customers millions of dollars on their energy bills. We appreciate this opportunity to provide the following comments about several aspects of the proposed efficiency specification and test procedure for battery charging systems (BCSs).

There have been extensive multi-stakeholder efforts underway in California since 2003 to develop a battery charging system test procedure and efficiency standards. In 2008, the California Energy Commission (CEC), with IOU technical support and input from manufacturers and other stakeholders, developed and adopted a battery charger energy efficiency test procedure.[1] In October 2010, the IOUs submitted a detailed proposal[2] to the CEC to develop battery charger energy efficiency standards in California ahead of the expected battery charger federal mandatory standards compliance date and continue to encourage the CEC to move forward with these standards.

Improving the efficiency of battery charger systems is a key step in a multi-product strategy to reduce energy use of many very different plug load end uses. While designers of battery charger systems often maximize the energy efficiency of their devices to ensure long operation times between charging, they

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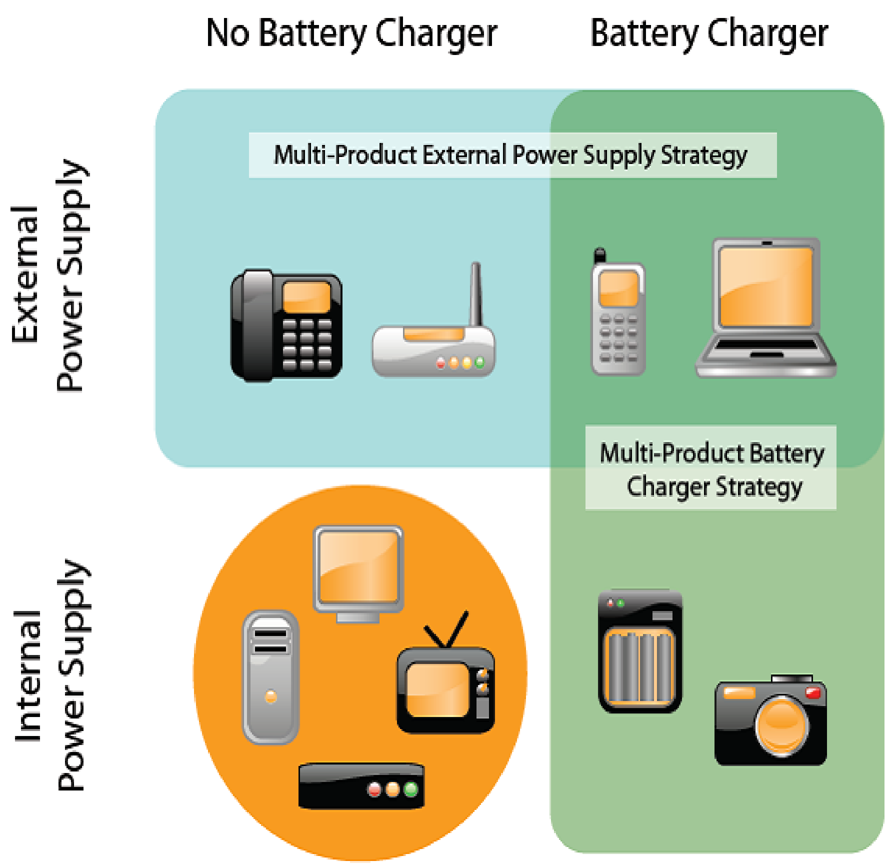
[1] Available at http://www.efficientproducts.org/reports/bchargers/1413_Battery%20Charger%20System%20Test%20Procedure_V2_2_2_FINAL.pdf

[2] Battery Charger Title 20 CASE Report available from the CEC website at http://www.energy.ca.gov/appliances/battery_chargers/documents/

often ignore how much energy is consumed in the process of converting alternating current (ac) electricity from the utility grid into direct current (dc) electricity stored in the battery. Creating one specification to improve the efficiency of the whole battery charger market will drive down the cost of battery charger control integrated circuits and other components that deliver cost-effective savings to consumers. It is time consuming and challenging to address all of these plug loads with individual specifications, but a comprehensive battery charger specification can reduce the energy use of portable products with one program (Figure 1).

Figure 1. External power supplies and battery charger systems are the two multi-product strategies to reduce plug load energy use



To help ensure broad battery charger specification adoption in the marketplace, the specification needs to have easy to understand requirements that address a wide scope of battery charger products. The external power supply specification was the first "common denominator" component specification for plug loads. ENERGY STAR, California, and subsequently the Department of Energy (DOE) successfully harmonized with many international jurisdictions, including China, Australia, Europe, and Canada to create one test procedure and one policy approach with different levels of stringency. The simple, multiple-metric approach that focused on improving the efficiency of all modes of operation of the power supply was very successful at transforming the market for these plug load components. Today, the majority of power supplies sold meet high levels of efficiency and consumers are getting savings regardless of how the external power supply is used by the product it powers. ENERGY STAR's efforts to transform the market were so successful that the program was determined to be no longer needed and the specification was retired in 2010.

ENERGY STAR has a similar opportunity to affect the world-wide market with its battery charger specification, achieving energy savings not only in California and the U.S., but also in international markets. We are pleased that ENERGY STAR is building on the ongoing efforts in California by opening a specification revision for battery chargers. Our research suggests that national annual energy savings from battery chargers is at least 4.2 rosenfelds[3] (18.7 TWh), higher than the savings estimates of the first ENERGY STAR external power supply specification.

Because of this substantial energy savings opportunity and the special nature of battery chargers, careful attention to the specification approach is warranted to ensure that the full cost-effective energy savings opportunity is achieved. Our comments focus on concerns with the harmonized DOE-EPA approach to battery chargers with battery energy less than or equal to 3 kWh, hereafter referred to as "small chargers." We understand that ENERGY STAR is on hold with this portion of the scope in order to coordinate closely with the DOE, but have offered our comments here so that you may take them into account when you release future drafts and work with the DOE on harmonization. We support the EPA's general approach to chargers greater than 10 kWh ("large chargers"). We also encourage ENERGY STAR to consider a two-tiered specification approach to these products to continue to capture energy savings and maintain the value of the ENERGY STAR label after the DOE and California standards for small and large chargers are in effect.

Detailed comments are below and in the order listed in the draft eligibility criteria. Comments marked with an asterisk ("*") are of particular importance to the signatories of this letter.

Comments on Scope of ENERGY STAR Battery Charging System Specification

***We strongly support ENERGY STAR's general approach to expand the specification to include not only specific power tool and home appliance chargers, but all consumer, commercial, and industrial products that have a battery charger system.** A broad scope is important to achieve market demand for large quantities of high efficiency battery charge control components, and expands the energy savings opportunity of the ENERGY STAR program. Because of the large savings opportunity, we strongly support including cordless phones in the battery charger specification. In addition, we support EPA's suggestion to include cellular telephones, personal digital assistants, electronic book readers, and mobile computing products that are not otherwise covered by ENERGY STAR's computer program. Our data suggest that there are variations in the efficiency of these products, and the market distinction of the ENERGY STAR label could help achieve some energy savings.

***We encourage EPA ENERGY STAR to include battery chargers with inductive coupling (electric toothbrushes and other devices) in the specification.** We have seen significant differences in inductively coupled battery chargers that are common today (e.g., electric toothbrushes). Perhaps even more important is that other end uses may soon have inductively coupled chargers. The Wireless Battery Consortium, which includes more than 50 member companies, has developed a specification for inductively coupled chargers to be used with cell phones and other portable devices. The wireless charging system enables consumers to place their cell phones and other portable electronics on a "pad" to charge, without needing a wired connection. Although the specification carefully addresses

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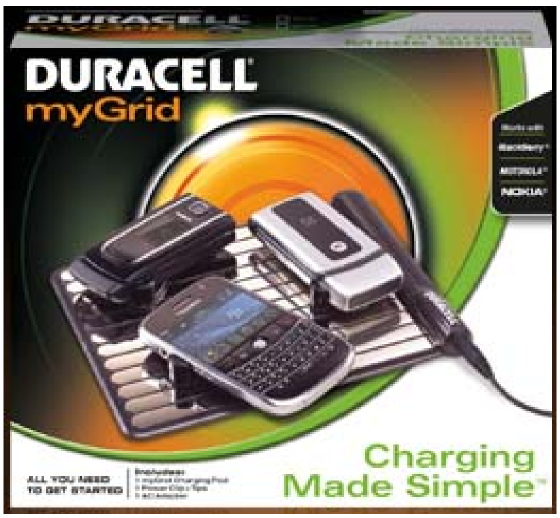
3 A new unit of energy savings equivalent to the annual energy output of an average 500 MW coal-fired power plant

See http://iopscience.iop.org/1748-9326/5/1/014017 communication and other protocols, there are no measures to ensure efficient transfer of energy. Sanyo and Energizer have announced products in development, and many early-adopters are looking forward to the new technology (see http://www.engadget.com/2010/09/03/global-qi-wireless-power-standard-released-energizer-and-sanyo/). Given that inductive charging inherently comes with efficiency penalties, we encourage ENERGY STAR to consider these products within the scope and to treat them identically to other chargers that have the same functionality.

For example, there are other "pad" charger technologies, such as the Duracell "myGrid" that use an alternative surface connection method that does not require inductive coupling, but provides similar function to the consumer.[4] See http://www.duracell.com/en-US/product/mygrid-kits.jspx.

Figure 2. Example of pad charger that does not require inductive coupling



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We encourage EPA ENERGY STAR to consider covering battery chargers for neighborhood electric vehicles as part of the golf cart specification (greater than 3 Kilowatt-hours and Less than or Equal to 10 Kilowatt-hours). These vehicles are very similar in technology to golf carts, and are not subject to highway safety requirements. They are marketed as green alternatives to regular gas or hybrid electric vehicles but are likely to have high variations in charge efficiency. Because of their high usage in California, we expect the Energy Commission to include them in the mandatory standards proposal in California.

***We encourage EPA ENERGY STAR to cover uninterruptible computer power supplies and security systems.** Although we agree that larger, commercial battery backup systems should be excluded because of the lack of available data and differences in the market and usage, small uninterruptible computer power supplies have significant variation in battery maintenance mode, and the opportunities for energy savings are significant. In the IOU mandatory standards proposal for California, these products were one of the top five energy savings opportunities for small and large chargers. Although DOE is likely to trim off the most energy consumptive products with a mandatory standard, consumers would benefit from additional information provided by the ENERGY STAR label.

[4] Current inductive chargers also have an inductive adaptor that plugs into the phone (just like this Duracell). These pad technologies are in the early phases of adoption. Integrated adaptors for conductive and inductive pad connections may be available in later iterations of the technology.

***We encourage EPA ENERGY STAR to include battery charging system requirements for laptops in the current specification revision for computers.** We agree that the ENERGY STAR computer specification comprehensively address laptop computer energy use when the computer is plugged in and running on ac from a wall outlet. However, we have seen significant differences in the charge efficiency of laptop computers, and suggest that ENERGY STAR incorporate a battery charger specification as one requirement in future revisions to the laptop computer ENERGY STAR program.

Comments on Qualification Criteria for Battery Chargers with Battery Energy Less than or Equal to 3 Kilowatt-hours

***ENERGY STAR's five product classes (DOE classes 2 through 6) are not based on significant differences in battery charger function and create a discontinuous specification that encourages manufacturer manipulation of the specification, resulting in lost energy savings opportunities.** The battery charger systems take electric energy and convert it to a stored form of chemical energy for later use. All ac-dc battery chargers have power conversion circuitry, charge control circuitry, and a battery. They also operate in three modes: charge, battery maintenance, and no battery. Battery chargers are tailored to specific applications and can vary based on chemistry, charge capacity, and other parameters. Fundamentally, they all provide the same function: portable power.

Because the function for all these battery chargers is the same, we strongly encourage EPA ENERGY STAR treat all battery chargers with the same specification approach, and reduce the number of product classes from 5 to 1 by combining product classes 2 through 6 into a single category (See table below). For context, we have included other IOU recommended DOE product classes. We specifically recommend that ENERGY STAR create one class matching product class B below.

Table 1. Recommended ENERGY STAR product classes

IOU Recommended Product Class	Functionality to consumer
A: Ac-dc inductive (DOE product class 1)	**CURRENTLY EXCLUDED BY ENERGY STAR**. ***Chargers provide portable power using alternating current source, with safety and longevity concerns associated with wet environments***. Use in wet environments (bathrooms) warrants a separate product class allowing lower efficiency of inductive chargers because of the safety and corrosion requirements.
B: Ac-dc (DOE product classes 2 to 7)	**ENERGY STAR FOCUS**. ***Chargers provide portable power using alternating current source.*** These products are generally used to power portable products that operate detached from the wall plug outlet. Although they vary greatly in battery energy capacity (the product of voltage and battery charge capacity), they serve the same general function to the consumer, to provide portable power for a device.
C: Dc-dc (DOE product classes 8 to 9)	**CURRENTLY EXCLUDED BY ENERGY STAR.** ***Chargers provide portable power using direct current source.*** These chargers perform a different function than ac-dc chargers because power conversion from ac to dc is not required. It is possible that higher levels of efficiency could be cost-effective compared to ac-dc chargers.
D: Ac-ac (DOE product class 10)	**CURRENTLY EXCLUDED BY ENERGY STAR.** ***Chargers provide backup stationary power using alternating current source.*** These stationary battery chargers have the primary purpose of providing short-term battery power backup in the event of an electric utility power outage.

Using one continuous specification for all the battery charger products in the EPA ENERGY STAR specification simplifies requirements for battery chargers, is more transparent to stakeholders, and makes compliance and verification easier. A simplified approach is also helpful for ENERGY STAR's international partners, some of which have already expressed interest in achieving energy savings from battery chargers. This approach also builds on the representative product groups that the DOE has already developed for its engineering analysis; they would not need to be changed.

In a 2010 report, The European Council for an Energy Efficient Economy (eceee) calls attention to problems with discontinuous specifications like the BCS specification proposed by ENERGY STAR in the current draft. "These types of specifications exhibit profound boundary effects over time as manufacturers gain experience with how to manipulate them. At the margins, differences in product capability between one category and another will be modest, yet manufacturers will have a strong incentive to move from one category to another in their next design cycle if the allowable power difference is significant."[5]

Because battery energy capacity and voltage are somewhat continuous functions across the range of ac-dc chargers, it is possible that some products that lie near the boundaries of ENERGY STAR's proposed product classes 2 to 7 could be redesigned or minimally changed to enable compliance within a different product class, which could result in lower-than-expected energy savings. Examples of products where product class migration could potentially occur are summarized in the table below (from the PG&E data set). PG&E provided this data set to ENERGY STAR in 2010, and we have attached it to these comments for reference.

Table 2. Examples of battery charging systems that may easily transition product class

[5] Calwell, Chris. "Is efficient sufficient? The case for shifting our emphasis in energy specifications to progressive efficiency and sufficiency." Published by eceee, March 2010. Available at http://www.eceee.org/sufficiency/

Battery Energy (Wh)	Battery Voltage	Battery Chemistry	Product Class ID	Adjacent Boundary Class ID	Application
2	3.7	Li-Polymer	2	3	Cordless phone w/ answering machine
1	3.7	Li-Polymer	2	3	Remote control helicopter
6	4.8	NiMH	3	2	2-way radio
5	4.8	NiCd	3	2	Rechargeable flashlight
13	7.4	Li-Ion	3	4	Digital camera
33	7.4	Li-Ion	3	4	Portable DVD player
14	10.8	Li-Ion	4	3	Power tool charger
28	10.8	Li-Ion	4	3	Netbook computer
120	12	SLA	5	4	12 V Charger
2520	12	AGM	5	7	12 V Charger

Adding or deleting a single battery cell or using a slightly larger capacity battery could cause a change in product class.

In summary, we strongly suggest that ENERGY STAR consider using one product class with a continuous function specification across the range of chemistries, voltages and capacities. This approach treats all battery chargers that provide portable power to the consumer with an identical approach. One set of rules for all chargers is simpler to administer, simpler for stakeholders and international partners to understand, and prevents unintended boundary effects associated with discontinuous specifications.

***Although appropriate for many end use products, the annual energy use metric is not the best approach for components of plug loads, such as battery chargers.** Like external power supplies, battery chargers are a component of other plug load products. Their usage cycles tend to be dictated by the products they power. The DOE identified more than 80 different end-use products for battery chargers in its recent preliminary analysis technical support document. There are very limited data on duty cycles for battery chargers, and even if ENERGY STAR had an opportunity to collect statistically significant data on each product end use, we would expect the standard deviation of such data to be quite wide. Therefore, while it is mathematically possible to combine charge, battery maintenance, and no-battery mode into a single energy use metric, combining the three modes together to develop energy conservation standards necessarily emphasizes the energy use and savings of one mode of operation over others. This emphasis may be appropriate for one particular end-use application, but will not represent other very different end-use products that would be subject to the same metric.

For example, ENERGY STAR product class 2 includes both mobile phones and portable phones. Mobile phone chargers are likely to be unplugged for substantial portions of time during a given year. On the other hand, cordless phones are rarely, if ever, unplugged because they must remain plugged in to receive calls on the landline. If ENERGY STAR employs the average usage profile for the product class in the DOE analysis, which includes more than 9 hours of time unplugged per day, ENERGY STAR deemphasizes the importance of reducing battery maintenance power for cordless phones. Employing a usage profile that aligns with that of mobile phones for all the products is likely to lead to the conclusion that significant improvements to battery maintenance mode for cordless phones are not warranted. PG&E research suggests cordless phones are one of the most important consumer battery charger opportunities for energy savings,[6] specifically because of high battery maintenance mode power and low active mode

[6] Porter, S. F. et al. Analysis of Standards Options for Battery Charger Systems. Prepared for Pacific Gas and Electric, Southern California Gas Company, San Diego Gas and Electric, and Southern California Edison, October 2010. Available on the California Energy Commission website:

energy efficiency. This example is one of many where duty cycle variation is very wide, leading to challenges when selecting duty cycles even within EPA's narrowly defined product classes.

***Instead of trying to account for all the possible duty cycle variations for more than 80 end-use applications with five unit energy consumption metrics (one for each product class), we recommend that ENERGY STAR apply a metric for each mode of operation of the battery charger (charge, battery maintenance, and no battery). EPA could harmonize with the DOE by encouraging the DOE to employ the most important subset of ENERGY STAR's metrics.** Current battery charger products have high duty cycle variability, even within one end use. For example, some cell phone users may tote their charger with them from work to home, or leave it in one location, while others may have two chargers plugged in at all times at both locations. In addition, portable battery charger products are being introduced regularly (e.g. mp3 players, tablets, etc.), and forthcoming products have duty cycles and uses that are unknown. In order to ensure that energy savings are achieved with battery chargers, we encourage ENERGY STAR adopt metrics for each mode of operation. This way, no matter how the battery charger is used, energy savings are guaranteed.

We propose the following metrics for charge, battery maintenance and no battery mode. In addition, we propose that ENERGY STAR consider requiring power factor correction for battery chargers of certain peak current. Using a test data set of over 100 battery chargers, we estimate that approximately 30% of current products in the market (spanning all product classes) would meet these proposed requirements.[7]

Table 3. IOU proposed ENERGY STAR specification for small chargers

24 hour charge and maintenance energy (Wh)[a]	Less than or equal to: **$7.2 + 1.5E_b$** (E_b = total battery capacity) [b]
Maintenance Power	Less than or equal to: **0.30 W**
No Battery Power	Less than or equal to: **0.20 W**
Power Factor	If the peak ac input current exceeds 1 amp in charging, maintenance or no-battery mode, then the power factor in that mode shall either (a) be at least 0.55, or (b) be at least 0.50 at both 115 V, 60 Hz and 230 V, 50Hz. If ac rms input current exceeds 1 amp in charging, maintenance, or no-battery mode, then the power factor shall be at least 0.90 in that mode.

[a] This charge and maintenance energy can also be expressed as a 24-hour efficiency limit.
[b] For chargers tested with multiple batteries, E_b would be the sum of capacity of all batteries installed.

Although we propose all battery capacities have the same maintenance and no battery power limits, we suggest the 24-hour maintenance energy metric, as specified by the draft DOE test procedure[8], as a continuous function of battery energy capacity (figure below). This continuous function is more stringent

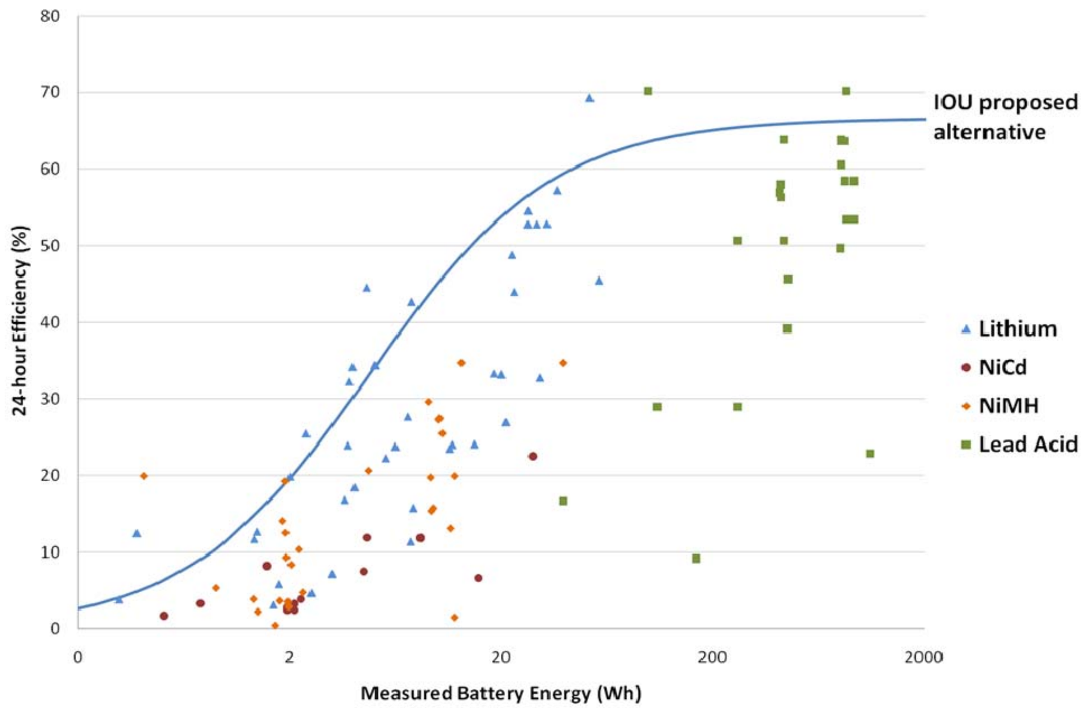
http://www.energy.ca.gov/appliances/battery_chargers/documents/2010-10-11_workshop/2010-10-11_Battery_Charger_Title_20_CASE_Report_v2-2-2.pdf.

[7] These percent estimates also include products with special case requirements (i.e. emergency systems and inductive chargers).

[8] The DOE test procedure that include active mode. See https://www.eecbg.energy.gov/buildings/appliance_standards/residential/tp_battery_chargers_active.html for more information.

than the IOU-proposed battery charger standards levels in California (as documented in the CASE report),[9] but has the same metrics, format and approach.

Figure 3. IOU proposed ENERGY STAR level for product classes 2 through 6



Note: 24-hour efficiency is equivalent to:

$$\frac{E_b}{\text{24 - hour charge and maintenance energy}}$$

Where E_b = total battery capacity

***ENERGY STAR's use of multiple metrics to ensure high energy savings would not hinder opportunities to harmonize with the DOE.** The DOE could utilize the most important metric for each of the product classes, while still enabling ENERGY STAR to use multiple metrics. For emergency battery backup applications (DOE product class 10), battery maintenance mode power could be used as the efficiency metric since these products are in maintenance mode virtually all of the time. For the remaining products that provide portable power, and are therefore charged some of the time (product classes 1 to 9), the 24-hour charge and maintenance efficiency could be used to characterize active mode and battery maintenance efficiency. In addition, the DOE could adopt a separate standby (no-battery mode) metric for portable power battery chargers under section 325(gg)(3) of EPCA that directs the DOE to prescribe a separate standard for standby mode and off mode energy consumption if it is "not feasible" to incorporate standby mode and off mode into a single standard.

[9] Battery Charger Title 20 CASE Report available from the CEC website at http://www.energy.ca.gov/appliances/battery_chargers/documents/

Table 4. IOU propose ENERGY STAR and DOE metrics for battery charger systems.

Product Group	Product Examples	Duty Cycle Characteristic	ENERGY STAR Proposed Metrics	DOE Proposed Metric(s)
Most battery charger products (DOE product class ID 1 to 9) **ENERGY STAR FOCUS**	Mp3, laptops, power tools, shavers, toys, golf carts	Charged some of the time; time split between charge, maintenance, and no battery modes	24-hour charge and maintenance efficiency (%); battery maintenance mode power (W); no-battery mode (W); and power factor	24-hour charge and maintenance efficiency (%); no-battery mode (W)
Emergency backup systems (DOE product class 10) **CURRENTLY EXCLUDED FROM ENERGY STAR**	Computer UPSs, security systems	Almost always in maintenance mode	Battery maintenance mode (W)	Battery maintenance mode (W)

Adopting multiple metrics is likely to harmonize with the forthcoming California Energy Commission standards approach. While the DOE may be limited in its ability to select a single metric to measure energy efficiency of battery chargers, we expect the CEC to proceed with a standards rulemaking with multiple metrics and a continuous specification, similar in concept to the specification approach proposed herein. We encourage you to contact Ken Rider or Harinder Singh at the CEC for details on their schedule and approach. They can be reached at KRider@energy.state.ca.us or 916-654-5066 and hsingh@energy.state.ca.us or 916-654-4091, respectively.

Comments on Qualification Criteria for Battery Chargers with Battery Energy Greater than 3 Kilowatt-hours and Less than or Equal to10 Kilowatt-hours

We encourage ENERGY STAR to combine this class of battery chargers with the less than 3 kWh group of chargers (small chargers), applying the same test procedure and policy approach. Grouping these "medium" chargers with the small chargers would simplify the ENERGY STAR program to two groups of battery charging systems: small (less than 10 kWh) and large (greater than 10 kWh). We recommend these chargers fall into IOU recommended class B: ac-dc, DOE product classes 2 to 7 (see Table 1). We suggest that ENERGY STAR use the IOU proposed standard level (Table 3) as the starting place for a standards discussion for these chargers. We have test data on these types of chargers, and have attached these to the comments. Grouping products will harmonize with the CEC standards approach as well as with the testing approach in the forthcoming DOE test procedure.

Comments on Qualification Criteria for Battery Chargers with Battery Energy Greater than or equal to 10 Kilowatt-hours

***We support the general ENERGY STAR approach to large chargers.** This approach harmonizes with the IOU proposal for large battery charger mandatory standards in California. Using the same test procedure, metrics, and approach will help enable manufacturers to meet mandatory standards in California and increase participation in the ENERGY STAR program. We strongly support the use of the metrics in the CEC test procedure: power conversion efficiency, charge return factor, battery maintenance, and no battery mode.

***We strongly suggest that ENERGY STAR include power factor as one of the metrics for large chargers.** IOU research suggests that energy losses in building wiring associated with poor power factor can be as much as 10% of total energy use of the product. Although some technologies already have power factor close to unity, many of the newest technologies that deliver charge very efficiently (high frequency chargers) can have poor power factor. Improving efficiency without a focus on power factor may reduce the energy savings achieved from the ENERGY STAR specification. In addition, because many industrial facilities have power factor limits as part of their electric rate structure, improved power factor helps facility managers minimize costs.

Research suggests the lower limit of charge return factor for large chargers should be removed to ensure applicability to possible future Li-Ion batteries in this market. Several stakeholders in the California standards dialog commented that this requirement is not appropriate for Li-Ion batteries, and can lead to unsafe operation and battery damage. We agree that 1.05 is too high a charge return factor for Li-Ion chemistries. The lower limit was originally recommended in the IOU CASE report to help ensure good performance of lead-acid charge systems; only the upper limit has an energy conservation impact. In order to make the proposed Large Battery Charger Standards technology neutral, we recommend eliminating the lower limits on charge return (as in table below).

Table 5. IOU recommended changes to charge return factor requirements.

Charge	100%, 80% Depth of Discharge	CRF ≤ 1.15
Return Factor (CRF)	40% Depth of Discharge	CRF ≤ 1.20

Comments on Test Requirements

***We strongly support EPA ENERGY STAR's approach to harmonizing test protocols with the DOE and CEC.** Many years of research have gone into the development of these test procedures, and although small details may need to be addressed, significant stakeholder input has already been included. These test procedures balance the need for detailed and accurate information with the testing burden and have been vetted in the laboratory for a wide range of product types.

Other General Comments

In the context of current mandatory policy activities underway in the U.S., we strongly encourage ENERGY STAR to take a two-tiered approach to its current battery charger specification draft. We expect California to pursue mandatory standards for all battery charger systems [small (<3 kWh), medium (3 to 10 kWh) and large battery (> 10kWh)] with an effective date in 2012. Although current IOU standards proposal for small and medium chargers differs in format from the EPA ENERGY STAR specification draft, the large battery charger standard is nearly identical to the IOU proposed mandatory standards approach. The DOE has suggested a federal compliance date for small consumer battery chargers in 2013 or 2014. In the context of these standards, we suggest that ENERGY STAR pursue a second tier of a battery charger specification (v3.0) to maintain the value of the ENERGY STAR label for small chargers once mandatory compliance is required. In addition, a version 3.0 for large chargers

enables electric utilities in California to continue to utilize the ENERGY STAR label as a criteria for energy savings incentive programs even after a compliance date for large chargers in California.
We suggest the following possible Tier 2 specification draft as the starting point for discussion with stakeholders. Version 3.0 could remain in draft form in June 2011, and then be revisited for possible revisions in 2013 after data is collected on the newest, most efficient, battery charger products. Version 3.0 savings over 2009 energy use of BCS could result in at least 6.2 rosenfelds or approximately 11.3 million metric tons of carbon dioxide emissions avoided each year.

Table 6. IOU proposed Tier 2 small battery charging system qualification levels

IOU Proposed ENERGY STAR Specification	Tier 2 (possibly Version 3.0)
24 hour charge and maintenance energy (Wh)[a]	Less than or equal to: **$3 + 1.4E_b$** (E_b = total battery capacity) [b]
Maintenance Power	Less than or equal to: **0.125 W**
No Battery Power	Less than or equal to : **0.10 W**
Power Factor	If the peak ac input current exceeds 1 amp in charging, maintenance or no-battery mode, then the power factor in that mode shall either (a) be at least 0.55, or (b) be at least 0.50 at both 115 V, 60 Hz and 230 V, 50Hz. If ac rms input current exceeds 1 amp in charging, maintenance, or no-battery mode, then the power factor shall be at least 0.90 in that mode.

[a] This charge and maintenance energy can also be expressed as a 24-hour efficiency limit.
[b] For chargers tested with multiple batteries, E_b would be the sum of capacity of all batteries installed.

Table 7. Proposed Tier 2 large battery charging system qualification levels

IOU Proposed ENERGY STAR Specification		Tier 2 (possibly Version 3.0)
Charge Return Factor (Crf)	**100%, 80% Depth of Discharge**	**Crf ≤ 1.10**
	40% Depth of Discharge	**Crf ≤ 1.15**
Power Conversion Efficiency		Greater than or equal to: **90%**
Power Factor		Greater than or equal to: **0.95**
Maintenance Power		Less than or equal to: **10 W**
No Battery Power		Less than or equal to: **10 W**

***In response to ENERGY STAR's request for data, we are providing a data set of more than 100 products collected by PG&E and SCE.** We provided these data to ENERGY STAR in advance of the first specification draft, and include them here for reference. We strongly support a data-driven specification development process, and look forward to providing any other useful data we may collect within ENERGY STAR's specification revision timeframe.

Thank you for the opportunity to provide these comments.

Sincerely,

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