



**Pacific Gas and  
Electric Company**

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**Responses to Test Procedure Suggestions  
Dr. Paul Bendt 4/22/2008**

**Additional responses to AHAM/PTI proposed Test Procedure V2.0 added on pages 3-4.  
Responses to Tim Tutt's questions of 4/28/2008 added on pages 5-8.**

#### Comments from AHAM/PTI

1. Definition of external power supply. The definition has been retained, but altered to prevent confusion with a *regulated* EPS. (This is, regulated by some particular jurisdiction.)
2. Specifying 2% uncertainty for energy measurements. Suggestions included.
3. Change of wording for associated batteries, Table B. Suggested language included with slight modification. Since these products require a separately-purchased battery for testing or for consumer use, the term "optional" was confusing and omitted.
4. Access to batteries for discharge test. The wording change proposed was much more than was discussed in the conference call and would create several problems. The wording proposes to measure discharge energy at the "final load connections." Some examples illustrate the problems this would create:
  - a) For a UPS, the load terminals are the AC output receptacle. Measuring the energy available here would decrease the observed efficiency by the losses in the output inverter.
  - b) For an MP3 player, the final load connection would be output headphone jack. One can divide the delivered music energy by the input charging energy, but this is not a relevant measure of battery charger efficiency.
  - c) Many power tools have a variable speed motor driven by a motor controller, usually a PWM controller. The motor controller does not deliver a constant current to the motor, making a constant-current discharge impossible.

The test procedure as written has been validated with over 200 tests without difficulty. The proposed changes have not been validated by actual testing and have obvious problems. The suggestions are not being incorporated. Instead, a paragraph has been added to section V.F. to allow battery discharge at the output of any protective circuitry, if appropriate instructions are provided by the manufacturer.

5. Reporting no-battery power as N/A for category 1 products. Changes incorporated. Also, changes have been made in the "off" mode power to report it as N/A if there is not a distinct off mode.

1. Power factor reporting. PG&E and others have indicated that energy loss due to low power factors is significant and of concern. Power factor reporting will continue as part of the test procedure.
  2. Reporting efficiency. The entire purpose of the Energy Efficiency Battery Charger Test Procedure is to measure efficiency. Reporting the final result is indeed appropriate.
  3. Removing definitions. The test procedure would be difficult to understand and impossible to implement consistently without its definitions.
  4. Input line voltages. Testing products that operate at 230 volts with 230-volt power helps promote international consistency and reduces duplication of effort.
- \* Removing dc-powered BCS from the scope. This was not up for discussion. The proposed changes have not been incorporated.

#### Comments from CEA

1. Dual testing of products that have both a BCS and an EPS. We disagree with the assertion that dual testing “will fail to contribute any additional power savings.” Reducing the energy lost in any component of a system generally reduces the total loss. Whether the additional savings is small or large depends on the particular standards being considered. This analysis can be considered during the setting of standards. Comment is not relevant to the test procedure.
2. Alignment with other test procedures. Addressed in the Comment and Response document available at [www.efficientproducts.org](http://www.efficientproducts.org), see comment #107. No changes
3. Products with long life cycles. Irrelevant to the test procedure.
4. Testing at 230 volts. See above AHAM/PTI comment.
5. The test procedure does not require “testing of every possible permutation.” For example, it requires testing with at most three batteries out of perhaps a very large number of possible suitable batteries. No changes.

## **Responses to Proposed Changes between Ecos's Battery Charger Test Procedure v1.2 and AHAM & PTI's v2.0**

### **Key Changes (with respect to PG&E/Ecos's v1.2):**

- Definition of battery charger systems changed to exclude: electronic devices with a dc input voltage through an internal or external power supply and a battery charger
  - **Previously addressed 4/22/08 page 1. This proposal was not included.**
- Eliminated the testing requirement of power factor and crest factor for battery charger systems with a rated input of 700 VA or less.
  - **Previously addressed 4/22/08 page 2. This proposal was not included.**
- Totally changed Input Reference Source testing requirements:
  - subjected testing requirements to NEMA WD 6 definition of a plug
    - **Not applicable. This proposal was not included.**
  - eliminated requirement for 2 voltage and frequency test requirements (115 V @ 60 Hz, 230 V @ 50 Hz)
    - **Previously addressed 4/22/08 page 2. This proposal was not included.**
  - subjected to test voltages “appropriate for the plug configuration”, with the exception that “plugs intended for 125 VAC and less shall be tested at 115 VAC”
    - **Not part of prior discussions. The existing wording in the test procedure is adequate. This proposal was not included.**
  - subjected to testing at nameplate voltage, given the UUT is wired without NEMA plug to facility distribution
    - **Previously addressed 4/22/08 page 2. This proposal was not included.**
  - requirement that UUT shall be tested at each voltage configuration
    - **Previously addressed 4/22/08 page 2. This proposal was not included.**
  - test frequency requirement of only  $60 \pm 1$  Hz
    - **Previously addressed 4/22/08 page 2. This proposal was not included.**
  - requires testing to be done with components “as recommended by the manufacturer”
    - **Previously addressed 4/22/08 page 2. This proposal was not included.**
  - eliminated ac ripple voltage requirement
    - **Previously addressed 4/22/08 page 2. This proposal was not included.**
  - eliminated testing requirements for UUTs intended for operation only on dc inputs



- **Previously addressed 4/22/08 page 2. This proposal was not included.**
- Selection of batteries allows manufactures that sell batteries for chargers not packaged with batteries to use “any and all optional or high-capacity batteries sold by the same manufacturer”
  - **Previously addressed 4/22/08 page 1, item 3.**
- Access to the battery for the discharge test instructions have been totally rewritten:
  - if systems have “additional protective circuitry”
    - requires measurement to be taken at “final load connection”
    - doesn’t specify the discharge rate
    - requires battery be fully charged
    - requires final load to be replaced with programmable or adjustable load
    - requires operational state of UUT to be in “final load” mode
  - eliminates data collection requirement at terminals of battery
    - **Previously addressed 4/22/08 page 1, item 4.**
- When preparing the battery for testing, eliminates the option “or the UUT circuitry terminates the discharge.”
  - **This proposal was not included.**
- For Category 1 Products, the reporting of products where off mode doesn’t apply, it is required that the off mode power be reported as the maintenance mode measurements
  - **Previously addressed 4/22/08 page 1, item 4.**
- For Category 3 Products any reference to EPS’s in the testing requirements has been eliminated
  - **Previously addressed 4/22/08 page 2. This proposal was not included.**
- The General A reporting requirements include:
  - an exception for reporting rated battery capacity, such that reporting is only required “if known”
  - Type of battery location (integral or detachable)
  - Whether or not there is a “cradle” present on integral battery locations
    - **This was discussed on the April 17 conference call, and appears in the notes. This proposal was not included.**
- The General E reporting requirements:
  - Excludes the Charge and Maintenance Mode Efficiency reporting
  - Excludes the definition of Charge and Maintenance Mode Efficiency
    - **Discussed on the April 17 conference call, and appears in the notes. This proposal was not included.**

From: Tim Tutt [mailto:Ttutt@energy.state.ca.us]

Sent: Monday, April 28, 2008 11:04 AM

To: Paul Bendt; Paul Sheldon

Cc: Chris Calwell; Peter Ostendorp; AlexC@energy-solution.com; Bill Pennington; Harinder Singh; John Wilson; Melinda Merritt; William Staack; esel@pge.com; gbf1@pge.com; Pat Eilert

Subject: RE: Battery chargers next steps Conference Call 4/17/2008,8:00AM - 9:00AM PACIFIC TIME

Hi Pauls,

I have the following questions about the battery charger test procedure.

1. On page 8, the tp discusses what happens when a manufacturer sells a charger with an EPS or sells an optional compatible EPS. Would it be reasonable to modify that section as follows:

"If a charger is powered by a low-voltage dc or ac input, and the manufacturer either packages the charger with an EPS or sells an optional EPS capable of providing that low voltage input, then the charger shall be tested using the manufacturer's EPS and the input reference source shall be a suitable input for the EPS. If the manufacturer does not sell or include an EPS, the charger shall be tested with an EPS recommended by the manufacturer, or , if none is recommended, with an appropriate EPS for the system".

**These issues are discussed in items 93 and 106 of the Comment and Response document posted on [www.efficientproducts.org](http://www.efficientproducts.org).**

**Ecos agrees that the following wording clarification in the third paragraph of section VI.D., on page 8 of the Test Procedure, Version 1.2 would clarify the situation you describe:**

If a charger is powered by a low-voltage dc or ac input, and the manufacturer either packages the charger with an EPS, ~~or~~ **or recommends** an optional EPS capable of providing that low voltage input, then the charger shall be tested using the **that** EPS and the input reference source shall be a suitable input for the EPS.

2. On page 14-15, the Charge Mode and Battery Maintenance Mode Test are a combined test. Are these combined for simplicity (they follow naturally and lead to the mostly 24 hour test period) or for some other reason?

**This topic has been addressed by item 13 in the Comment and Response document posted on [www.efficientproducts.org](http://www.efficientproducts.org).**

**PG&E has supported Ecos in the testing of several hundred battery charger systems, which has revealed that when examining many systems, such as UPSs, exit signs, many NiCad power tools, and many cordless phones, it is not possible to distinguish Charge Mode and Battery Maintenance Mode. Therefore, it would complicate data analysis unnecessarily to collect data on these modes only for the systems in which they can be distinguished—this would be likely to lead to more complicated standards. The record of these proceedings contains no evidence to indicate that distinguishing these modes would lead to greater energy efficiency or greater energy savings.**

**Ecos recommends no change to the existing wording of Version 1.2.**

3. In this test, it seems possible in the procedure that the battery will not be fully charged at the end of the test period - in the case where there is no indicator light, where the manufacturer has indicated a charging period, but where the battery does not get fully charged within +/- 5 minutes of the specified charging time. Is this the case, or is there just some confusion of terms in my mind? In clause 7 on page 15, for example, is 'duration of the charging period' the same or different than 'charging time', and do one or both of these correspond to the period determined in Clause V.E?

**Regarding whether or not the battery is fully charged, this was thoroughly discussed during the Stakeholder Workshop in May of 2007. In response to stakeholder concerns, the sequence of the test procedure was reversed, so that the battery is discharged before the test period begins. The current Test Procedure (Version 1.2) specifies that after having discharged the battery, the test measurement period begins with charging the battery, followed by discharge. Thus, if the unit is not fully charged, the resulting discharge will be proportionately less, and the overall efficiency rating will be effectively the same as if it had been fully charged—the efficiency is a ratio of the discharge and charge, which will be proportional, regardless of whether or not the battery achieves full charge during the Charging and Maintenance Mode Test period.**

**Ecos recommends no change to the existing wording of Version 1.2.**

**Regarding "charging time" the existing wording is not entirely clear. The phrase "duration of the charging period" in Section VI.D.7) reads: "Record the input power for the duration of the charging period, as determined by Clause V.E." This sentence refers to Section V.E. "Duration of the Charging and Maintenance Mode Test."**

**One could reasonable assert that the existing wording is understandable. However, if the Commission requests clarifying wording Ecos would propose the following clarification of the wording in Section VI.D.7:**

**"Record the input power for the duration of the ~~charging~~ "Charging and Maintenance Mode Test" period, as determined by Clause V.E. The actual time that power is connected to the battery charger system shall be within ±5 minutes of the specified ~~charging time~~ "Charging and Maintenance Mode Test" period, as determined by Clause V.E."**

4. On page 17, I assume that new wireless charging systems fit in Category 3. The term 'connected to' in that case would be broadly defined to include the inductive charging that occurs even when there is no cradle in which to 'connect' the product, or cord reaching from a base unit to line current? Am I correct here? Are any clarifications appropriate to make clear?

**You are correct. "connected" in the industry is understood to mean a completed circuit, regardless of how the electromagnetic connection is made—wire, contact, induction, wireless—they're all covered by the term "connected."**

**Ecos recommends no change to existing wording in Version 1.2.**

5. On page 19, it would seem reasonable to me to report the total charging energy for active mode. It would appear that one can calculate this from items 3, 4, and 1 under B, but why not just report it?

**This issue has been addressed in items 13 and 24 of the Comment and Response document posted on [www.efficientproducts.org](http://www.efficientproducts.org). Because it is not possible to distinguish active mode from maintenance mode in many systems (such as most UPSs, most exit signs, many NiCad power tools, and many cordless phones) it would complicate data analysis unnecessarily to collect data on these modes only for the systems in which they can be distinguished—this would be likely to lead to more complicated standards. The record of these proceedings contains no evidence to indicate that distinguishing these modes would lead to greater energy efficiency or greater energy savings.**

**Ecos recommends no change to the existing wording of Version 1.2.**

6. On page 20, it would seem reasonable to me to report the charge mode efficiency, as well as the charge and maintenance mode efficiency. Is there a reason not to do this?

**As with #5, above, this issue has been addressed in items 13 and 24 of the Comment and Response document posted on [www.efficientproducts.org](http://www.efficientproducts.org).**

**Because it is not possible to distinguish charge mode from maintenance mode in many systems (such as most UPSs, most exit signs, many NiCad power tools, and many cordless phones) it would complicate data analysis unnecessarily to collect data on these modes only for the systems in which they can be distinguished—this would be likely to lead to more complicated standards. The purpose of this test procedure is to measure the overall efficiency of the complete battery charger system, not the individual modes.**

**The record of these proceedings contains no evidence to indicate that distinguishing these modes would lead to greater energy efficiency or greater energy savings.**

**Ecos recommends no change to the existing wording of Version 1.2.**

7. I am open to consideration of adding the definitions of integral, detachable, and cradle, as well as reporting of this information, as recommended by AHAM. I do not think that this means that these products should be tested differently, but think it possible that different standards should be set for them, and without the knowledge that a particular set of test data applies to integral batteries, as opposed to detachable, for example, we would not have full information with which to set appropriate standards. This seems to me to be similar to collecting impedance data -- collecting the data provides us with more information allowing us to set reasonable, energy-saving standards where appropriate.

**These terms do not occur in the Test Procedure as currently written, so there is no reason to include their definitions at this time. If the Commission chooses to separate these categories during the standard-setting process, they could be added at that time. However, in testing over 200 products, Ecos has not noted any correlation between these categories and energy efficiency of a product category. Within the identified product categories, there are products with integral-, detachable-, and/or cradle-type systems. But there are examples of both efficient and inefficient models of each. Thus, whether or not the system features include integral, detachable, and/or cradle components does not appear to be relevant to the overall efficiency of the system being measured.**

**Ecos recommends no change to the existing wording of Version 1.2.**

8. I would also be open to adding a definition for 'wireless', perhaps, since this type of charging may have different characteristics than induction with a cradle. Do any changes in the tp under clause V.A. have to be made to accommodate wireless chargers?

**No changed needed. It is understood within the industry that "connected" includes any form of connection—wires, contacts, inductive charge, or wireless—as long as an electromagnetic connection is being use to complete a circuit, the proper terms are "connect," "connected," and/or "connected to."**

**Further, in Section V. "Battery Charger System Setup Requirements," Section A. "General Setup" begins with the phrase "The battery charger system shall be prepared and set up in accordance with the manufacturer's instructions ..." thus, any special conditions required to accommodate wireless technologies would be stipulated in such instructions.**

**Lastly, there are currently no mass-produced, wireless chargers available for testing. Also, under current technological conditions, it is unlikely that any wireless charging technology would meet the efficiency levels set by any reasonable standard.**

**Ecos recommends no change to the existing wording of Version 1.2.**