ENERGY STAR® Battery Charger Stakeholder Meeting

Hosted by ICF Consulting
Concourse Level Meeting Room
1725 Eye Street NW, Washington, DC
Thursday, June 23, 2005
8:30 a.m. – 12:30 p.m.
Meeting Agenda

Welcome and Introductions

ENERGY STAR Overview

Session I: Why Develop a Battery Charger Specification?
- Summary of External Power Supply Specification and Battery Charging Systems Temporary Exclusion
- Preliminary Savings Analysis

Session II: Creating the New Specification
- Product Research to Date
- Approaches and Options for Battery Charger Specification
- Potential Issues
- Discussion of Other Key Elements of Specification
- Timeline & Next Steps

Adjourn
ENERGY STAR® Overview
In the United States, power plants are responsible for:

- 39% of all CO₂ (carbon dioxide) emissions
- 33% of all Hg (mercury) emissions
- 63% of all SO₂ (sulfur dioxide) emissions
- 22% of all NOx (Nitrogen oxide) emissions

Benefits of Reducing Electricity Consumption

• Improve air quality
  – less smog, acid rain

• Help mitigate climate change

• Improve reliability of electricity grid; reduce the probability of power outages

• Improve the performance of products – build consumer loyalty
What Is ENERGY STAR?

- **Voluntary federal program** makes it easy to identify energy-efficient products, homes, and buildings

- Objective: Transform product markets
  - maximize **energy savings**
  - reduce greenhouse gases & mitigate climate change

- Products earn the ENERGY STAR mark by meeting strict **energy performance criteria**

- Used in **Australia, Canada, EU, Japan, New Zealand, Taiwan**
  - Special case (China)
ENERGY STAR Accomplishments

• 79 specifications in 7 broad product categories

• 1,400 manufacturing Partners
  – 550 retailers (21,000+ storefronts)

• 1 billion products purchased by American consumers

• In 2004, ENERGY STAR:
  – saved > $10 billion on consumer energy bills
  – reduced GHG emissions equivalent to removing 20 million cars from the road for 1 year
  – saved enough electricity to power 24 million homes for 1 year
Growing Influence/Awareness of the ENERGY STAR Mark

- **Public awareness** of ENERGY STAR jumped to 64% of US households in 2004

- 54% of households were favorably influenced by the ENERGY STAR mark

- More than 70% of households would recommend an ENERGY STAR labeled product to their friends

- 95% of recent purchasers say they are likely to buy a product with the ENERGY STAR mark in the future
GOOD HOUSEKEEPING SEAL SURVEY

ENERGY STAR label ranks among the highest level of influence on product purchase among all consumer emblems, similar in ranking to the Good Housekeeping Seal and Consumer Reports.

Source: Fairfield Research, May 2003
Major Retailers Now Marketing ENERGY STAR
Major Retailers Now Marketing ENERGY STAR

Energy Solutions Guide

Together, we're saving more than money.

Lowes is your home

Our energies are focused on a more efficient world. As ENERGY STAR Retail Partner of the Year for the second year in a row, Lowes is committed to offering you ENERGY STAR solutions for your home that help you save money and increase comfort.

From ENERGY STAR qualified lighting and appliances to heating and cooling products, we have it all. And with the tips and solutions offered in this guide, you'll learn about steps you can take to save energy and reduce air pollution.

Lowes understands that the quality of our environment is everyone's responsibility and is proud to be your home for ENERGY STAR Solutions!

Inside
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Improving Your Home's "Envelope" . . .4-6
Saving on Heating & Cooling . . . . 6-7
Kitchen & Laundry Solutions . . . . 8-9
Living Room & Family Room Solutions . . . .10-11
Other Solutions . . . . 12

Lowes is a Retailer of the Year 2004

Together, we're saving more than money.

ENERGY STAR is the national symbol for superior energy efficiency. Backed by the U.S. Environmental Protection Agency (EPA) and the Department of Energy (DOE), these products help save money and energy, and make a difference for the environment by helping to prevent air pollution.

Did you know that a typical household spends $1500 a year on energy bills? With ENERGY STAR, you can save up to 30% or about $450 per year. Last year with ENERGY STAR qualified products sold at Lowes, customers saved more than $60 million on energy bills and prevented 200 million pounds of air pollution equivalent to removing nearly 75,000 cars from the road.

We encourage you to join us in creating a cleaner, greener, and more efficient world. Be part of the solution by following these steps from the EPA and DOE.

Step 1: Change 5 lights. Replace your 5 most frequently used lights, or the bulbs in them, with ones that have earned the ENERGY STAR.
Step 2: Look for products that have earned the ENERGY STAR, Lowes' energy efficient appliances, and more.
Step 3: Heat and cool simply. Improve the performance of your heating and cooling system by having it cleaned and serviced annually and using an ENERGY STAR qualified programmable thermostat.
Step 4: Seal up your home: Seal air leaks, add insulation, and choose ENERGY STAR qualified windows when replacing old windows.
Step 5: Tell family and friends. Help spread the word that energy efficiency is good for your home and good for our environment.
Examples of Other Retail Efforts
Growing Visibility

- Comparing November 2001 to November 2004
  - volume of news articles about ENERGY STAR increased 86%
  - advertising equivalency increased 146%
  - circulation increased 117%

- Monthly volume of news articles about ENERGY STAR has reached 1,400 articles, or a circulation of 140,000,000
  - November 2004 (example)
    - 1,125 articles
    - total circulation of 81,796,264
    - $415,055 in earned media value
Benefits of Membership in ENERGY STAR

- Enjoy **product differentiation** and increase market share
- Increase **credibility** with customers by positioning company as a **technology and environmental leader**
- Access **new customers**
- Leverage ENERGY STAR **campaigns, tools, and materials**

JOIN NOW @ www.energystar.gov
Summary of the ENERGY STAR External Power Supply Specification
What Is an External Power Supply (EPS)?

**Key Elements:**

- Is designed to convert line voltage ac input into lower voltage ac or dc output
- Is sold with, or intended to be used with, a separate end-use product that constitutes the primary load
- Is contained in a separate physical enclosure from the end-use product

*Note: Definition elements are an excerpt from the ENERGY STAR Program Requirements for Single Voltage External Ac-Dc and Ac-Ac Power Supplies*
EPS Market & Savings Strategy

• Broad applications for end-use products
  – More than 1 billion shipped worldwide/year
  – 5-10 in use in the average US home

• Power supply savings
  – ENERGY STAR’s focus to date has been on Standby for consumer and office electronics
  – Power supplies efficiency address Active Mode(s) by increasing efficiency in all modes of operation
  – Active mode accounts for nearly \( \frac{3}{4} \) of all power supply energy use
  – Many power supplies are as little as 30 to 60% efficient, but efficiencies of as high as 90% are achievable
Final specification released in December 2004

Specification sets:
- Minimum average efficiency for Active Mode
- Maximum energy consumption in No-load condition

Specification took effect in January 2005

For more information visit: http://www.energystar.gov/powersuppliesdevelopment
EPS Inclusion in Future ENERGY STAR Specifications

• Beginning **July 1, 2006**, the ENERGY STAR telephony specification will require the use of an ENERGY STAR qualified EPS in *cordless telephones* and *answering machines*.

• Similar EPS requirements will be added to all consumer and office electronics specifications, as appropriate.
## EPS Specification Levels

### Current (Tier I) Specification Levels

<table>
<thead>
<tr>
<th>Active Mode</th>
<th>No-load</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nameplate Output Power (Pno)</strong></td>
<td><strong>Required Efficiency</strong></td>
</tr>
<tr>
<td>≤ 1w</td>
<td>≥ 0.49*Pno</td>
</tr>
<tr>
<td>&gt;1-49w</td>
<td>≥ [0.09*Ln(Pno)]+0.49</td>
</tr>
<tr>
<td>&gt;49-250w</td>
<td>≥ 0.84</td>
</tr>
</tbody>
</table>

• **EPA intends to release Tier II levels**
  – Target effective date for Tier II is July 1, 2006
  – EPA is collecting data to finalize levels for Tier II
Other Elements of Specification

Testing / Reporting Requirements
- Use ENERGY STAR test method to calculate efficiency
- Report data for three randomly chosen units of the same model
  - All three units must meet ENERGY STAR levels in order to qualify
- Where applicable, test at both 115 V at 60 Hz and 230 V at 50 Hz

Labeling Requirements
- No mark on power supply unit itself
- ENERGY STAR mark required on Internet site and product packaging; encouraged on product literature and advertising
- Follow International Efficiency Marking Protocol as of January 1, 2006
ENERGY STAR Partnership Opportunity for Finished Product Manufacturers

- Recruiting Finished Product Manufacturers
  - Incorporate ENERGY STAR qualified EPSs into finished product designs
  - Use new ENERGY STAR graphic to promote products using ENERGY STAR qualified EPSs

Powered by an ENERGY STAR® qualified adapter for a better environment
<table>
<thead>
<tr>
<th>Company</th>
<th>Logo</th>
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<tbody>
<tr>
<td>Astec (Emerson)</td>
<td>ASTEC</td>
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<tr>
<td>Ault Incorporated</td>
<td>AULT</td>
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<tr>
<td>Celetronix USA Inc.</td>
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<tr>
<td>Delta Electronics Inc.</td>
<td>Delta</td>
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<td>FRIWO Mobile Power GmbH</td>
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<td>GlobTek Inc</td>
<td>GlobTek Inc.</td>
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<td>Hipro Electronics</td>
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<td>Leader Electronics, Inc.</td>
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<td>Li Shin International Enterprise Corporation</td>
<td>Li Shin International Enterprise Corporation</td>
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<td>Lite-On Technology Corporation</td>
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<td>Phihong USA Corporation</td>
<td>Phihong USA Corporation</td>
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<tr>
<td>Salcomp (ShenZhen) Co. Ltd.</td>
<td>Salcomp</td>
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</table>
Battery Chargers Temporarily Excluded from EPS Specification

ENERGY STAR® Program Requirements for Single Voltage External Ac-Dc and Ac-Ac Power Supplies

Eligibility Criteria

Below is the product specification for ENERGY STAR qualified single voltage external ac-dc and ac-ac power supplies. A product must meet all of the identified criteria if it is to be qualified as ENERGY STAR by its external power supply manufacturer.

1) **Definitions:** The goal of this ENERGY STAR external power supply specification is to recognize those models with an efficient ac-dc or ac-ac conversion process. Consistent with this goal and the test methodology, as described in Section 4, EPA has prepared detailed definitions of single voltage external ac-dc and ac-ac power supplies and other related terms as relevant to ENERGY STAR.

Please note the following products are temporarily excluded from this specification as outlined below:

- Those power supplies with battery charging functions intended to recharge batteries that power: 1) flashlights; or 2) end-use products whose *principal output* is mechanical motion, the movement of air, or the production of heat (e.g., power tools and rechargeable vacuums); or 3) detachable batteries for use in the end-use products described in #1 and 2 above. (While it is difficult to precisely delineate and categorize products in today’s converging marketplace, in general this exclusion applies to power tools and household appliances that produce heat, light, or motion. It does not affect computer and consumer electronics, such as laptops, digital cameras, monitors, CD players, cell phones, and cordless phones. Further, EPA recognizes that external power...
Why a Battery Charger Exclusion?

• Temporary exclusion developed for battery charger “systems”.

• Separate test procedure and specification required for battery charger systems
  – Intended to mirror how product is used
Examples of Excluded Products

Exclusion covers battery charging “systems” typically found in household appliances and power tools

Sample Products:

- **Personal Care Products**
  - Beard/Mustache Trimmers
  - Curling Irons
  - Hair Clippers
  - Shaver/Trimmer Combos
  - Toothbrushes/Plaque Removers

- **Floor Care Products**
  - Electric Sweepers
  - Vacuums
  - Hand-held Vacuums

- **Kitchen Appliances**
  - Can Openers
  - Hand Mixers
  - Hand Blenders
  - Power Knives

- **Power tools**
  - Screwdrivers
  - Drills
  - Rotary Tools
  - Hedge Trimmers
• Temporary exclusion expires **December 31, 2005**

• If no specification is finalized, these battery charging systems will be covered under the current EPS specification
Preliminary Savings Analysis
Energy Savings

Power Tools (17.5 Million Units in 2004)
  Average unit savings of ~18 kWh/yr
  Potential Savings in 2010: ~1 Billion kWh/yr

Cordless Vacuums (18 Million Units in 2010)
  Average unit savings of ~ 7 kWh/yr
  Potential Savings in 2010: ~125 Million kWh/yr
Opportunities for Energy Savings

• Tailor power use to power need
  – C/6 chargers
    • C rate
    • Variable charge rate
  – Slowest chargers
    • C rate
  – Fast chargers
Opportunities for Energy Savings cont’d

• Reduce power conversion losses
  – Slower chargers
    • 29% to 62% efficiency for charging (average ~44%)
    • 29% to 58% efficiency for maintenance mode (average ~41%)
  – Fast chargers
    • 46% to 87% efficiency for charging (average over 70%)
    • 13% to 52% efficiency for maintenance mode (average ~30%)

• Reduce standby losses
  – Battery presence switch
    • Power tool charger ~0 W
Product Research to Date
Battery Charging Efficiency Specification

• Under development – Spring 2005
• Would cover many products not currently covered by EPS specification
  – Floor care
  – Personal hygiene (e.g., shavers and toothbrushes)
  – Yard care
  – Power tools
  – Small kitchen appliances
Sample Products:

- **Personal Care Products**
  - Beard/Mustache Trimmers
  - Hair Clippers
  - Shaver/Trimmer Combos
  - Toothbrushes/Plaque Removers

- **Floor Care Products**
  - Electric Sweepers
  - Vacuums
  - Hand-held Vacuums
  - Robotic Vacuums

- **Kitchen Appliances**
  - Hand Mixers

- **Power tools**
  - Contractor Packs
  - Screwdrivers
  - Drills
  - Rotary Tools
  - Hedge Trimmers
  - Li-Ion
Products Tested

- Manufacturers voluntarily submitted products for testing
- 19+ Manufacturers Represented
- 88 products tested, for a variety of device types

Device Types Tested

- 40 Replacement Batteries
- 13 Shavers/Trimmers
- 12 Drills
- 6 Screwdrivers
- 6 Toothbrushes
- 3 Rotary Tools
- 2 Sweepers
- 2 Vaccums
- 4 Other

* Other: ATV Battery, Cordless Mixer, Hedge Trimmer, Power Quality Analyzer
Battery Characteristics

- Product voltages ranged from 1.2V to 28V
- Average voltage = 9.8 V, Median voltage = 9.6 V
- Battery chemistries tested: NiCad, NiMh, Li-Ion and Lead Acid
- NiCads currently dominate the market for tested products

Batteries Tested

<table>
<thead>
<tr>
<th>Battery Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NiCad</td>
<td>88%</td>
</tr>
<tr>
<td>NiMh</td>
<td>9%</td>
</tr>
<tr>
<td>Li-Ion</td>
<td>2%</td>
</tr>
<tr>
<td>Lead Acid</td>
<td>1%</td>
</tr>
</tbody>
</table>

Bar chart showing the number of units for each battery type at different voltage levels from 1.2V to 28V.
Market Coverage

• **Over 17.8 million shipments** of shavers and trimmers in 2003*

• **Over 10.2 million shipments** of electric tooth care products in 2003*

• **25.6 million battery packs** for power tools are expected to ship in 2005

• Data collected for products from **all 6 top selling shaver/trimmer manufacturers**

• Data collected for products from **4 of the top 5 selling power tool manufacturers**

*Not exclusively cordless models

Future Markets

- **Growing market** for cordless products - as battery technology improves, more products will move from corded to cordless
- **Power tool battery packs** expected to have a compound annual **growth rate of 4.4% over the next 5 years**
- NiCads currently dominate the market because of their relatively low price
- Li-Ion entering the power tool market
- Li-Ion already popular for consumer electronics (e.g., mobile phones, PDAs, notebook computers) where price is less of a barrier

Source: Power Packs for Portable Electronic Devices, Fifth Edition, Darnell Group
Ongoing Data Collection

- Current data gives adequate coverage for power tools and personal care products (i.e. shavers/trimmers, toothbrushes)
- Additional test data desired for kitchen appliances and floor care products
- Product testing and data collection will continue through the creation of the final specification
- Please continue to volunteer products for testing to ensure an accurate representation of current battery charger products!
Principles Behind Specification

- Keep specification simple
- Use actual energy consumption of battery chargers
  - User/product scenarios
  - Active
  - Battery maintenance
  - Standby (no load)
- Complex systems: let metering data drive decisions
  - smart chargers
  - C/6 chargers
• **Equipment**
  – Yokogawa 1600WT
    • High precision
    • Low measurement range
    • High frequency

• **Metering Period**
  – 24 hour test
  – Capture all modes

• **AC/ DC Measurement**
  – Observe conversion efficiency in various modes

• **AC only Measurement**
  – Focused on capturing energy use
Energy Use in Battery Systems

- Battery charging (directly useful energy)
- Additional needed to charge battery (Coulombic efficiency)
- Cell equalization
- Self discharge balance, mainly NmH, NiCad (battery maintenance)
- Losses in power conversion
- Standby
  - Used in sensing circuits
Battery Maintenance and Standby Dominant for a Fast Charger

- No Load (Stby) Losses: 19%
- Battery energy: 8%
- Additional required charge: 2%
- Charger Losses--Active: 3%
- Required battery maintenance: 9%
- Required cell equalization: 3%
- Additional energy input-BM: 33%
- Charger Losses--BM: 23%
Non-Active Losses Also Significant for Slow Chargers

- No Load (Stby) Losses: 9%
- Battery energy: 5%
- Additional required charge: 3%
- Charger Losses - Active: 14%
- Required BM: 5%
- Required CE: 3%
- Additional energy input - BM: 18%
- Charger Losses - BM: 43%
Normalize by Battery Energy, Battery Voltage

• Energy use a function of battery energy
  – Charging = \( (V_{\text{battery}} \times Ah_{\text{battery}}) \times k \)
  – Battery Maintenance = \( V_{\text{battery}} \times (C/\sim 30) \times \text{time} \)
    for NmH, NiCad

• Data show inverse relationship with battery voltage
48-hour “non-active” Energy Use: 90 Products

Battery Voltage

AC Wh/Battery Wh

Fast Chargers
Mod. + Slow Chargers
Lilon

n=90
Total Energy for 26 Products

Battery Voltage vs. Total Energy Wh/Battery Wh for n=26 products.
Non-Active Energy for 26 Products

![Graph showing the relationship between battery voltage and non-active energy consumption. The graph includes data points for 26 products, with battery voltage ranging from 1.2 to 30 volts and non-active energy ranging from 0 to 50 Wh.](image_url)
Observations

- Normalizing by battery energy looks viable
- Normalized energy use inversely proportional to battery voltage
- Large variation in energy use = savings opportunity
- Low voltage products have relatively high energy use, single cell (1.2 volt) have highest use
- “Fast” chargers have lower energy use, but overlap with “slow” chargers: 1 or 2 specification categories?
  *Fast ~<3.5 hours
Specification Options
Guiding Principles for ENERGY STAR Specification Development

- Significant energy savings potential
- Purchasers will recover their investment within a reasonable time period
- Product performance can be maintained or enhanced
- Efficiency can be achieved with multiple technology options that are diffuse in the market
- Product energy consumption & performance can be measured and verified with testing
- Labeling would differentiate products (recognize approx. top 25%) & be visible to purchasers

www.energystar.gov/productdevelopment
48-hour Energy Use: 90 Products

Battery Voltage vs. AC Wh/Battery Wh

- Fast Chargers
- Mod. + Slow Chargers
- LiIon

n=90
Observations

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  *Fast ~<3.5 hours
Option 1: Total energy
- Captures all energy use
- Sensitive to use scenario
  - Could require many use scenarios
  - Could invite disagreement
  - Difficult to compare products across categories
- More sensitive to small errors in measurement of battery capacity
Option 2: Maintenance and standby only

- Focuses on lowest efficiency mode, largest savings
  - Battery maintenance important, charging energy usually less important
  - Standby energy use of varying importance
- Robust, simple test
- Still focuses on top 25 percent of market
- Achieves similar savings to Option 1
- Avoids difficulties of Option 1
- May miss some additional saving opportunity for some products?
Sample Specification: Total Energy

Graph showing the relationship between Battery Voltage and Total Energy Wh/Battery Wh.

- **Total Energy Spec**: Dashed blue line
- **Total Energy**: Red diamonds

**n=26**
Sample Specification: Non-Active Energy

Battery Voltage vs. Non Active Wh/Battery Wh

- Non Active Spec
- Non Active Energy

n=26
Total Energy and Non-Active Energy Overlap

Battery Voltage

n=26
Total Energy and Non-Active Observations

- Approximately equal savings opportunities for products tested (< 3% Difference)
- Same products meet both specification options
- In either case, a well designed specification can achieve significant energy savings
Single Curve: May Need to Adjust for Multi-voltage Fast Chargers

![Graph showing the relationship between Battery Voltage and Non Active Energy/Nominal Battery Energy (Wh/Wh) for different chargers.]
Fast Charger Specification: Adjusted Curve

![Graph showing the relationship between battery voltage and non-active energy/nominal battery energy for different chargers. The x-axis represents battery voltage ranging from 7.2 to 24, and the y-axis represents non-active energy/nominal battery energy ranging from 0 to 30. The graph includes lines for Charger 1 to Charger 7, with one line representing the specification.](image)
Fast Charger Specification: Extra Slide

Battery Voltage vs. Non Active Energy/Nominal Battery Energy (Wh/W)

- Charger 1
- Charger 2
- Charger 3
- Charger 4
- Charger 5
- Charger 6
- Charger 7
- Specification
- Charger 8
- Charger 9
- Charger 10

Battery Voltage range: 7.2 to 24 V
Non Active Energy/Nominal Battery Energy range: 0 to 30 Wh/W
Potential Issues
Open Questions

• Single cell (1.2 V) products use 40 or more times the capacity of the battery each 48 hours—how to address?
• Should a specification include all energy used or only battery maintenance and standby energy used?
• Should inductive coupled devices be treated differently?
• Efficient diode, rectifier opportunities
• Do cord/cordless products use more energy than cordless devices?
Cord/ Cordless v. Cordless

![Graph showing battery voltage comparison between Cord/Cordless and Cordless devices.](image-url)
Energy Use: by voltage, product

- Cordless Shavers/Trimmers
- Cordless Toothbrushes

Battery Voltage vs. AC Maintenance Energy/Battery Energy (Wh/Wh)
Discussion of Other Key Elements of Specification

Battery Charger Definitions
Test Methodology
Effective Date
Scope of the Specification

- Covers products excluded from EPS specification
  - motor driven battery charged products and other battery charged products without separable EPSs

- May require fine tuning to include additional product types
Definitions in Progress

Device Types
- Battery Operated
- Cord / Cordless
- Inductive Coupling

Battery Packs
- Rechargeable
- Detachable / Integrated

Test / Measurement Terminology
- Battery Chemistry
- Nominal Voltage
- Battery Capacity
- Rated Capacity
- Battery Energy
- Accumulated Energy
- Energy Ratio
**Battery Charger** – A device intended to replenish the charge in a rechargeable battery. The battery charger will connect to the mains at the power input and connect to the battery at the output. The charger may be comprised of more than one enclosure and may or may not be all or partially contained in the end-product.

**Definition intended for:**
- Chargers designed for rechargeable battery chemistries (e.g., lead acid, NiMh, NiCad, Li-Ion)
- Batteries with voltages < 42 volts
- Able to be tested at 115 VAC and/or 230 VAC
- Maximum input power between 1 watt and 150 watts
Important operating modes:

**Active Mode** – Mode of operation where the battery is taking on the main charge.

**Standby (No-Load) Mode** – Mode of operation where no battery is present in the charger, but the charger is still plugged in and drawing power.

**Battery Maintenance Mode** – Mode of operation where the battery is still connected to the charger, but is fully charged. Charger may perform functions such as cell equalization, and cell discharge balance while in this mode.
Important energy terminology:

**Accumulated Energy** ($E_a$) - The energy, reported in watt-hours (Wh), consumed by the battery charger in a particular mode of operation or in several modes of operation over a defined period.

**Battery Energy** ($E_b$) – The product of the rated battery capacity ($C$) and the nominal battery voltage ($V_b$), expressed in Wh. $E_b = C \cdot V_b$.

**Energy Ratio** (ER) – The ratio of the accumulated energy ($E_a$) divided by the battery energy ($E_b$). $ER = \frac{E_a}{E_b}$. 
Test Methodology

• Must develop a well-defined test procedure
  – Generates repeatable results and allows for objective comparisons among products

• Final test method will be dependent on which specification approach is chosen
  – Total energy vs. particular modes of operation
  – Active vs. Non-active
Test Procedure: Preparation

1. Record essential information about the product
   - Make and model number
   - Battery chemistry
   - Battery capacity
   - Nominal voltage of pack
   - Coupling system used

2. Completely drain battery pack prior to testing
   - Discharge detachable battery packs at < 2C
   - Discharge integrated battery packs by operating the product until it becomes incapable of functioning

3. Disconnect any applicable subsystems (primarily in integrated battery products) to ensure no parasitic power loss during testing
3. Connect battery charger and leave charging for 24 hrs
   - Collect accumulated energy ($E_a$) for active mode if required
   - Shorter periods may be used if this would not effect the test results

4. After the 24 hour period has passed, measure accumulated energy ($E_a$) for the next 48 hours
   - 36 hours of battery maintenance (fully charged battery connected to charger)
   - 12 hours of standby (battery / device disconnected from charger)

5. Use battery energy ($E_b$) to compute the energy ratio (ER) for accumulated energy values collected
   - This normalizes energy consumption by capacity
Test Procedure: Test Cycle

- **Charging Cycle**
- **Active Mode** (variable time)
- **Battery Maintenance**
- **Standby**
Effective Date

The date that manufacturers may begin to qualify and promote products as ENERGY STAR will be defined as the effective date of the specification.

The proposed ENERGY STAR battery charger effective date is January 1, 2006.
Battery Charger Specification
Timeline & Next Steps
Tentative Schedule

• Mid July
  – EPA creates and releases Draft 1 of the Battery Charger specification and Test Method for stakeholder comment. EPA begins to plan marketing/communications efforts for battery chargers.

• August
  – EPA reviews stakeholder comments, conducts additional testing where needed, and analyzes results, options, etc. EPA will post stakeholder comments on the ENERGY STAR Web site, when agreed to by author.

• September
  – EPA addresses feedback and releases the Final Draft for comment. EPA hosts Web cast to summarize key changes and rationale.

• October
  – EPA reviews latest set of comments and discusses issues with stakeholders as needed.

• November
  – EPA releases Final specification.

• December
  – EPA signs up new partners and discusses 2006 marketing plans.
Partnership Agreement: Standardized format that captures the fundamental program requirements of ENERGY STAR

Partner Commitments include:

- Meet Eligibility Criteria (i.e., energy-efficiency specification)
- Qualify one product within three months of joining ENERGY STAR and then update product lists regularly
- Use clear and consistent ENERGY STAR labeling on product packaging, Internet site, etc.
- Provide unit shipment data on an annual basis to EPA
Partnering with ENERGY STAR (cont.)

- No new paperwork for already existing EPS partners

- Appliance and power tool manufacturers join ENERGY STAR by signing a Partnership Agreement (PA)
  - To request a PA, please contact Brooke Taylor, ICF Consulting, btaylor@icfconsulting.com
Contact Us

• US EPA
  – Andrew Fanara
    • 202-343-9019
    • fanara.andrew@epa.gov

• Technical Questions
  – David Korn, The Cadmus Group, Inc.
    • 617-673-7116
    • dkorn@cadmusgroup.com

• Program and Partnership Questions
  – Robin Clark, ICF Consulting
    • 202-862-1223
    • rclark@icfconsulting.com