



ENERGY STAR® Program Requirements for Products with Battery Charging Systems (BCSs)

DRAFT Eligibility Criteria

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Below is the specification for ENERGY STAR qualified battery charging systems packaged with a variety of end-use products. A battery charging system must meet all of the identified criteria if it is to be qualified as ENERGY STAR by its manufacturer.

- 1) **Definitions:** The goal of this ENERGY STAR battery charging systems specification is to recognize efficient battery charged models. While addressing a different set of product designs, this specification is intended to complement the existing ENERGY STAR external power supply specification. Manufacturers shall carefully examine their product designs and compare them to the detailed definitions for battery charging systems (see 1.A and 1.B below) and external power supplies (visit www.energystar.gov/powersupplies) to determine the appropriate specification for ENERGY STAR qualification. Manufacturers may only qualify individual models under one specification (i.e., external power supply OR battery charging system) that best reflects the power supply and product design. Below are detailed definitions of battery charging systems and other related terms as relevant to ENERGY STAR.

Note: *The external power supply specification applies to separable external power supplies designed to convert line voltage ac into lower voltage ac or dc output. See www.energystar.gov/powersupplies for the full definition. Product models meeting this definition shall be tested under the ENERGY STAR External Power Supply Test Method and, where appropriate, qualified as ENERGY STAR under the external power supply specification.*

The battery charging systems specification, on the other hand, primarily applies to: motor-driven battery charged products; products whose principal output is heat, light, or motion; and small consumer battery chargers. In the battery charging systems specification, the battery may be either separable from or integral to the end-use product. Please see below for the complete definition. Product models meeting this definition shall be tested under the ENERGY STAR Battery Charging System Test Method (see Section 4) and, where appropriate, qualified as ENERGY STAR under the battery charging systems specification.

Manufacturers are strongly encouraged to contact EPA with questions or uncertainties about ENERGY STAR eligibility.

General

- A. **Battery (also Battery Pack):** An assembly of one or more rechargeable cells intended to provide electrical energy to an end-use product. Rechargeable cells are any of a number of established cell chemistries intended for repetitive discharge and recharge. Primary alkaline cells are not considered rechargeable. Batteries may be in one of the following forms:
 - a) **Detachable Battery:** A battery that is contained in a separate enclosure from the end-use product and is intended to be removed or disconnected from the end-use product for recharging.
 - b) **Integral Battery:** A battery that is contained within the end-use product and is not removed from the end-use product for charging purposes. A battery that is to be removed from the end-use product for disposal or recycling purposes only is considered to be an integral battery.
- B. **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 multiple components, in more than one enclosure, and may be all or partially contained in the end-use product.

- 69 **Device Types**
70 C. Battery Operated End-use Product: Product or appliance fully powered by the battery at least part
71 of the time.
72
73 D. Cord/Cordless: Product or appliance that is capable of operation with the battery or from the
74 power cord when plugged into an electrical outlet.
75
76 E. Inductive Coupling: The transfer of energy from one circuit to another by means of mutual
77 inductance between the two circuits. Inductive charging relies on the magnetic induction of
78 electricity rather than metal-to-metal contact, limiting the possibility of electric shock or a short
79 circuit. Certain small household appliances, such as cordless toothbrushes and shavers, use
80 inductive charging.
81

82 **Operational Modes**

- 83 F. Active Mode: The condition in which the battery is receiving the main charge.
84
85 G. Battery Maintenance Mode: The condition in which the battery is still connected to the charger, but
86 is fully charged. Charger may perform functions such as cell equalization, and cell discharge
87 balance while in this mode.
88
89 H. Standby (No-Load) Mode: Lowest power consumption mode which cannot be switched off
90 (influenced) by the user and that may persist for an indefinite time when an appliance is
91 connected to the main electricity supply and used in accordance with the manufacturer's
92 instructions. Note: The standby mode is usually a non-operational mode when compared to the
93 intended use of the appliance's primary function.¹ For the purposes of this specification, standby
94 mode is the condition in which no battery is present in the charger, or where the battery is integral
95 to a product, the product is not attached to the charger, but the charger is plugged in and drawing
96 power.

Note: The above standby definition is consistent with IEC 62301. The standard is available at www.iec.ch.

- 97
98 **Test/Masurement Terminology**
99 I. Accumulated Non-Active Energy (Ea): The energy, in watt-hours (Wh), consumed by the battery
100 charger in battery maintenance and standby modes of operation over a defined period. For the
101 purposes of this specification, the 48-hour period consists of 36 hours of maintenance mode
102 operation followed by 12 hours of standby mode operation. The accumulated non-active energy is
103 the sum of the energy use in these two modes.
104
105 J. Battery Capacity: The quantity of charge, indicated by the symbol C and measured in ampere-
106 hours (Ah), capable of being provided by a battery during discharge, the conditions of discharge
107 being specified.
108
109 K. Rated Battery Capacity: The battery capacity, in amp hours, as specified by the manufacturer of
110 the cells. If such information is not available, the battery may be evaluated by the methods of IEC
111 61951-1 and IEC 61951-2.
112
113 L. Nominal Battery Voltage (Vb): The highest terminal voltage of the battery intended to provide
114 operating voltage to the end-use product. The nominal battery voltage is an equilibrium voltage at
115 standard temperature and pressure.
116
117 M. Nominal Battery Energy (Eb): The product of the rated battery capacity and the nominal battery
118 voltage (Vb), expressed in Wh.
119
120 N. Non-Active Energy Ratio (ER): The ratio of the accumulated non-active energy (Ea) divided by the
121 nominal battery energy (Eb). $ER = Ea / Eb$.
122

¹ This definition is consistent with IEC 62301: Household Electrical Appliances – Measurement of Standby Power.

- 123 2) **Qualifying Products:** This ENERGY STAR specification applies to battery charging systems
 124 packaged with portable, rechargeable products, including but not limited to small household
 125 appliances, power tools (i.e., end-use products whose principal output is mechanical motion, the
 126 movement of air, or the production of heat) and flashlights. In addition, the battery charging systems
 127 included with these products must meet the following conditions:
 128 - Chargers intended for rechargeable battery chemistries (e.g., Nickel Cadmium, Lead Acid,
 129 Lithium Ion and Nickel Metal Hydride) and not for primary cell chemistries (e.g., alkaline
 130 “dry” cells);
 131 - Chargers that do not rely on inductive coupling; inductively coupled devices are excluded
 132 from this energy-efficiency specification;
 133 - Batteries with voltages less than 42 volts; and
 134 - Chargers with maximum input power between 1 and 150 watts.
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136 In order to qualify as ENERGY STAR, a model must meet the above parameters and the efficiency
 137 criteria provided in Section 3, below.
 138

139 Please note that single voltage external power supplies (including some that use the power supply’s
 140 dc output to charge batteries) and the end-use products they power are covered under separate
 141 ENERGY STAR agreements (“ENERGY STAR Program Requirements for Single Voltage External
 142 Ac-Dc and Ac-Ac Power Supplies” and “ENERGY STAR Program Requirements for End-Use Products
 143 Using External Power Supplies”). Visit www.energystar.gov/powersupplies for additional information.

Note: *This Draft 1 specification covers an array of end-use products with battery charging systems, including small household appliances, power tools, digital cameras, small consumer battery chargers, and toys. EPA intends to cover a broad range of products under this specification and welcomes stakeholder feedback on additional product areas for testing and analysis. Interested manufacturers also are encouraged to voluntarily provide data.*

- 144
 145 3) **Energy-Efficiency Specifications for Qualifying Products:** To be eligible for ENERGY STAR
 146 qualification, a battery charging system must not exceed a maximum Non-Active Energy Ratio, which
 147 is based on the nominal battery voltage (Vb). The maximum allowed Non-Active Energy Ratios are
 148 provided in Table 1 below.
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Table 1: Energy-Efficiency Criteria

Nominal Battery Voltage (Vb)	Non-Active Energy Ratio
≤ 1.5	≤ 30
1.5 < Vb ≤ 3.0	≤ 21.5
3.0 < Vb ≤ 6.5	≤ 15.0
6.5 < Vb ≤ 13.0	≤ 8.5
13.0 < Vb ≤ 42.0	≤ 3.5

Note: *In this Draft 1 specification, EPA has decided to focus on Non-Active modes (i.e., battery maintenance and standby) because they offer the largest potential for energy savings and can be consistently measured through a robust and easy-to-use test method. While a total energy approach including Active mode has the benefit of addressing all operational modes, it also would require usage scenarios/assumptions per product area and may introduce measurement inconsistencies. EPA remains interested in addressing Active mode and will continue to support research in this area.*

EPA has chosen Energy Ratio as its performance metric because it allows data to be normalized based on battery energy. EPA believes the proposed approach treats all product categories equitably, but welcomes additional comments or insights from stakeholders.

Consistent with the ENERGY STAR guiding principles, the proposed specification represents the top 24% of models from EPA’s data set, which includes 92 new power tool, household appliance, yard care, and personal care models.

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- 4) **Test Methodology:** The specifics for testing the energy efficiency of a battery charging system are outlined in a separate document titled “Test Method for Determining the Energy Efficiency of Battery Charging Systems (Draft, July 2005),” which is available on the ENERGY STAR Web site. The test results produced by this procedure shall be used to determine if a model qualifies as ENERGY STAR. In addition, below are four ENERGY STAR-specific testing requirements.

Note: For a copy of the test methodology, visit http://www.energystar.gov/index.cfm?c=new_specs.batterychargerdevelopment.

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- A. **Safety Standards:** ENERGY STAR qualified battery charging systems shall comply with applicable safety standards from UL, CSA, and other global standards organizations. It is the Partner’s responsibility to ensure that its products meet applicable local safety standards based on where the product will be sold.
- B. **Number of Units Required for Test:** Testing shall be conducted by the manufacturer or its authorized representative on three randomly chosen units of the same model. Manufacturers shall report Energy Ratio values for all three units as well as the average values. To qualify as ENERGY STAR, all three units must meet the ENERGY STAR specification; however, the average of the three test values will be displayed on ENERGY STAR’s qualifying product list (see Section 4.D below).
- C. **Models Capable of Operating at Multiple Voltage/Frequency Combinations:** Manufacturers shall test their products based on the market(s) in which the models will be sold and promoted as ENERGY STAR qualified. EPA and its ENERGY STAR Country Partners have developed the following table with three voltage/frequency combinations for testing purposes:

Supply Voltage:	North America/Taiwan:	115 Volts AC, 60 Hz
	Europe/Australia/New Zealand:	230 Volts AC, 50 Hz
	Japan:	100 Volts AC, 50 Hz/60 Hz

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For products that are sold as ENERGY STAR in multiple international markets and therefore rated at multiple input voltages, the manufacturer must test at and report the required power consumption or efficiency values at all relevant voltage/frequency combinations. For example, a manufacturer that is shipping the same model to the United States and Europe must measure, meet the specification, and report test values at both 115 Volts/60 Hz and 230 Volts/50 Hz in order to qualify the model as ENERGY STAR in both markets. If a model qualifies as ENERGY STAR at only one voltage/frequency combination (e.g., 115 Volts/60 Hz), then it may only be qualified and promoted as ENERGY STAR in those regions that support the tested voltage/frequency combination (e.g., North America and Taiwan).

- D. **Submission of Qualified Product Data to EPA:** Partners are required to self-certify those product models that meet the ENERGY STAR guidelines and report information to EPA. ENERGY STAR qualifying product lists, including new models as well as notification of discontinued models, must be provided at least semi-annually. If no new models are introduced during a six-month timeframe, manufacturer should notify EPA to ensure its partnership status is maintained.

193 5) **Effective Date:** The date that manufacturers may begin to qualify and promote battery charging
194 systems as ENERGY STAR will be defined as the *effective date* of the agreement. The ENERGY
195 STAR battery charging systems effective date is January 1, 2006.

Note: Battery charging systems typically found in household appliances and power tools are currently excluded from qualifying as ENERGY STAR under the external power supply specification; the temporary exclusion ends on December 31, 2005. EPA is proposing that the new battery charging systems specification take effect on January 1, 2006, which is immediately following the expiration date for the exclusion. Once the battery charging systems specification is finalized, EPA will update the external power supply specification to remove any references to the exclusion and to add language directing stakeholders to the new battery charging systems specification.

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197 6) **Future Specification Revisions:** EPA reserves the right to change the specification should
198 technological and/or market changes affect its usefulness to consumers, industry, or the environment.
199 In keeping with current policy, revisions to the specification are arrived at through stakeholder
200 discussions. In the event of a specification revision, please note that ENERGY STAR qualification is
201 not automatically granted for the life of a product model. To qualify as ENERGY STAR, a product
202 model must meet the ENERGY STAR specification in effect on the model's date of manufacture. The
203 date of manufacture is specific to each unit and is the date on which a unit is considered to be
204 completely assembled.