

ENERGY STAR Draft 1 Specification for UPSs Comment Summary

Topic	Subtopic	Comment	EPA Response
Communications and Measurement		<p>Most stakeholders indicated that in consumer and commercial applications either no metering is required or the display on the UPS is adequate. UPSs for these applications either do not provide metering or require an additional card. Therefore, a communication requirement has the potential of burdening smaller UPS products with unjustified additional cost and power consumption.</p> <p>Stakeholders commented that requiring meters would be unnecessary, duplicative, burdensome, and in some cases less accurate---in particular, UPS meters will be less accurate than standalone meters when:</p> <ul style="list-style-type: none"> * The standalone meter is installed near the server rack, thereby including any conduction losses between the UPS and the rack * The UPS is in bypass * The standalone meter is also used to provide forensic data on powerline disturbances * Multiple UPSs are deployed in parallel <p>Several stakeholders also commented that it would be difficult to standardize the differing communication protocols currently in use; furthermore, there may not even be a need, since building management systems (BMSs) already perform this function. Finally, reading a meter that is a part of the UPS could pose a risk to operation of the UPS.</p> <p>In contrast, one stakeholder did suggest that the UPS should always be able to communicate its energy efficiency using a TCP/IP-based protocol. Lastly, one stakeholder requested that temperature reporting not be required as there is no standard location for it to be measured on UPSs (in contrast to servers, where temperature can be measured at the air inlet).</p>	<p>EPA recognizes that standalone meters provide additional benefits in a variety of situations. EPA has heard these concerns and plans on holding a further discussion with UPS manufacturers about the ENERGY STAR Buildings program to ensure that the concerns of both manufacturers and the Buildings program are given a fair review.</p> <p>In the meantime, EPA is proposing that partners report the communication and measurement capability (either as-shipped or following installation of any necessary add-ons) on the Power and Performance Data Sheet for all ENERGY STAR qualified UPS products. Communication capabilities will become increasingly important and given the long life of data center UPS such documentation is prudent.</p>
Efficiency Requirements	Classification	<p>Stakeholders recommended that EPA classify UPSs into nine categories for setting specification levels, by input dependency characteristic and output power, and focus on the ranges of output power where there are many units sold.</p>	<p>EPA has adopted stakeholders' suggested classification UPSs into nine categories according to the following:</p> <p><u>Input Dependency Characteristic</u></p> <ul style="list-style-type: none"> i) Voltage and Frequency Dependent (VFD) ii) Voltage Independent (VI) iii) Voltage and Frequency Independent (VFI) <p><u>Product Class (rated output power)</u></p> <ul style="list-style-type: none"> i) Consumer ii) Commercial iii) Data Center

ENERGY STAR Draft 1 Specification for UPSs Comment Summary

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Efficiency Requirements	Data Assembly & Analysis	Stakeholders commented that data in the 200-10,000 kVA range looks peculiar, in particular, the six samples that qualified under VI and the other six samples that qualified under VFD. Stakeholders requested that EPA follow up with manufacturers with any data questions.	EPA has contacted manufacturers and manufacturers have confirmed that test results have been classified correctly, in cases where the measured efficiency was contrary to expectations (i.e., higher or lower than that of the majority of units tested at a given output power and input dependency characteristic).
Efficiency Requirements	Levels	<p>Stakeholders commented that EPA base its efficiency requirements on kW, not kVA, and use sloped lines or stepwise functions to better fit the data (i.e., a straight line may not fit the data at either end of output power).</p> <p>Many stakeholders were concerned that performance levels based on the top 20% most efficient units will be too stringent, and recommended loosening the requirements to include the top 25%, especially in this first version of the specification. A more stringent Version 1 specification level may discourage participation by manufacturers, who are already concerned with the uncertainty of the certification and verification processes and the efficiency impacts of manufacturing variation.</p>	<p>As requested by stakeholders, EPA has based the efficiency requirements on kW instead of kVA.</p> <p>EPA has considered the reasons cited for less stringent efficiency levels and has proposed Draft 2 specification levels corresponding to the top 25-30% of available models in each classification.</p>
Efficiency Requirements	Loading	Several stakeholders proposed using different loading profiles for UPSs in the consumer, commercial, and datacenter categories, with heavier loading at the lower output powers. One stakeholder commented that manufacturers should also report efficiency at each loading point---in addition to the average---at the higher output powers.	<p>EPA appreciates the suggestions for alternative loading profiles and has revised the average efficiency formula for each output power classification.</p> <p>One stakeholder suggested that EPA conduct a market study with industry participation to obtain up-to-date data for UPS loading. EPA believes this would be very beneficial to both the ENERGY STAR UPS specification and to the UPS industry. Some data relevant to data center UPSs has already been collected by the ENERGY STAR Buildings program. In Draft 2, EPA is proposing to base its loading profile on this empirical data, supplemented by typical loading assumptions, as suggested by commenters. EPA proposes to require reporting efficiency data at each loading point in the PPDS.</p>
Efficiency Requirements	Manufacturing Variation	Stakeholders commented that EPA should lower its proposed efficiency levels to account for unit-to-unit differences in efficiency due to manufacturing variation, as manufacturers are unlikely to pursue qualification of units that are too close to the specification line.	EPA will loosen the specification levels in Draft 2 such that more units tested in each classification qualify (up from 20% in Draft 1). Based on comments received, EPA expects this will provide sufficient margin for manufacturers to qualify models despite any unit-to-unit variation.

ENERGY STAR Draft 1 Specification for UPSs Comment Summary

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Efficiency Requirements	Modes of Operation	<p>Some stakeholders disagreed with the proposal to test and qualify UPSs in Eco Mode, as this could lead to incorrect comparisons between UPSs with different capabilities, though one encouraged EPA to include Eco Mode efficiency on the PPDS. This stakeholder further commented that end users operate UPSs almost exclusively in their most-protective mode as it is usually impossible to determine the ride-through capabilities and other electrical compatibility requirements of the load equipment (required to ensure safe operation in Eco Mode). Additionally, this stakeholder noted that the inclusion of Eco Mode may incentivize vendors to invest heavily in improving the efficiency of alternative modes and cease improving the performance of the highest-protective mode.</p> <p>On the other hand, another stakeholder expressed support for testing multi-mode UPSs in their highest efficiency mode and using the efficiency requirements for that mode as the primary means for ENERGY STAR qualification provided that the UPS can switch modes within industry accepted performance boundaries.</p>	<p>Despite the differences of opinion surrounding Eco Modes, EPA sees the potential for significant energy savings and therefore is proposing to incentivize the qualification of multi-mode UPSs in Draft 2. In particular, multi-mode UPSs shall be tested in their highest- and lowest-input dependency mode and shall meet the efficiency for the lowest-input dependency protective mode (i.e., VFI or VI). However, the efficiency used for qualification shall be a weighted average of the two modes. The efficiency in both modes shall be reported on the power and performance datasheet (PPDS).</p> <p>Stakeholders also clarified that IEC 62040-3 defines the capability of the UPS, but does not specify the time that it takes an UPS to switch from VFD and/or VI to VFI modes. EPA concedes that this transition time is important for UPS end-users and proposes to require reporting of transition times on the PPDS for multi-mode units.</p>
Efficiency Requirements	Power Factor	<p>Stakeholders suggested that input power factor requirements be excluded from the ENERGY STAR criteria since high efficiency UPSs typically have high input power factor and the upstream losses related to power factor are small.</p>	<p>EPA agrees with the commenters and has not included power factor requirements in the Draft 2 specification due to the already high power factor achieved by currently existing units. The units that manufacturers shared with EPA had an average power factor of 0.98.</p>
Efficiency Requirements	Savings	<p>Stakeholders commented that EPA's high-power (> 20 kVA) analytical category was too broad to be meaningful and also recommended comparing the savings against organic efficiency growth.</p>	<p>EPA thanks stakeholders for their comments and will evaluate the high output power category with more granularity when next calculating savings, if the available data allow.</p>
General	Battery Location	<p>One stakeholder suggested that ENERGY STAR promote the common practice of separating UPS electronics from the batteries and removing them from the cooled area, to reduce the energy consumption of datacenter cooling equipment.</p>	<p>EPA agrees that separating UPS electronics from the batteries and removing them from the cooled area reduces energy use and proposes requiring manufacturers to include information about the separability of the UPS and battery in the PPDS.</p>

ENERGY STAR Draft 1 Specification for UPSs Comment Summary

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General	Enhanced Testing & Verification	Stakeholders expressed concern with DOE's enforcement testing and its application to UPSs. In particular, test results might vary from unit to unit such that originally claimed efficiencies may not be reproduced.	<p>EPA notes stakeholders concerns regarding potential test result variation within the same model and the impacts on verification testing. As specified in EPA Directive No. 2011-04 "ENERGY STAR Verification Testing for Certification Bodies - Test Sample Sizes and Determining Testing Failures (Non-Lighting Products)" (available at www.energystar.gov/ia/partners/downloads/mou/ES_Product_Certification_Directive_2011_04_Test_Sample_Sizes.pdf), products that are qualified based on a single test must meet the specification following verification testing of only one unit. On the other hand, products shall be verified using a sample consisting of 4 units and a T-test only if the ENERGY STAR specification allows for and the manufacturer chooses to qualify a product based on a statistical combination of tests on multiple units.</p> <p>EPA welcomes stakeholder suggestions on ways to minimize the impacts of testing variation within the constraints of the Third Party Certification process described at www.energystar.gov/testingandverification.</p>
General	Timeline	Stakeholders indicated that the timeline and proposed effective date of September 1, 2011, is too aggressive and may not allow for adequate discussion of the draft specifications and full preparation for the third-party certification process. One stakeholder requested that the EPA delay the effective date of the program by 90 or 120 days after the publication of the final program requirements suggesting January 1, 2012 as an alternative.	Typically, new ENERGY STAR specifications take effect directly upon finalization to allow manufactures to immediately label and promote models that currently meet the specification requirements. EPA has sought to minimize any difficulties relating to the transition by involving certification bodies (CB's) throughout the development of the specification.
General		One stakeholder expressed general support for the Draft 1 specification and several other stakeholders commented that customers have been asking for increased efficiency so the specification comes at an opportune time. However, some stakeholders were concerned that UPSs are unlike other products currently covered by the ENERGY STAR program and were interested what form the labeling will take.	EPA recognizes the challenges in labeling data center products and plans to take a similar approach as other ENERGY STAR covered products, such as servers. (See http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DC for more information.)
Scope and Definitions	DC-Output UPSs	Stakeholders recommended that EPA include DC-output UPSs in the scope, and at the very least ENERGY STAR should follow the DC-output market. One stakeholder suggested that ENERGY STAR clarify the definition of DC-output UPS since most manufacturers refer to these as "rectifiers."	<p>Recognizing that DC-output systems are prevalent in the telecom market, EPA has retained them in the scope of the program and is proposing specification levels for them in the Draft 2 specification.</p> <p>Since many industry stakeholders refer to DC-output UPSs as rectifiers, EPA has included this terminology in the Draft 2 specification.</p>

ENERGY STAR Draft 1 Specification for UPSs Comment Summary

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Scope and Definitions	Distributed UPS	One stakeholder suggested that EPA should monitor the development of distributed UPSs (units that are part of the individual server power supply) for possible inclusion in future versions of the UPS specification.	EPA welcomes stakeholder comments regarding the applicability of different and novel technologies to ENERGY STAR specification for UPSs and will continue to evaluate the inclusion of distributed UPSs in a future specification revision.
Scope and Definitions	General	<p>Stakeholders emphasized that EPA should align with IEC 62040-3 Edition 2 where feasible: definitions, test methods, and reporting formulas should remain identical. However, ENERGY STAR should provide supplemental definitions and consider referencing additional sources including the European Code of Conduct on Energy Efficiency and Quality of AC Uninterruptible Power Systems.</p> <p>Stakeholders commented that EPA should clarify whether industrial UPS are included in the scope, while one stakeholder asked that they be excluded. Another stakeholder recommended that Utility & Community Energy System UPSs, Safety & Emergency UPSs, Cable TV UPSs and rectifiers of all types not intended for use as UPSs be explicitly excluded.</p> <p>Also, one stakeholder suggested classifications and definitions for each market segment (consumer, commercial, and datacenter) based on output power, while another recommended removing definitions not used in the Efficiency Requirements or Test Method.</p>	<p>EPA has aligned the definitions and concepts, where applicable, with those referenced in IEC 62040-3 Edition 2. As the specification development process advances, EPA will continue to take this approach of incorporating industry accepted terminology within the specification, test method, and accompanying documentation.</p> <p>EPA has amended the scope section of the specification to include commercial UPSs that are used only in datacenter, office, or home environments, as well as DC-output UPS for telecom. Industrial UPSs, Utility & Community Energy System UPSs, Safety & Emergency UPSs, and Cable TV UPSs have been explicitly excluded from the scope.</p>
Scope and Definitions	Input Dependency Characteristics	One stakeholder noted that the term "Input Dependence Characteristic" should be replaced with "Input Dependency Characteristic" to be consistent with IEC 62040-3 Ed. 2. One stakeholder also commented that the mischaracterization of Input Dependency Characteristics experienced during the initial data collection was due to lack of familiarity with the IEC 62040-3 and suggested that involvement by Certification Bodies and listing the topology on the PDDS would serve as additional checks on the declared Input Dependency Characteristic.	<p>EPA has replaced "Input Dependence Characteristic" with "Input Dependency Characteristic" to be consistent with IEC 62040-3 Ed. 2.</p> <p>Furthermore, it is EPA's understanding that IEC 62040-3 is a widely accepted and familiar standard among stakeholders in the UPS industry. As such, EPA will continue to coordinate with stakeholders, including Certification Bodies and manufacturers, in assuring the correct usage of all terminology used in the specification.</p>
Scope and Definitions	Modularity	One stakeholder conveyed that there is a lack of consensus regarding the definition of modularity within the UPS industry and another stakeholder suggested an alternative definition that takes into account the overlap between modularity and redundancy. Finally, another stakeholder supported EPA's proposal to test modular UPSs at their smallest and largest capacity configuration.	Per stakeholder suggestion, EPA has revised the definition of modular UPS in Draft 2 to reflect the overlap between modularity and redundancy and welcomes comment. EPA is continuing to propose that modular UPSs be tested at their minimum and maximum configuration.

ENERGY STAR Draft 1 Specification for UPSs Comment Summary

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Scope and Definitions	Multi-Mode UPS	<p>One stakeholder noted that if a multi-mode UPS is functioning properly, i.e., changing automatically from VFD and/or VI to VFI when necessary, then it should be categorized as a VFI. Another stakeholder proposed the following alternative definition for multi-mode UPS: "a UPS capable of operation in more than one normal mode of operation. Typically each normal mode will have a different Input Dependency Characteristic."</p> <p>Stakeholders disagreed on whether or not EPA should use the ITI-CBEMA curve to categorize the capabilities of multi-mode UPSs, as it may no longer reflect the current capabilities of equipment.</p>	<p>EPA is proposing to define multi-mode UPSs as "able to function within the parameters of more than one set of input dependency characteristics."</p>
Scope and Definitions	Parallel & Redundant UPS	<p>Although one stakeholder recommended that EPA not consider redundancy in the specification since the weighted load levels for average efficiency will account for the difference in loading due to redundancy, other stakeholders requested that EPA differentiate between different redundancy levels, in particular N+1, where additional control electronics consume more power.</p> <p>However, stakeholders further noted that manufacturer may have no information regarding the redundancy configuration employed by the end-user, and suggested either testing all units as N+0 or as shipped to the customer.</p>	<p>As the average efficiency calculation takes into account the typical loading in datacenters (including as a result of redundancy), EPA is continuing to propose that all units be tested in their non-redundant configuration, if available.</p> <p>Furthermore, as EPA is proposing to require reporting of efficiency at each loading point on the power and performance datasheet (PPDS), customers will still be able to estimate the efficiency at their particular loading and redundancy configuration.</p>
Scope and Definitions	Reference Test Load	<p>One stakeholder questioned whether a UPS is allowed to be backfed into the input AC supply as permitted under the definition for Reference Test Load (Footnote 5).</p>	<p>The definition for Reference Test Load comes from IEC 62040-3, an established industry standard. EPA plans to abide by the standard to the extent possible. EPA therefore requests additional stakeholder input for deviating from any of its provisions.</p>

ENERGY STAR Draft 1 Specification for UPSs Comment Summary

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Scope and Definitions	Refurbishment	Most stakeholders expressed support for eligibility of refurbished models, though they disagreed whether refurbished units should meet the same performance levels as new equipment (i.e., the performance levels in effect when they are re-sold) or the performance levels in effect when they were first manufactured, underscoring the difference between "refurbished" versus "used".	<p>EPA will not create a specific category for refurbished UPSs; however, it will continue to include them within the specification. Partners wishing to label refurbished units shall qualify them to the ENERGY STAR program requirements in effect at the time the units are refurbished for sale. Similar to other ENERGY STAR product categories with a large market for refurbished units, EPA is proposing that refurbished UPSs be qualified based on a standard combination of original unit and a refurbishment kit; all units refurbished in the same fashion by the same partner could then display the ENERGY STAR mark.</p> <p>EPA welcomes additional stakeholder input regarding processes and criteria for refurbished units.</p>
Scope and Definitions	Rotary UPS	One stakeholder commented that ENERGY STAR should consider not including rotary UPSs in the scope noting that rotary UPSs have short backup times and that no rotary manufacturers are participating.	Although EPA has received very little information and test data pertaining to Rotary UPSs, these products continue to be under consideration due to their high efficiency and high output power and potential energy savings from adopting them more generally.
Standard Information Reporting Requirements	Lifecycle Impacts	Stakeholders commented that lifecycle carbon and other impacts should not be considered within the ENERGY STAR criteria until IEC 62040-4 is released and widely used within industry. Some stakeholders also commented that ENERGY STAR should defer to other programs that focus specifically on non-energy use impacts, with one stakeholder suggesting that EPA provide recycling information and other resources on the ENERGY STAR website.	EPA has removed life-cycle requirements from Draft 2 of the specification, but may reconsider them in a future revision once IEC 62040-4 has been finalized.
Standard Information Reporting Requirements	Power and Performance Data Sheet	Stakeholders expressed support for a Power and Performance Data Sheet (PPDS). Stakeholders further recommended that it contain all applicable test information and act as an efficiency related subset of IEC 62040-3 Table D-1. One stakeholder recommended that the PPDS include declaration of a unit's multiple normal modes including efficiency data and clarifying which normal mode was used for qualification.	Per stakeholder feedback, EPA has developed a draft PPDS template for review, based on Table D-1 from IEC 62040-3.

ENERGY STAR Draft 1 Specification for UPSs Comment Summary

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Test Method	Battery Charger Test Method	<p>Stakeholders recommended that EPA not use the U.S. Department of Energy's (DOE's) test method for battery chargers when qualifying UPSs, even ones with low output power. Stakeholders cited the following reasons:</p> <ul style="list-style-type: none"> *ENERGY STAR applies to UPSs with all types of energy storage; DOE regulations only apply to UPSs with chemical batteries *ENERGY STAR tests UPSs with their output on (as they are typically used); DOE tests UPSs with their output off *ENERGY STAR uses the International Standard test procedure for UPSs (IEC 62040-3 Ed. 2); DOE uses a non-standard test procedure designed to test battery chargers, not UPSs *Small units (within the scope of the DOE test method) could be combined into one larger modular unit *Lack of clarity in the how the DOE test procedure will be performed *The DOE test procedure only applies to products sold in the U.S. 	<p>EPA has consulted with DOE regarding the applicability of the DOE Battery Chargers test method to Consumer UPS systems in the ENERGY STAR UPS specification. EPA and DOE believe that the scopes of the two programs differ: the DOE test method is designed to test the battery charging aspects of Consumer UPSs, while the ENERGY STAR test method evaluates the functionality of the full UPS product. Accordingly, the DOE Battery Chargers test method will not be incorporated into the ENERGY STAR UPS specification.</p>
Test Method	DC-Output UPSs	<p>Stakeholders commented that although some draft specifications have been developed for 380 VDC distribution, and products have been released, the voltage has not yet become standard. Another stakeholder commented that telecom rectifiers should be tested at 54 V and not at the 48 V nominal. Finally, stakeholders recommended referencing ATIS Standard 0600015.04.2010.</p>	<p>Per stakeholder recommendations, EPA has modified the DC-output test method to reference ATIS Standard 0600015.04.2010.</p>
Test Method	Modularity	<p>Stakeholders agreed with EPA's proposal to test modular units in the smallest and largest capacity configuration.</p>	<p>Per stakeholder feedback, EPA has not made any changes to the test method for modular units.</p>
Test Method	Ref: IEC 62040-3 Ed. 2.	<p>Stakeholders provided mixed feedback on whether the ENERGY STAR test method should be a standalone document (e.g., when specifying instrument precision) or whether it should only be a supplement to and reference IEC 62040-3 Ed. 2.</p>	<p>EPA thanks stakeholders for their feedback, but does not wish to duplicate the test method in appendix J to IEC 62040-3. Referencing the IEC standard in the ENERGY STAR test method avoids duplication while giving EPA additional control over the test requirements. EPA does welcome feedback on specific clarifications it can provide in the body of the ENERGY STAR test method.</p>
Test Method	Representative Models	<p>One stakeholder noted that the internal configuration of a UPS may vary from unit to unit within the same model, leading to efficiency variation. To address this problem, stakeholders suggested identifying the representative model/configuration in the Power and Performance Data Sheet or another centralized location.</p>	<p>EPA welcomes further information regarding the efficiency variation from unit to unit within the same model.</p>

ENERGY STAR Draft 1 Specification for UPSs Comment Summary

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Test Method	Thermal Stability	IEC 62040-3 appendix J and the ENERGY STAR test method that references it both require the unit-under-test to reach thermal stability prior to testing. The time required to reach thermal stability cannot be easily determined, so stakeholders suggested various ways to communicate the information to Certification Bodies and other entities engaged in third-party testing, for example, by including such information on the PPDS or in the testing request form submitted to CBs.	In response to stakeholder explanations of thermal stability, EPA has revised the test method to include a stabilization period equal to 125% of the manufacturer-declared thermal stabilization time.
Test Method	Uncertainty Requirements	Stakeholders expressed concern about the accuracy of the power and energy measurement at the megawatt level. In particular, stakeholders were not certain that a test requiring the use of multiple transducers could meet the test method requirement of 0.5% uncertainty at the 95% confidence level (per Appendix J of IEC 62040-3).	IEC 62040-3 is an established industry standard and EPA plans to abide by the standard to the extent possible. EPA therefore requests additional stakeholder input for deviating from any of its provisions, in particular evidence that the measurement uncertainty provisions would be inappropriate at high output power.