Topic	Subtopic	Comment	EPA Response
Data Collection	Data Collection	● The input, output and energy storage sections of the data collection spreadsheet should be greatly reduced, retaining only those items which help the user to compare the efficiency of UPSs of similar size, performance classification, and voltage and frequency range. ● Form requires information that vendors may not have for all products, some of which is ambiguous in their definition. Furthermore, collecting this much data will impose too much burden. ● Specifically remove: - Performance classification parts BB and CCC (Not all products fit defined categories) - Dimensions (not necessary for efficiency) - Mass (not necessary for efficiency) - Intended market (ambiguous, constraining) - Life expectancy (hard to quantify) - Input and Output Voltage, frequency and current nominals and tolerances should just be name plate nominals or ranges (per IEC 60950-1 and 62040-1) - Overload (not necessary for efficiency) - In-rush (not necessary for efficiency) - Power factor (redundant with efficiency test data) - AC Distribution system compatibility (not necessary for efficiency) - Short circuit power required (not necessary for efficiency) - Type of load (ambiguous) - Output THD (especially at non-linear loads) - Storage device design life (hard to quantify, ambiguous) - C10 Ah capacity (not available for high discharge rate batteries, redundant with back-up time) - Stored energy mode of operation (ambiguous) - Stored energy time should be at 100% resistive load not rated load - Restored energy time - Duration of max stored energy time (ambiguous) - Battery weight (varies hugely by SKU, this would be very difficult to compile and present) - Battery cut-off voltage (ambiguous – could vary with load) - Battery recharge interval (ambiguous) - Battery service life required (ambiguous) - Ability to separate storage device in a separate room (not necessary for efficiency) - Quantity of cells and strings (varies hugely by SKU, this would be very difficult to compile and present) - Presence of other loads on battery and their voltage tolerances (not necessary for efficiency) - RMS ripple current (not necessary for efficiency) - Nominal discharge current (varies with load, not necessary for efficiency) - 30%, 20%, 10% and 0% measurements	In order to accommodate stakeholders, EPA has modified the data collection form and created optional fields. However, EPA hopes that stakeholders will provide as much information as possible and appropriate to allow all factors that may have an impact on UPS efficiency to be considered during ENERGY STAR specification development.
Definitions	Bypass	Bypass function is currently called out in sections 3.C.1.iv and 3.C.4 without any reference definition. Take the definition of 'static bypass' from IEC 62040-3 FDIS.	EPA has incorporated the bypass definitions from IEC standard 62040-3 FDIS into the test method.
Definitions	Bypass Switch	Add “static bypass switch” to the UPS definition (Section 3.A.1) and (Section 3.A.1.ii.1). The “static bypass switch” is a key reliability component of the UPS and provides capability to transfer from rectifier/inverter to static bypass switch providing constant dual power paths to critical loads.	Although EPA understands the importance of static bypass switches, the term is not referenced anywhere in the draft test method, so EPA will not be including a definition for this term.
Definitions	Output Performance Classifications	Do not require output performance beyond the input dependency characteristic (e.g.: VFD, VI or VFI), as many consumer UPSs do not fit into the defined voltage waveform characteristics or dynamic output performance categories. ● Not much benefit to output performance information if the input performance of the load is unknown (analogous to a lock and key, each of which is of little use without the other).	EPA is soliciting information available for performance characteristics regardless of the application of the UPS.

Definitions	Parallel UPS	● All mention of parallel UPSs should be removed and the term 'Modular UPS' should be substituted. ● Alternatively, retain the definition of Parallel UPS (Section 3.A.1.ii.3). Parallel UPS for high reliability is common in mission critical applications, and the efficiency of Parallel UPS should be included in the EPA ENERGY STAR program. The test efforts on Parallel UPS are needed to determine if single module UPS efficiency is equal to parallel UPS efficiency.	EPA has substituted 'modular UPS' for 'parallel UPS', and intends to evaluate any efficiency differences in mission-critical UPSs by categorizing them in terms of redundancy.
Definitions	Reliability	All references to 'reliability' should be changed to 'protection' or 'performance'.	All references of 'reliability' have now been changed to 'performance'.
Definitions	Topology	Remove topology definitions in favor of the IEC 62040-3 performance classifications. The IEC standard provides consistent and clear definitions for UPS topologies.	EPA will retain the topology definitions for reference. In addition, EPA is asking stakeholders to report the topology of their system, if known. If the topology is not listed under definitions, please include the applicable name and description.
Definitions		All definitions and test procedures should be derived from the FDIS version of IEC 62040-3 Ed. 2. Consider eliminating definitions entirely from the ENERGY STAR for UPS specification, referring readers instead directly to IEC 62040-3 Ed. 2.	Where pertinent, EPA is aligning definitions with IEC standard 62040-3 FDIS.
Efficiency Measurements	Hibernate Mode	● Eliminate testing with the input powered and the output off, as this mode is rarely encountered in data centers, not all UPSs charge their batteries in this mode, and it is covered by pending Department of Energy battery charger regulations in the consumer space. ● Efficiency measurements should be taken with the battery disconnected consistent with IEC standard 62040-3/FDIS. Charger operation time is a relatively small period of time, various charging schemes among manufacturers exist, and the Department of Energy's new battery charger specification will define charger efficiency. ● Delete definition of hibernate mode.	EPA agrees with stakeholders and has removed the requirements to test in hibernate mode (i.e., with the output inverter off and the battery in maintenance). Consequently, EPA has also removed the definition of hibernate mode.
Efficiency Measurements	Loading Points	● Return to alignment with IEC standard 62040-3/FDIS (testing at 100, 75, 50, and 25 percent of resistive load) as the proposed level of granularity is unnecessary to determine the overall efficiency of the UPS and imposes burden. Adopt interpolation methodology to compute efficiency measurements at 40, 30, 20, and 10 percent of the reference test load based on tests done at 0, 25, 50, 75 and 100 percent. ● Furthermore, using IEC loadings would allow ENERGY STAR to leverage tests already done under the IEC standard. ● Add 0% load (with output on) to cover usage scenarios such as 'catcher systems' in data centers and for computers in standby or hibernate modes in consumer and business desktop applications. ● Alternatively, test at 7 load points (100%, 75%, 50%, 40%, 30%, 20, 10%) for high power UPS modules (200 kVA and above). The use of N+1, N+N and other redundant/parallel configurations results in UPSs operating below 50% load, and higher resolution of efficiency at lower operating load points (40%, 30%, 20%, 10%) will be valuable to the consumer.	EPA understands stakeholders' concerns and has agreed to test at the four loading points stated in IEC 62040-3/FDIS in addition to testing at 0% load. However, EPA is encouraging stakeholders to submit additional data in order to validate a proposed interpolation methodology.

Efficiency Measurements	Modes for Test	● Evaluate Eco Mode as normal operating mode, but avoid use of vendor specific names and use the IEC 62040-3 definitions for UPS classifications. This additional information could be useful, even though there are some concerns with the protection offered in Eco Modes (e.g., sometimes used for the protection of mechanical equipment, not the IT load, or promoted only in half of the redundant modules). ● Alternatively, test only in the most protective normal mode offered as this is the most likely mode to be used; furthermore, Energy Saver modes are not significantly more efficient than today's leading designs in VFI mode. ● Additional available normal modes of operation could be listed on the power and performance data sheet. They should not have to be measured and there should be no mandatory performance requirements in these alternate normal modes ● Also, energy-saver modes and their relationship to UPS topology needs to be properly defined, while some end-users expressed interest in the time necessary to switch from an Eco Mode to double conversion. ● As a third option, UPSs should only be tested in their "as shipped" normal mode as it is likely to be the only normal mode in which the product will be operated, and testing in all normal modes (2 or 3, but up to 6) could be burdensome, while further data could confuse and overwhelm a customer. E.g., smaller, consumer UPSs sometimes use Energy Saver as the default setting.	EPA understands manufacturers' concerns with the proliferation of modes to be tested, while remaining aware of the potential benefit of Eco Modes to end-users. EPA is therefore proposing to compromise by requiring UPSs to be tested in two modes: highest efficiency/lowest protection and lowest efficiency/highest protection. If available, EPA would like to obtain test data in additional modes. As always, EPA wishes to ensure that sufficient data are gathered to support specification levels.
Efficiency Measurements	Modularity	● Test modular UPSs at minimum and maximum non-redundant (i.e.: N+0) configurations; assume all intermediate configurations comply. ● Alternatively, allow manufacturer to choose the minimum and maximum configurations for test.	EPA has selected to test modular UPSs at minimum and maximum non-redundant (i.e.: N+0) configurations, assuming all intermediate configurations comply.
Efficiency Measurements	Overload	● Overload testing should be removed from the draft test procedure as overload capability is a temporary condition unrelated to efficiency. Higher UPS loading does not result in higher efficiency, and testing at 100% load provides adequate proof that the UPS will meet published ratings. ● Overload testing is included in IEC 62040-3 to provide customers with confidence that the UPS will handle fault conditions in a predictable manner, not to encourage use of the product beyond its allowed load range. ● Furthermore, knowing the overload capability is not operationally significant for the user. Overload capabilities are very short term whereas data center loads tend to be steady state. ● The primary factor here is how much stress is added to a UPS system, should another UPS shut down (planned or unplanned). In a 2N environment the step load would be 50% of full load, causing greater stress at 100% of rating, than an N+1 environment where the step load is 1/N+1. Consider a 5/6 system, one down means the other five systems step up only 20% if proper load management has been enforced. This will affect how close to 100% an end-user might load a UPS.	Due to the stakeholders' overwhelming concern and little additional end-user benefit from standardizing overload information, EPA has removed overload from the test method.
Efficiency Measurements	Reliability	● The focus of the spec should be on product performance centered on energy usage. Reliable UPS protection of the critical load is a given. ● Reliability (performance) is the number one factor considered when selecting an UPS system, along with the necessary maintenance.	EPA understands that load protection is the paramount concern of end-users; however, EPA will continue to seek ways to best inform end-users about the efficiency impacts of any protection decisions to help them make a balanced judgment.
Efficiency Measurements		IEC 62040-3 is also intended to: ● introduce uniformity in testing; ● aid customer comparisons of test results; and ● help customers to make trade-offs between available products. Therefore, ENERGY STAR efficiency tests should be harmonized with IEC 62040-3.	The ENERGY STAR Uninterruptible Power Supply test will be harmonized with the IEC 62040-3 FDIS to the extent possible.

End-User Selection Criteria for UPSs		● The process for identifying additional UPS hardware needs is as follows: 1. Determine required capacity. 2. Assess a list of human interface features. 3. Come up with the building blocks for larger systems that require modular designs. ● Additional considerations include: Air handling, size, weight, performance/topology, ● Procurement process varies by customer/UPS size: 1. Datacenter-scale: Select what is most important and then send out specifications to multiple vendors for bid. Work with consultants or in-house experts to choose UPS. Only advanced customers consider total cost of ownership (TCO). 2. Mid-size (e.g., bank trying to purchase UPSs for its branches): May use datacenter process above, or if smaller, work with manufacturer's sales office or reseller; utility rebates would be helpful in this space 3. Consumer: Retail; this is where a point-of-purchase ENERGY STAR mark may be most effective. ● The ENERGY STAR label, searchable database, and third-party testing would be helpful to purchasing a UPS system, especially for small and mid-size consumers.	EPA thanks respondents for this information and will continue to consider all aspects of a UPS that may have an impact on energy consumption and the environment as a whole.
Lifecycle		● Corporate customers are increasingly interested in the life-cycle impacts of UPSs, usually due to pressure from their CEOs. ● Manufacturers present life-cycle analysis (LCA) to customers upon request. But ENERGY STAR should focus on efficiency.	EPA would like to obtain additional information from stakeholders on life cycle analysis (LCA), if available.
Other Environmental Impacts		● Because UPSs and batteries already comply with environmental and recycling programs (RoHS, WEEE, etc.) and because IEC 62040-4 is under development, EPA should not include any specific environmental or recycling requirements in the initial revision of the specification. ● Furthermore, in some US states, there are directives promoting easy UPS disassembly, and customers can often send back an old UPS unit for refurbishing and resale. ● Also, batteries are often sold separately from the UPS, so including battery recycling in the spec might be problematic. ● On the other hand, one potential area for ENERGY STAR involvement could be promoting easy removal of batteries. Also, more information about recycling programs would be of interest, as batteries are replaced on average every five years, as would information about recycling modules (many of which are currently scrapped at end-of-life).	EPA thanks those stakeholders who provided feedback on other environmental considerations and will continue to assess the environmental impacts UPS systems by soliciting feedback on the existence of programs for battery and UPS takeback and recycling.
PD Schedule	Data Collection	● The proposed data collection period is too short: the 6-7 weeks of 2011 don't allow for ENERGY STAR UPS volume data collection, as the testing of a small product could easily occupy a test stand for a day and a large system could occupy one for a week. ● Lengthen the test period significantly (e.g. 4-6 months) to allow testing within constraints of production test facilities as to not interrupt normal business operations ● Alternatively, base the initial efficiency requirements entirely upon existing test data.	EPA understands that the testing of UPS systems is time consuming, therefore the data collection process has been split into two phases: Phase 1: Collection of existing data which is to be submitted by January 14, 2011. Phase 2: Collection of new data gathered through March 18, 2011. Data received during Phase 1 will help EPA focus the new testing to be done in Phase 2, minimizing manufacturer burden without impacting the specification development schedule.

PD Schedule	General Schedule	● Overall schedule for the specification development process is too short by 6-8 months. ● If EPA wishes to retain the proposed timeline, we suggest that the scope be limited only to consumer UPSs which are much less complex and far faster to test. ● A senior executive within the US EPA should be assigned to champion this effort directly to the executives of UPS manufacturing companies responsible for making the resource commitments necessary to develop this new standard.	Due to the proposed two-phase data collection effort, the specification development schedule for UPSs should not be significantly impacted. Nonetheless, EPA may adjust the timeline depending on the results of data collection.
Real-Time Efficiency Reporting		● Both proprietary and open source communications solutions already exist for consumer UPSs, while Modbus, SNMP, etc., are universally available in larger UPS applications. Therefore, it is unnecessary to specify communications capabilities in the ENERGY STAR specification. ● Also, measuring efficiency (especially as it approaches 100%) requires expensive and complicated instrumentation (current UPS displays are often rough approximation). Datacenter operators already install these meters where required and requiring their use in UPSs will result in costly duplication of effort, while requiring EPA to consider cost and accuracy issues. ● Finally, end-users are generally locked into an efficiency curve for the particular UPS bought, so real-time data reporting will not help increase efficiency beyond influencing decisions such as shutting down a UPS module under light load. ● Alternatively, it would be beneficial to standardize the reporting capability through open formats (e.g., DNP or Modbus) in order to work out real UPS efficiency. Currently, UPS output is known, but the input is not.	Although EPA has understood stakeholder concerns regarding cost and accuracy, the Agency is nonetheless interested in learning more about the benefits and accuracy of real-time reporting and is therefore asking stakeholders to provide applicable information on the data collection form.
Scope		EPA may be reaching too broadly in attempting to cover all types and sizes of UPSs in the Revision 1 specification: limit target market (e.g. by target market, by capacity, by voltage and/or by technology {static vs. rotary}) to speed development. ● Scope should be limited only to consumer UPSs which are much less complex and far faster to test. ● Alternatively, start ENERGY STAR program with high power UPS (>200 kVA 3-Phase) as first priority, then (<200 kVA 3-Phase), and lastly 1-Phase. (Faster adoption at higher power levels due to higher payback).	During the first phase of data collection, EPA will gather data covering a wide rage of UPS systems with the goal of identifying gaps and opportunities; EPA will consider scope issues following the analysis of this initial data.
Test Set Up	AC Voltage for test	● Three-phase UPSs should be tested at their "native input and output voltages and frequencies" because doing otherwise would require the use of input and/or output transformers, which are not typically used and unfairly penalize products optimized for a particular voltage. ● The following voltages should be added to the test method, as they constitute a considerable portion of the UPS market: Single Phase (120V), Single/Three Phase 208/120V and Three Phase 600V. ● Alternatively, allow testing at any combination of input and output voltages matching a nominal system voltage listed in ANSI C84.1:2006, along with suitable non-US nominal voltage and frequency combinations. ● Further, the efficiency increase in server power supply efficiency in moving from 208V to 240V is less than half a percentage point on an ~90% efficient power supply (it would be even less on a more efficient supply). This gain will be more than offset by transformer losses. Therefore EPA should be encouraging transformerless power distribution topologies, perhaps through the ENERGY STAR for Data Centers program, rather than mandating 230V to the IT loads. ● Alternatively, EPA should promote powering ICTE equipment at 230 or 240V in the USA and recommend that be done as part of the ENERGY STAR for Data Centers specification, not the UPS specification.	EPA agrees with stakeholders' comments and has now proposed a new set of voltage/frequency testing points which will allow testing at the most common native voltage/frequency combinations.
Test Set Up	Accessories for Test	UPS should not be tested with transformers because: ● Transformers would need to be sourced for testing from third parties at considerable expense (as each test lab would have to possess a collection of these transformers precisely matched to the ratings of each UPS under test) and ● Transformers would have to be allowed to thermally stabilize in order for accurate measurements to be taken which would prolong the test by many hours, increasing burden	EPA understands stakeholders' concerns relating to transformer costs, and has mitigated them by proposing to test UPSs at their native voltages as described above.
Test Set Up	DC-Output UPSs	Include 48V DC as a standard voltage for DC UPS, as only 48V DC equipment is widely available and deployed in meaningful quantities within commercial data centers.	EPA has added additional output voltages for DC-output UPSs.

Test Set Up	UPS Segmentation	● Because the number of phases required or supported by a UPS doesn't inherently relate to its efficiency or feature set, we suggest instead that UPSs be categorized by output power rating, for clarity and consistency with IEC 62040-3 and feature variations required by the various market segments (consumer, SMB, and enterprise-class). ● Alternatively, segment UPS by "number of phases" and "kVA size", and refrain from using location/application segmentation (consumer/small office, data center), which is too vague.	EPA has removed test conditions specific to UPSs intended for a particular applications or number of phases. EPA will address the segmentation of UPS systems later in the specification development process after it has had a chance to evaluate available test data.