



ENERGY STAR Specification Development for Uninterruptible Power Supplies (UPSs)

Stakeholder Meeting August 1, 2011

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Webinar Details



- Webinar and related materials will be available on the UPS Web page:
 - www.energystar.gov/newspecs
 - Follow link to “Uninterruptible Power Supplies”
- Audio provided via teleconference:
 - Call in:** +1 (877) 423-6338 (U.S.)
+1 (571) 281-2578 (International)
 - Code:** 456-417
 - Phone lines will remain open during discussion
 - Please keep phone lines on mute unless speaking
 - Press *6 to mute or un-mute your line
 - Refer to the agenda for approximate discussion timing

Agenda



Time (Eastern Time)	Topic
10:00 – 10:15	Meeting Introduction
10:15 – 10:35	Stakeholder Presentations
10:35 – 11:30	Ac-output UPS Efficiency Requirements
11:30 – Noon	Draft ENERGY STAR Test Method Revisions
Noon – 12:30	Dc-output UPS/Rectifiers Efficiency Requirements and Test Method
12:30 – 1:00	Lunch/Break
1:00 – 1:30	Toxicity and Recyclability Requirements
1:30 – 2:00	Qualification Processes
2:00 – 2:30	Additional Topics
2:30 – 3:00	Next Steps

Meeting Introduction



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Meeting Introduction



- EPA thanks all stakeholders who have participated thus far in the development of the ENERGY STAR specification for Uninterruptible Power Supplies (UPSs)
 - Stakeholder participation is critical to the specification development
 - EPA looks forward to continued feedback

EPA-DOE ENERGY STAR Team



- DOE team will provide overview of support and findings related to the test method

EPA: Brand and Specification Manager	DOE: Test Procedure Manager
<ul style="list-style-type: none">• New Products• Performance Levels• Marketing & Outreach• Monitoring & Verification• Product Database	<ul style="list-style-type: none">• Federal Test Procedures• Metrics• Monitoring & Verification

Activities To Date



- Late 2010: Development of Draft ENERGY STAR Test Method
- January–March 2011: Data assembly conducted
 - 8 manufacturers shared test results for 321 ac-output UPSs
- May 5, 2011: Draft 1 Specification released
 - Stakeholder meeting held on May 12
 - Comments and dc-output/rectifier data received and reviewed
- July 15, 2011: Draft 2 Specification Released
- Today, August 1, 2011: Stakeholder webinar to present Draft 2 changes and receive comment

Webinar Objectives



1. Introduce proposed modifications to the specification where EPA welcomes further stakeholder input
2. Explain revisions to the test method and clarify any questions
3. Provide opportunity to comment on other aspects of the UPS specification

Meeting Conduct



- Meeting sections correspond to topics addressed in the Draft 2 specification and test method
 - Ac-output UPS Efficiency Requirements
 - Draft ENERGY STAR Test Method Revisions
 - Dc-output UPS/Rectifiers Efficiency Requirements and Test Method
 - Toxicity and Recyclability Requirements
 - Qualification Processes
- EPA and/or contractors will present work on each topic
 - Stakeholders are welcome to comment at any time
 - Additional time will be provided at the end of each section for broader discussion on each topic

Comments



- In addition to making verbal comments during the meeting, stakeholders are strongly encouraged to submit written comments and data
- Please send all comments to:

ups@energystar.gov

Comment Deadline
August 11, 2011

Stakeholder Presentations



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Stakeholder Presentations



- EPA would now like to open up for stakeholders who have requested time to make presentations.

Ac-output UPS Efficiency Requirements



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Energy Savings Potential and Draft 2 Specification Levels

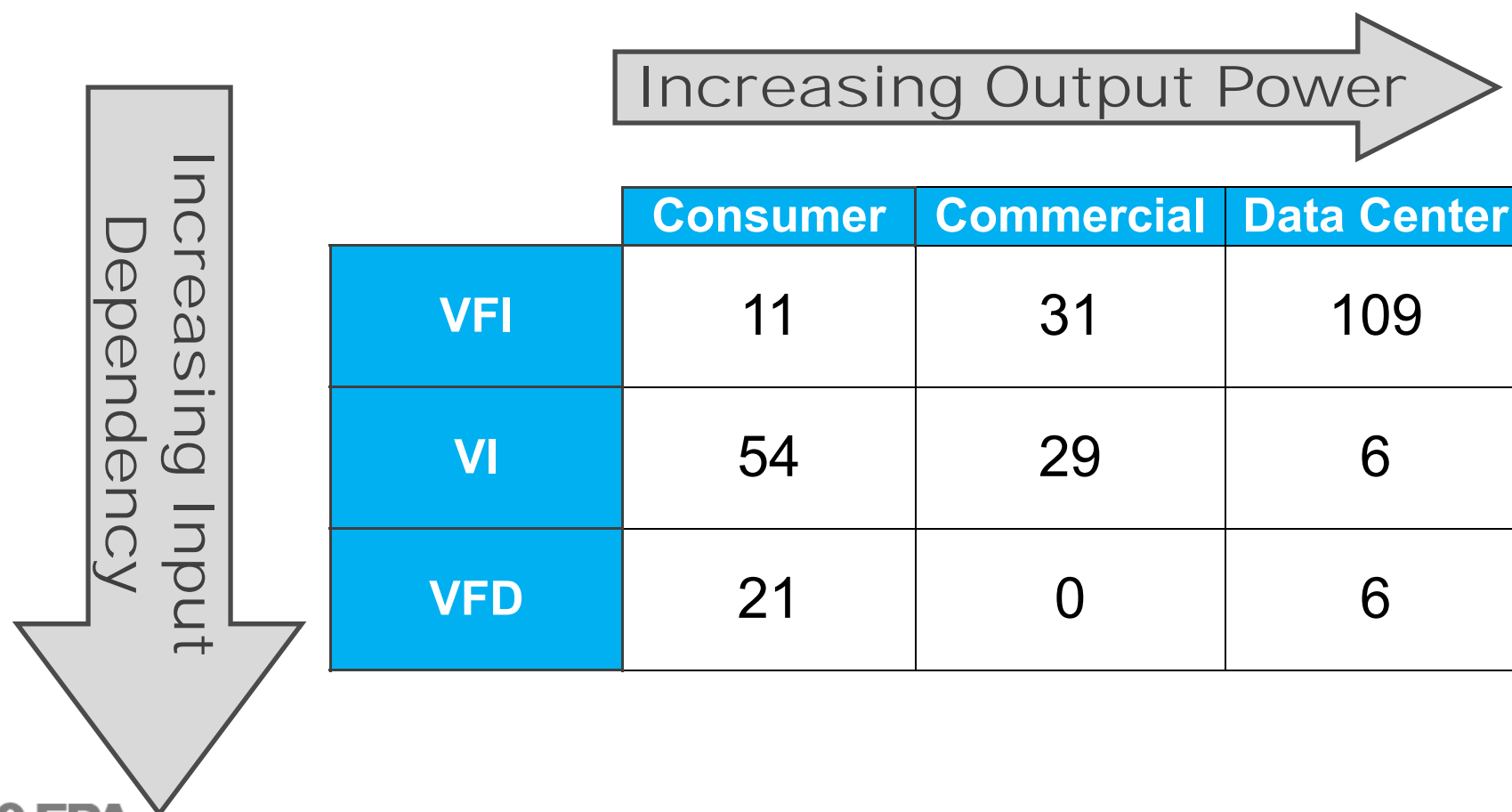


- Revision of specification levels proceeded in three stages:
 1. UPS test results were divided into **revised classifications** based on rated output power and input dependency characteristic
 2. Specification levels corresponding to the **top 25-30% of available models** were calculated for each classification
 3. **Best-fit lines were updated** from Draft 1 to reflect new classifications and specification levels in Draft 2

Revised Ac-output UPS Classifications



- Number of units analyzed in each classification:



The diagram illustrates the relationship between input dependency and output power for UPS classifications. A large grey arrow on the left points downwards, labeled "Increasing Input Dependency". A large grey arrow on the top points to the right, labeled "Increasing Output Power". The table below shows the number of units analyzed for three UPS types (VFI, VI, VFD) across three categories (Consumer, Commercial, Data Center).

	Consumer	Commercial	Data Center
VFI	11	31	109
VI	54	29	6
VFD	21	0	6

Ac-output UPS Classifications Recommended by Stakeholders



- Ac-output UPS classified by application and equipment intended for protection

Increasing Output Power

Consumer UPS $P \leq 1.5 \text{ kW}$	Commercial UPS $1.5 \text{ kW} < P \leq 10 \text{ kW}$	Data Center UPS $P > 10 \text{ kW}$
Desktop computers and related peripherals, and/or home entertainment devices (TVs, set-top boxes, DVRs, DVD players)	Small business/branch office information & communication technology equipment (servers, network switches & routers, small storage arrays)	Large installations of information & communication technology equipment (enterprise servers, networking equipment, and large storage arrays)

Loading Profiles by Class

- Average Efficiency calculated based on expected loading:

$$Eff_{AVG} = t_{25\%} \times Eff|_{25\%} + t_{50\%} \times Eff|_{50\%} + t_{75\%} \times Eff|_{75\%} + t_{100\%} \times Eff|_{100\%}$$

UPS Class	Proportion of Time Spent at Specified Proportion of Reference Test Load, $t_{n\%}$			
	25%	50%	75%	100%
Consumer ($P \leq 1.5$ kW)	0.2	0.2	0.3	0.3
Commercial (1.5 kW < $P \leq 10$ kW)	0	0.3	0.4	0.3
Data Center ($P > 10$ kW)	0.25	0.5	0.25	0

Loading Assumptions

- Revised loading point assumptions based on stakeholder suggestions and empirical data

Consumer UPS $P \leq 1.5 \text{ kW}$	Commercial UPS $1.5 \text{ kW} < P \leq 10 \text{ kW}$	Data Center UPS $P > 10 \text{ kW}$
<ul style="list-style-type: none"> Purchasers typically do not “overbuy” on capacity 		<ul style="list-style-type: none"> Over-provisioning Redundant operation ENERGY STAR Buildings and Plants program dataset collected in 2008-2009: utilization for 108 locations
<ul style="list-style-type: none"> Heavily loaded when protected equipment is on Typically spends time without any loading when protected equipment is off 	<ul style="list-style-type: none"> These larger units are rarely/never operated without load → no weight at the 25% loading point 	

Resultant Data Center loading profile same as Draft 1 proposal

Loading Assumptions



- EPA is supportive of industry initiatives to conduct a market study that would obtain up-to-date UPS loading data for future specification revisions

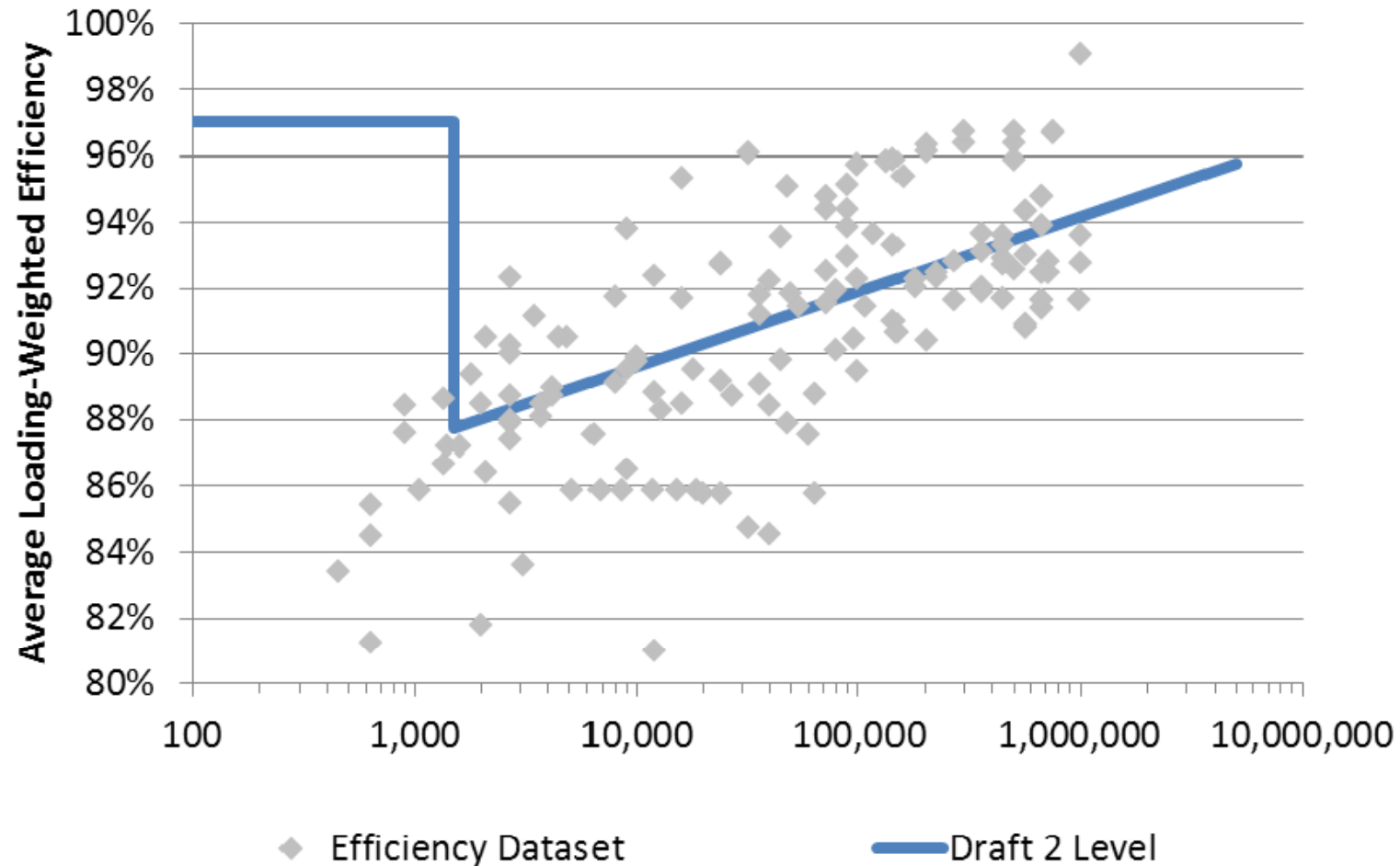
Ac-Output UPS Efficiency Requirements



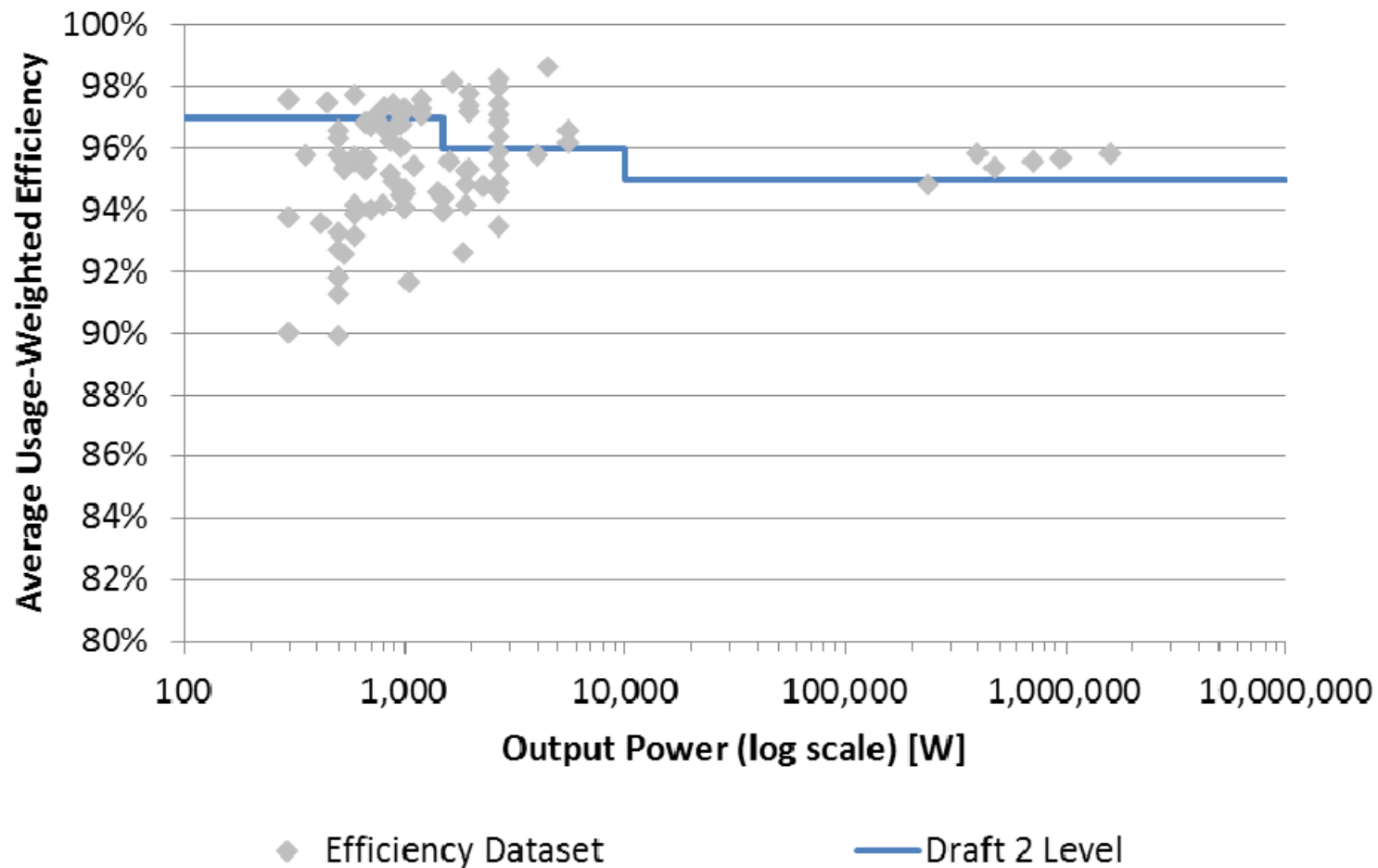
Consumer category is combined for purposes of comparing efficiencies—purchasers are not likely to have a preference for input dependency

Minimum Average Efficiency Requirement ($\text{Eff}_{\text{AVG MIN}}$), Where: P is the Output Power in watts (W), and \ln is the natural logarithm			
UPS Class	Input Dependency		
	VFD	VI	VFI
Consumer ($P \leq 1.5 \text{ kW}$)	0.97		
Commercial ($1.5 \text{ kW} < P \leq 10 \text{ kW}$)	0.97	0.96	$0.0099 \times \ln(P) + 0.805$
Data Center ($P > 10 \text{ kW}$)	0.97	0.95	$0.0099 \times \ln(P) + 0.805$

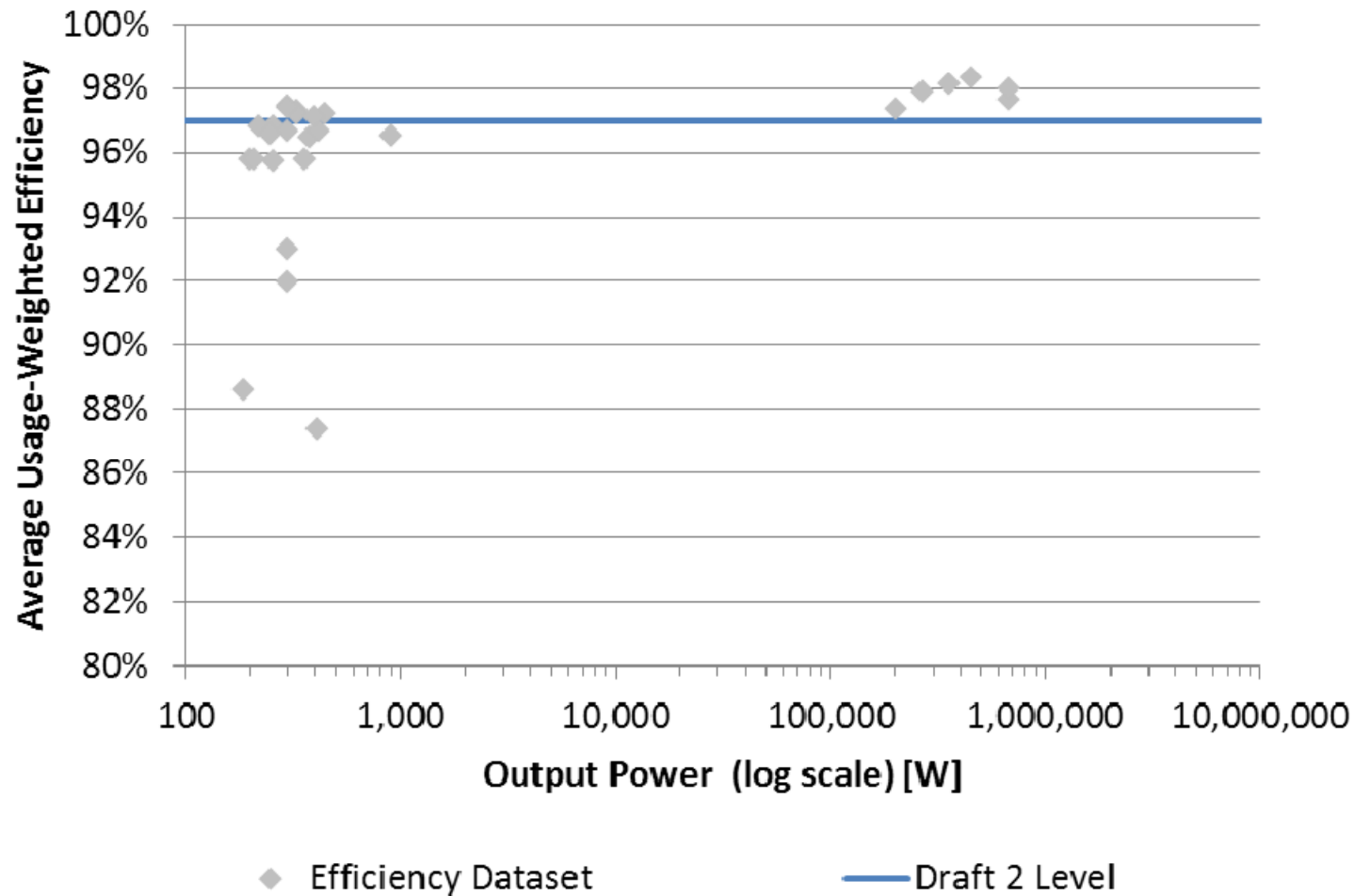
Proposed Specification Level: VFI



Proposed Specification Level: VI



Proposed Specification Level: VFD



Multi-Mode UPS



- Significant energy savings potential associated with multi-mode UPS
 - Models can run in more efficient, less protective modes
 - Switch to less efficient, higher protective modes when necessary

Multi-Mode UPS Draft 2 Proposal

Motivation



- Improvements in UPS systems
 1. Basic efficiency improvements
 - Capacitors, electronics, controls, etc.
 2. Modular systems
 3. Multi-mode systems
- ENERGY STAR strives to be technology neutral.
 - Given input dependency is crucial to qualification, setting single level based on single input dep. does not recognize full operation of multi-mode.
 - Unclear how often high efficiency modes are used with these products. Discussions with users were mixed.
- Testing in both modes develops database for future specification revisions
- Manufacturers can report tested and verified data for ESTAR qualification

Multi-Mode UPS Draft 2 Specification Proposal



- EPA proposes incentivizing the qualification of multi-mode UPS
 1. Multi-mode UPSs shall be tested in both highest- and lowest-input dependency modes
 2. Efficiency in both modes shall be reported on the Power and Performance Data Sheet – transition time between modes shall also be reported
 3. Efficiency used for qualification shall be a weighted average of the two modes
 4. Multi-mode UPSs shall ship with their highest-input dependency (highest efficiency) mode enabled.

Multi-Mode UPS Average Efficiency Calculation



- Weighted average of the highest- and lowest-input dependency mode must surpass the efficiency requirement for the lowest-input dependency mode:

$$\text{Eff}_{\text{Avg}} = 0.75 \times \text{Eff}_1 + 0.25 \times \text{Eff}_2$$

Where:

- **Eff₁** is the average load adjusted efficiency in the lowest-input dependency mode (i.e., VFI or VI)
- **Eff₂** is the average load adjusted efficiency in the highest-input dependency mode (i.e., VFD)

Open Comment



- EPA would now like to open up the line for any comments from stakeholders pertaining to:

Ac-output UPS Efficiency Requirements

Draft ENERGY STAR Test Method Revisions



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Draft ENERGY STAR Test Method Revisions: Table of Contents



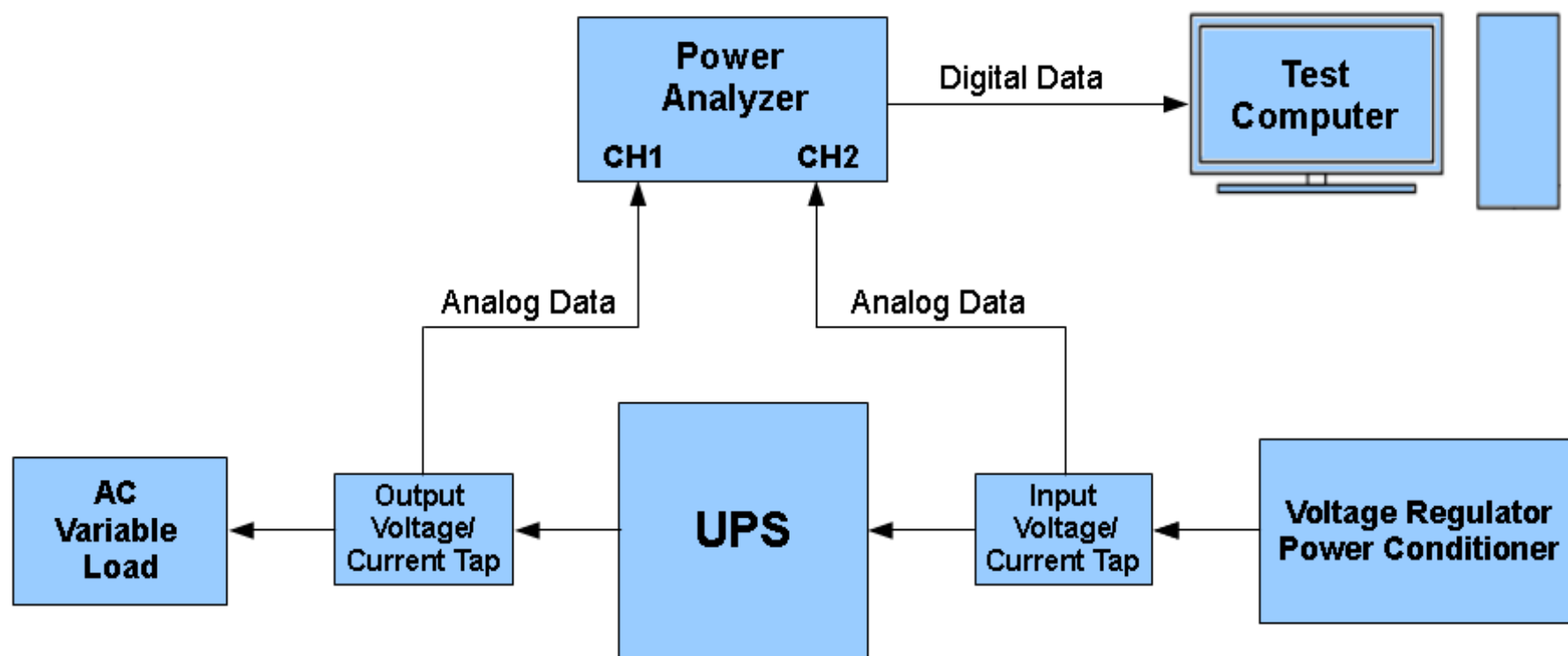
1	Testing Performed / Setup
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3	Proposed Change: Battery Charging
4	Proposed Change: Sampling Rate
5	Proposed Change: Stability Requirement

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General Test Setup



Testing Performed



- ENERGY STAR Draft 1 Test Method validation testing
 - 21 products from various manufacturers
 - Products ranging from 1 to 3 kVA max output
 - Voltage and Frequency Dependent (VFD) and Voltage Independent (VI) topologies
- Setup and Testing
 - 1) Charged all UPSs overnight
 - 2) Set load condition; waited for UPS to hit target load before collecting data
 - 3) Order of tested loads (% of max output): 100%, 75%, 50%, 25%, 0%
 - 4) 15 min test per load

Draft ENERGY STAR Test Method Revisions: Table of Contents



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Draft 2 Changes Overview



- Validation testing exposed several gaps in the Draft 1 test procedure
- Issues
 - Ambiguous instructions for battery charging
 - A UPS can meet Draft 1 requirements but still not provide repeatable results
- Proposed changes for Draft 2 based on testing
 - Clearly define charging time for batteries
 - Increase sampling rate for repeatable results
 - Add stability requirement to confirm data accuracy
- **ENERGY STAR welcomes recommendations and comments on any changes**

Draft ENERGY STAR Test Method Revisions: Table of Contents



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Problem: Battery Charging

- Testing a UPS with a battery that is not fully charged can result in measuring the battery charging function of the UPS
- This is not recommended by IEC 62040-3
- This could result in skewed power consumption values
- Draft 2 recommends a method to ensure a fully charged battery

Proposed Change: Battery Charging



- Adopted from Appendix Y to Subpart B of Part 430 - Uniform Test Method for Measuring the Energy Consumption of Battery Chargers [76 FR 31776, June 1, 2011], *section 5.2: Determining the Duration of the Charge and Maintenance Mode Test*
- Proposed change:
 - If the UPS has a charging indicator, charge battery for at least 5 hours past “charged” status
 - If no indicator, charge battery for at least 5 hours past manufacturer’s recommended time
 - If none of the above applies, charge battery for at least 24 hours
 - *Note: the recommended 5 hour time extension is given as instructed in DOE’s Final Rule dated June 1, 2011*

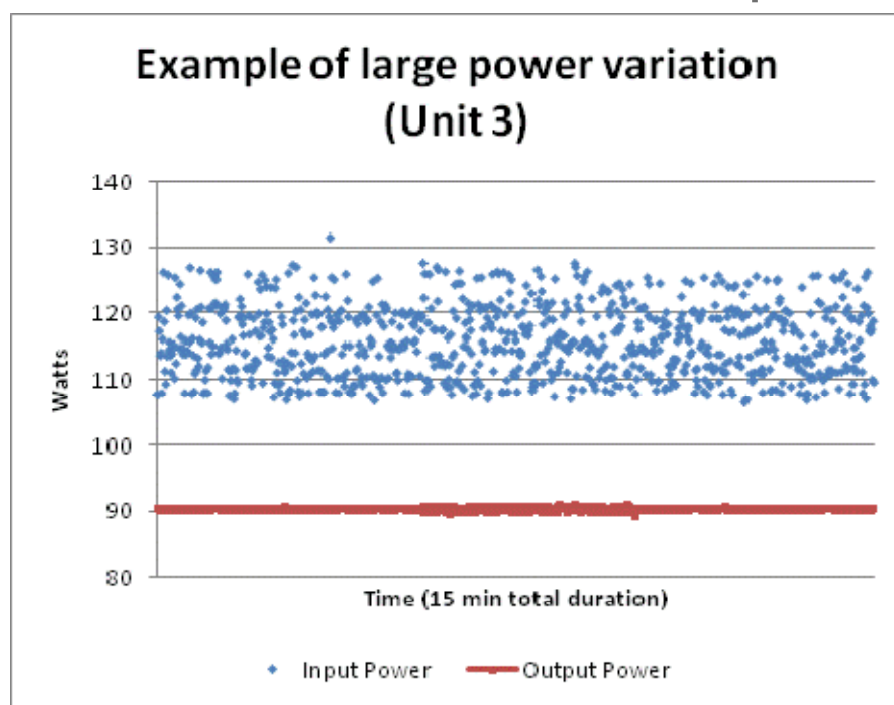
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Problem: Power Variation

- Draft 1 specifies “**three successive readings taken no more than 15 minutes apart**” for sampling
- This sampling frequency may not provide enough resolution to obtain repeatable data

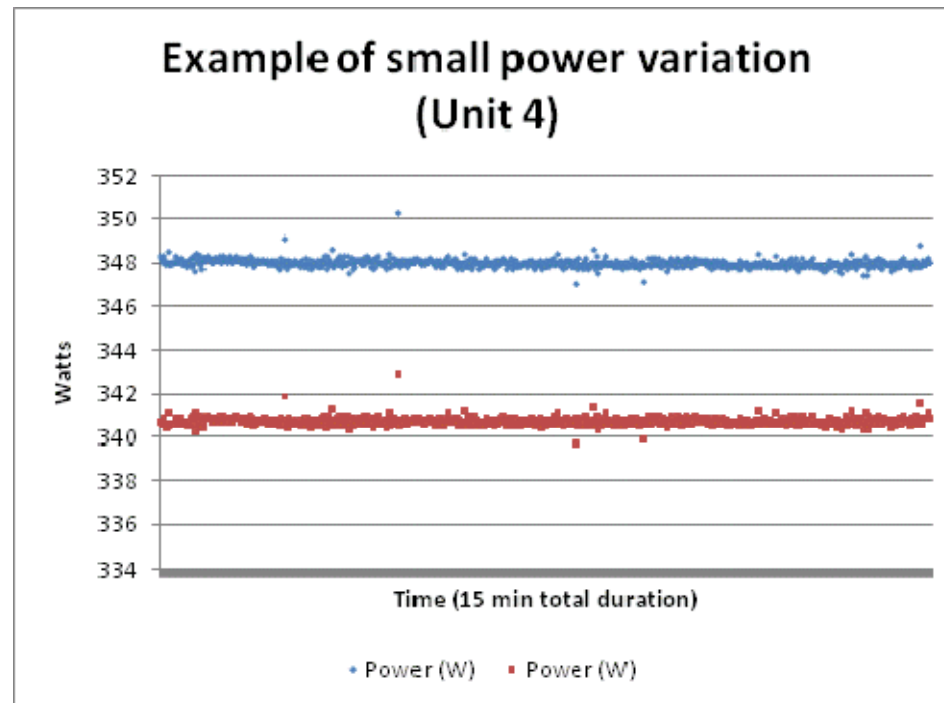


- Input variation differed for each unit tested
- Example: Unit 3 showed large input power variation
 - Documenting input power at three times could have reported anywhere from 108 W to 128 W

Proposed Change: Increased Sampling



- Example: Unit 4 showed small input power variation



- Proposed change:
 - One power reading per second over a 15 minute test period
 - Report average of all power readings

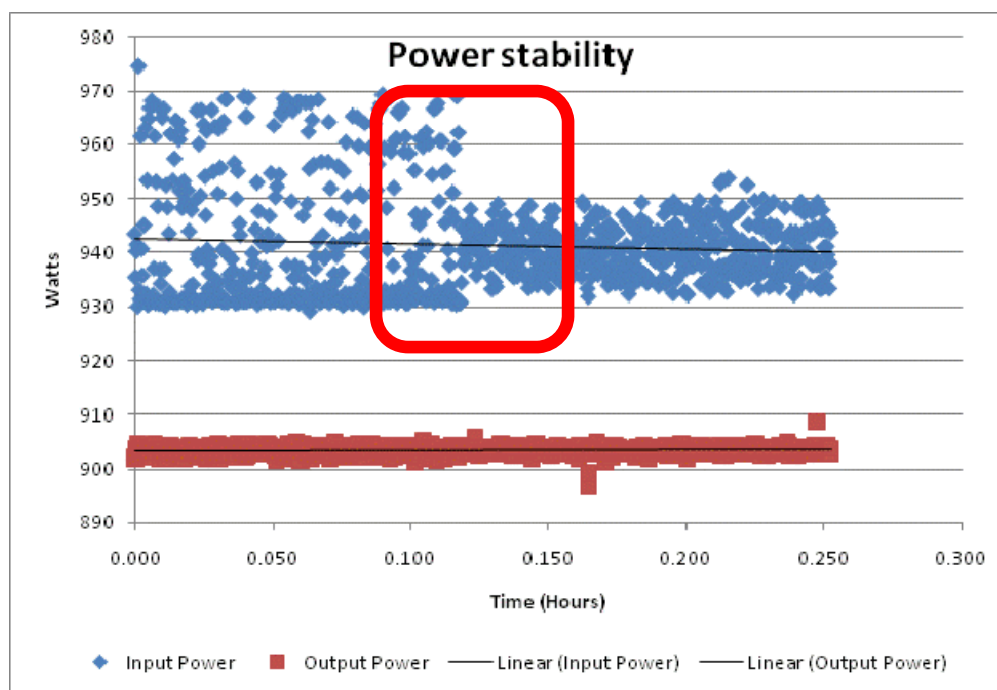
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Problem: Power Stability

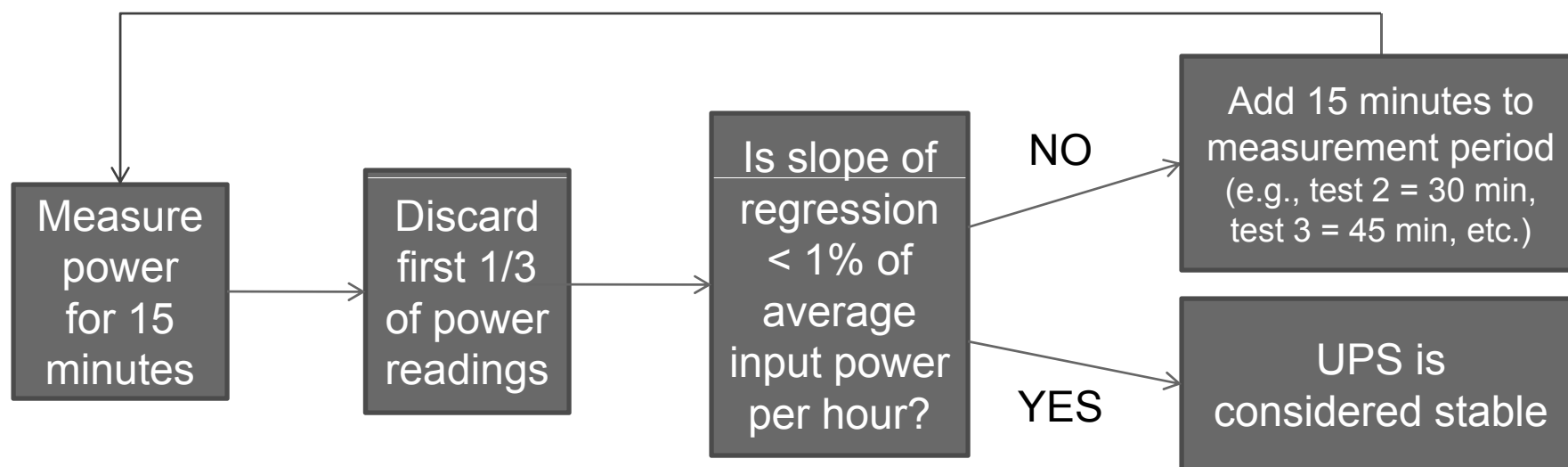
- Some units exhibited fluctuations in input power within the test window, even though setup/charging was performed as instructed in the test method
- Unstable power can result in non-repeatable and non-representative energy-use values



Proposed Change: Stability Requirement



- Proposed change*:



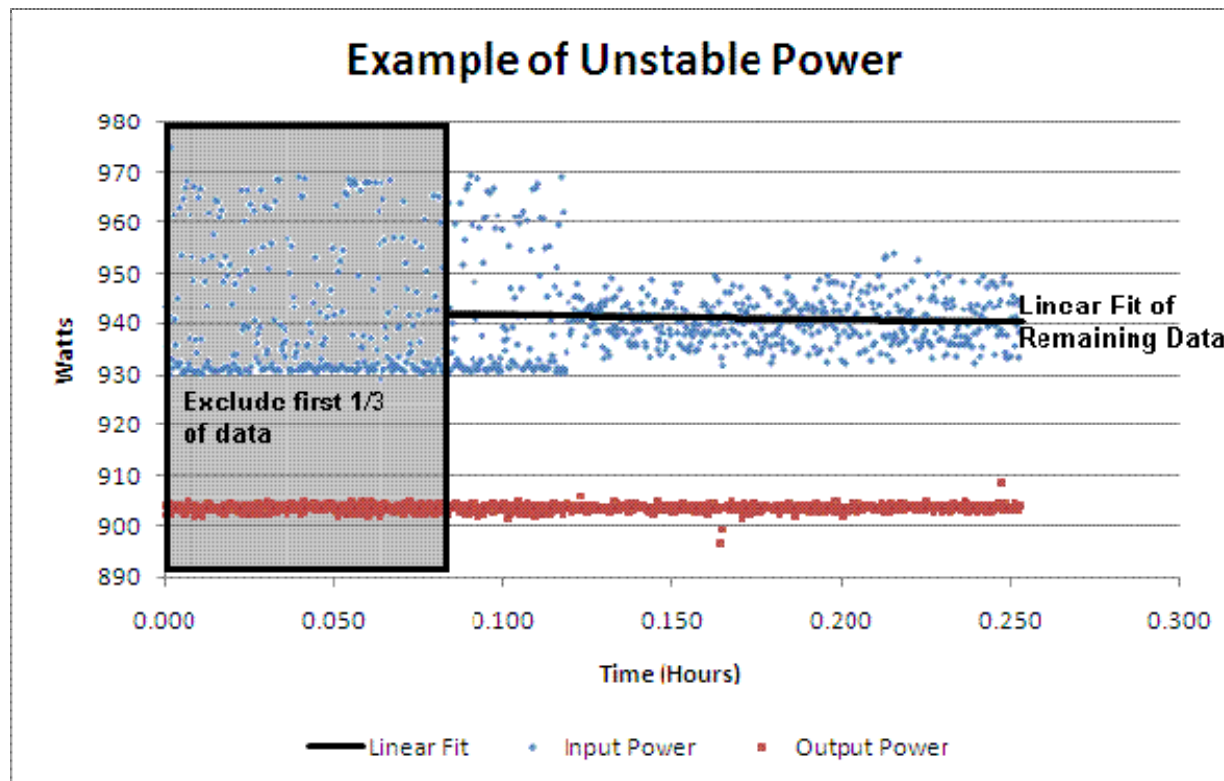
- The slope requirement prevents power drift during testing
- Using the average input power as a point for comparison helps scale the requirement depending on the size of the UPS

**Adapted from Section 5.3.2 of IEC standard 62301 (Ed. 2.0): Household electrical appliances – Measurement of standby power*

Example of Stability Requirement



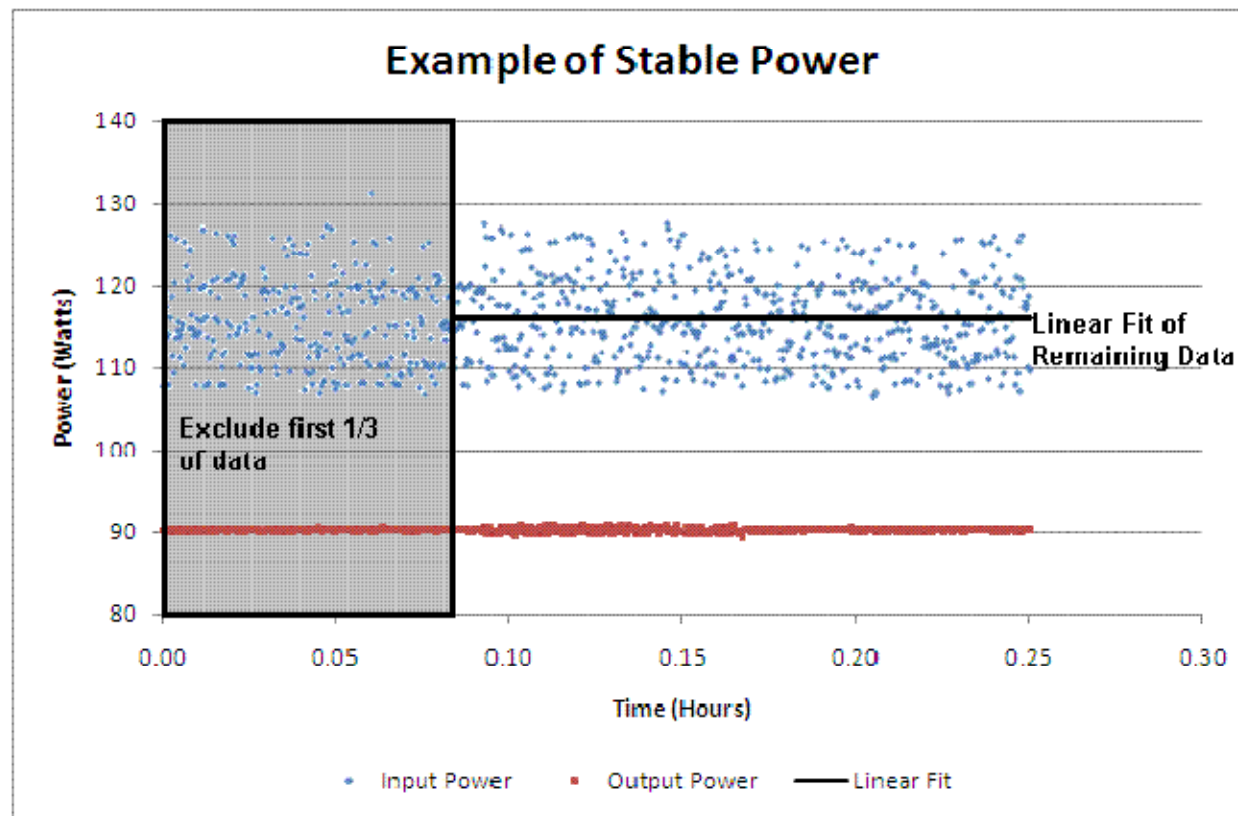
- Example:
 - Slope of the linear fit for input power is -10 W/hour
 - Average power of remaining data is 941W
 - Slope is 1.1% of the average power, so it fails the stability requirement and an additional 15 minutes of data collection is required.



Example of Stability Requirement



- Example:
 - Slope of the linear fit for input power is -0.0015 W/hour
 - Average power of remaining data is 115W
 - Slope is 0.001% of the average power, which passes the stability requirement.



Summary of Proposed Changes



Topic	Draft 1 Test Method	Draft 2 Test Method
Battery Charging Time	Not clearly defined	<ul style="list-style-type: none">• Indicator status + 5 hours• Recommended time + 5 hours• 24 hours
Power Sampling	Three samples taken within 15 minutes	One sample per second for 15 minutes
Stability Requirement	None	<ul style="list-style-type: none">• Measure power for 15 minutes• Slope of regression < 1% of average power per hour• If fails, add 15 minutes to measurement period (e.g., test 2 = 30 min, test 3 = 45 min, etc.)

Upcoming Testing



- Starting the week of August 1, ENERGY STAR will be performing validation testing on larger UPSs
 - 6 -13 products from various manufacturers
 - Products ranging from 5 to 20 kVA max output
 - Voltage Independent (VI) and Voltage and Frequency Independent (VFI) topologies
- Testing will be completed at the end of August
- ENERGY STAR welcomes comment on how the Draft 2 proposed changes apply to larger UPSs

Open Comment



- EPA would now like to open up the line for any comments from stakeholders pertaining to:

Draft ENERGY STAR Test Method Revisions

Dc-output UPS/Rectifiers Efficiency Requirements & Test Method



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Dc-output UPS: Market Overview



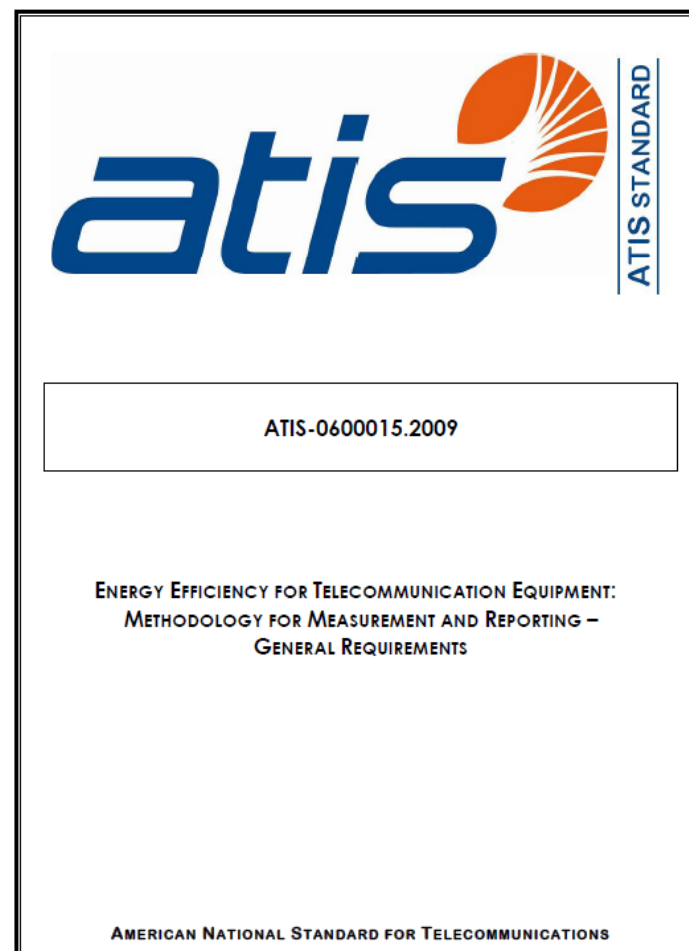
- Dc-output UPSs commonly referred to as “Rectifiers”
- High shipments primarily for telecommunications use
 - Four primary suppliers in the U.S.
 - 48 V dc equipment is widely available and deployed in telecom data centers
- Dc-output UPSs are expected to enter the IT data center industry with higher output voltages (380 V)
 - Industry groups have been formed to speed adoption

Dc-output UPS/Rectifiers

ENERGY STAR Test Method



- References ATIS-0600015.2009:
 - Energy Efficiency for Telecommunication Equipment: Methodology for Measurement and Reporting
 - ATIS-0600015.04.2010:Dc Power Plant–Rectifier Requirements
- DOE expects to review and validate the ATIS test procedures for Dc-output UPSs/Rectifiers over the next 12 months
 - May result in technical modifications to the test method and/or specification
 - Stability and steady-state requirements apply to both ac-output and Dc-output/Rectifier UPS



Dc-Output UPSs/Rectifiers Average Efficiency Calculation



- Proposed Average Efficiency equation in Draft 2 is derived from ATIS-0600015.04.2010:
 - Efficiency is measured at six loading points from 30% to 80%
 - Each loading point measurement is weighted equally

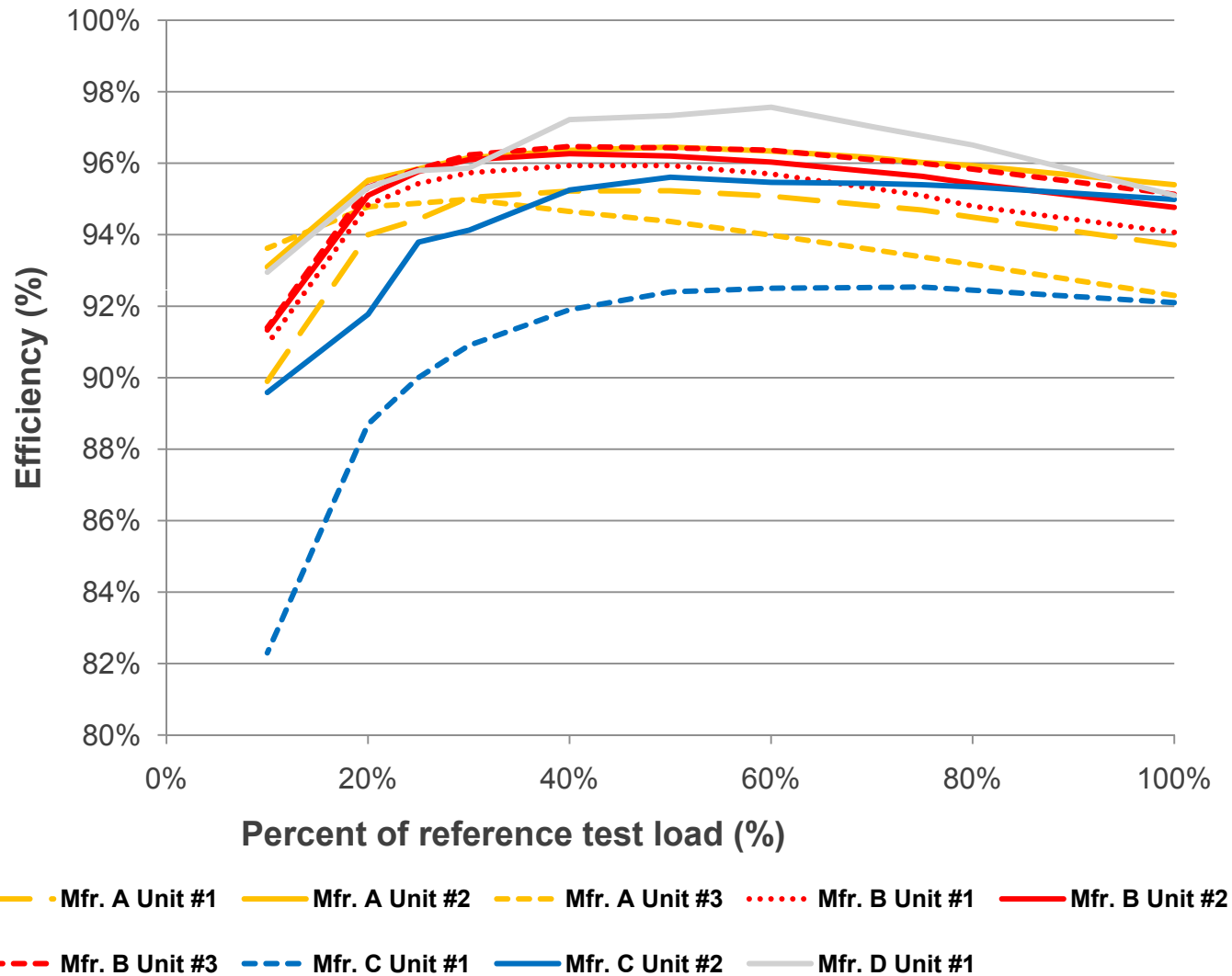
$$\text{Eff}_{\text{Avg}} = 1/6 (\text{Eff}|_{30\%} + \text{Eff}|_{40\%} + \text{Eff}|_{50\%} + \text{Eff}|_{60\%} + \text{Eff}|_{70\%} + \text{Eff}|_{80\%})$$

Dc-output UPS/Rectifier ENERGY STAR Data Form

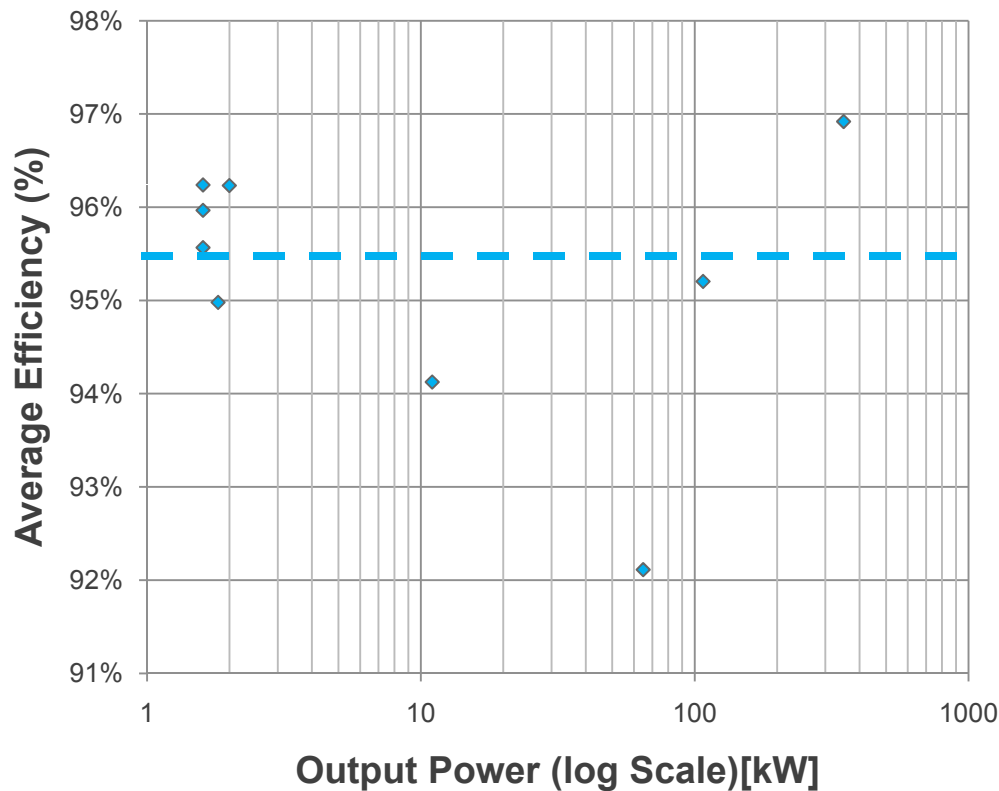


- EPA is inviting Dc-output UPS/Rectifier manufacturers to share additional performance data to help refine the proposed specification
- **Appendix B** of the ENERGY STAR Test Method for Dc-Output UPS – Draft Data Form has been released
- Dc-output UPSs/Rectifiers should be tested at **80%, 70%, 60%, 50%, 40%, 30% and 0%** of full load
 - Stakeholders may submit test data at additional loading points, e.g., 100%, 75%, 25%, 20% and 10%
- EPA thanks stakeholders that have submitted data to date and continues to welcome additional data before completion of the Final Draft specification

Dc-Output UPS/Rectifier Dataset Assembly Overview



Proposed Efficiency Requirement for Dc-Output UPSs/Rectifiers



- The efficiencies at each loading point were averaged
- Draft 2 proposes a minimum average efficiency requirement ($\text{Eff}_{\text{AVG_MIN}}$) of 95.5%
- Of 9 units submitted to EPA, we expect 2 or 3 to qualify.

Open Comment



- EPA would now like to open up the line for any comments from stakeholders pertaining to:

**Dc-output UPS/Rectifiers Efficiency
Requirements & Test Method**

Lunch/Break



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Toxicity and Recyclability Requirements

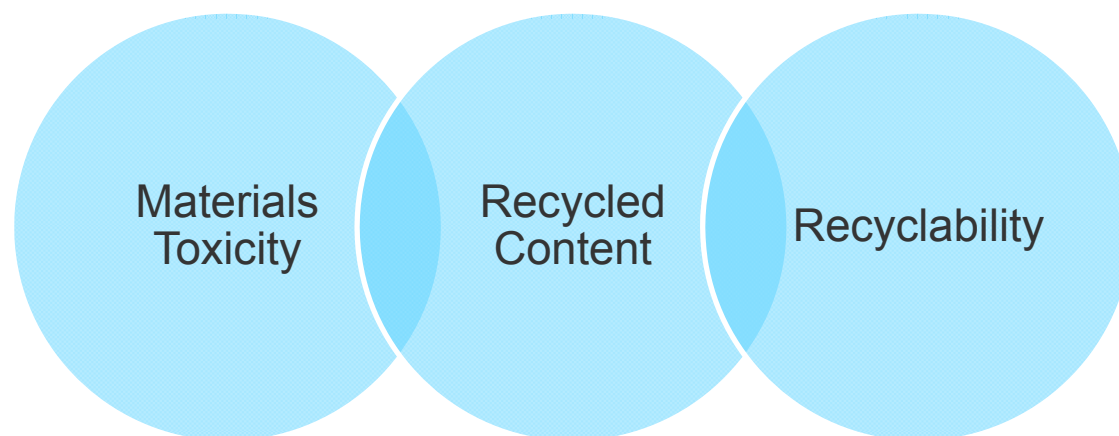


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ENERGY STAR Consumer Value



- ENERGY STAR is committed to delivering energy efficiency **and** product features and functions that consumers value
- Ensure that UPS products meet minimum expectations of:



- Leveraging existing standards rather than create new requirements.

Industry initiatives: Toxicity, Recyclability/Recycled Content and LCA



- A number of UPS manufacturers have noted their voluntary compliance with the EU's, "Directive on restriction of certain hazardous substances in electrical and electronic equipment (RoHS)"
 - RoHS sets restrictive levels of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers in electrical and electronic equipment
 - Substances controlled by the RoHS directive are also being addressed by IEC 62040-4 draft standard on UPS environmental aspects requirements and reporting

ENERGY STAR Proposal: Toxicity and Recyclability/Recycled Content Requirements



EPA proposes that UPS manufactures abide by the RoHS Directive

- Many manufacturers currently have voluntary RoHS compliance for their UPS products.

UPSs are not specifically delineated within WEEE

- Products within scope of the RoHS directive fall under categories set out in Annex IA and Annex IB of the EU Waste Electrical and Electronic Equipment Directive (WEEE) directive

Category Nine within WEEE (Monitoring and Control Equipment) might be applicable to UPSs

- Category Nine is not within scope under the RoHS directive, but it is expected to come into scope in 2014.

EPA applauds the UPS industry's voluntary initiatives for reducing environmental impacts and encourages discussion of plans for future compliance.

Open Comment



- EPA would now like to open up the line for any comments from stakeholders pertaining to:

Toxicity and Recyclability Requirements

Qualification Processes



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ENERGY STAR UPS Power and Performance Data Sheet (PPDS)



- Collection of efficiency-related information and important details pertaining to the configuration of all ENERGY STAR qualified UPSs
- Intended to help end users make informed decisions when purchasing UPS systems
- Could encourage adoption and proper use of more efficient UPSs
- Could facilitate efficient design and operation of data centers
- Draft has been released for comment
 - Based on Table D.1 in IEC 62040-3

IEC 62040

PPDS

ENERGY STAR® Power and Performance Data Sheet
A123

System Characteristics	
Power Factor	0.95
Operating Systems Supported	Microsoft Windows Server 2008 R2, Linux, VMware ESX/ESXi 5.0, Citrix XenServer 6.0, Oracle VM VirtualBox 4.2.12, Hyper-V 3.0
Available Operating System for Testing	Microsoft Windows Server 2008 R2 SP1, Linux CentOS 6.5, Oracle VM VirtualBox 4.2.12, Hyper-V 3.0
Available Expansion Slots	Up to 6 PCIe and up to 2 PCI-X
Processor	
Available Processor Sockets	2
Processor Information	Intel Xeon E5-2600 v2, AMD Opteron 6300, Intel Xeon E5-2600 v2, AMD Opteron 6300, Intel Xeon E5-2600 v2, AMD Opteron 6300
Processor Configuration Notes	<ul style="list-style-type: none"> Intel Xeon E5-2600 v2 processor offers up to 100 GB/s performance based on SPECint_rate_base2000 performance in a standard database. Supported features include: - Enhanced Dynamic Frequency Scaling - Hyper-Threading - Virtualization Support - Integrated Memory Controller
Memory	
Available DIMM Slots	16
Max Memory Capacity (GB)	128
ECC and/or Fully Buffered DIMMs	Yes, ECC and Registered DIMM (RDIMM) memory
Memory Information	12 GB (8 x 1.5 GB) PC3-10600 (DDR3-1333) Registered DIMMs
Storage/IO	
Minimum / Maximum # of Hard Drive/SSDs	0 / 10
Internal Storage Options	None
Power Supplies	
Redundant Power Supply Capable?	Yes
Power Supply Make and Model	PowerLogic AP1200 750 W
Power Supply Output Rating (Watts)	750
Minimum and Maximum # of Power Supplies	1 / 2
Input Power Range (AC or DC)	115-240VAC
Power Supply Efficiency at Specified Loadings*	86.1% @10% load, 89% @20% load, 91.5% @50% load, 91.5% @100% load
Power Supply Power Factor at Specified Loadings*	0.92 @10% load, 0.94 @20% load, 0.92 @50% load, 0.90 @100% load
* Note: Power supply information is for a single power supply only.	
IO Devices	
IO Devices	Two HP NC360 Dual Port Multibay SATA Drive Adapters
Other Features	
Power Supply Redundancy and Redundancy Configuration	Redundant, Redundant
Management Controller or Remote Processor Available?	Yes
Other Hardware Features / Accessories	<ul style="list-style-type: none"> - Centrally-Managed Chassis Cooling - iDRAC™ Support - Integrated KVM and LCD Console

ENERGY STAR PPDS Content



General UPS Product Information

- UPS Configuration
- Mechanical Characteristics
- Environmental and Other Conditions for Operation
- Communication and Measurement
- Consumer education (e.g., running the UPSs in an energy saving mode)

Energy Efficiency & Power Profile

- Output power and efficiency values at the tested loads
- Rectifier TEER for Dc-Output UPSs

Battery/Stored Energy Characteristics

- Technology
- Design or float service life
- Quantity of cells and strings
- Nominal voltage
- Stored energy time
- Restored energy time
- Battery removal and storage (UPS/Datacenter best practices)
- US recycling programs

ENERGY STAR UPS PPDS

Development Status



- PPDS draft includes proposals to:
 1. Report information pertaining to the adoption of typical 'best practices' that minimize power consumption of data centers
 - E.g., separability of batteries from UPSs
 2. Report participation in battery recycling programs within the U.S. or provide links to websites with this information
- Upon finalization, all PPDS will be represented on the product website
 - All ENERGY STAR data center products will utilize the same format, currently under development
 - EPA is looking into the creation of an interactive PPDS form for use on manufacturer websites

Open Comment



- EPA would now like to open up the line for any comments from stakeholders pertaining to:

Power and Performance Datasheet

ENERGY STAR Third Party Certification



- Third-party certification of test data prior to qualification and labeling
- Organizations become recognized by EPA under the scope of each product category

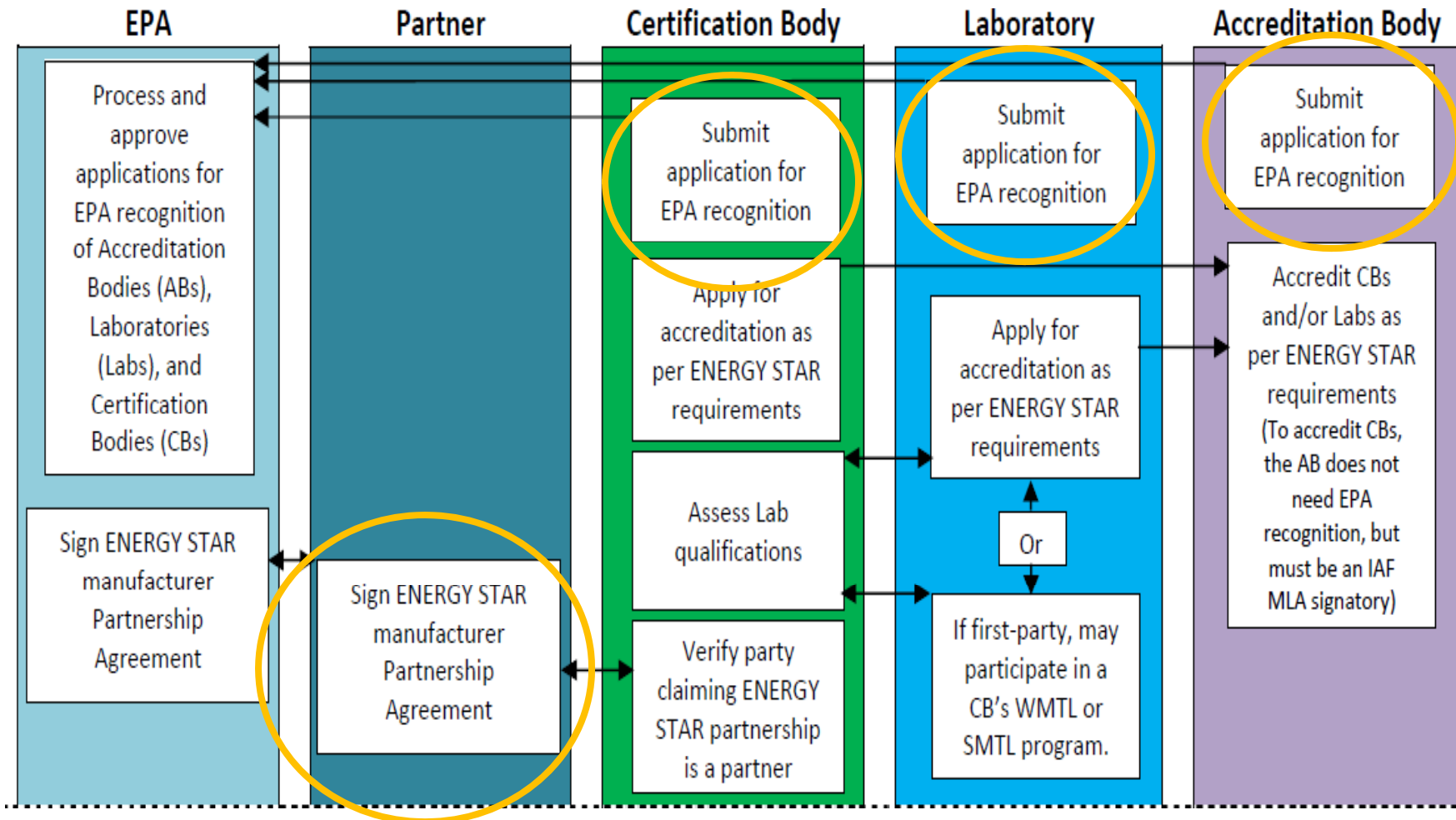
EPA Recognized Organizations:

Accreditation Bodies

Certification Bodies

Laboratories

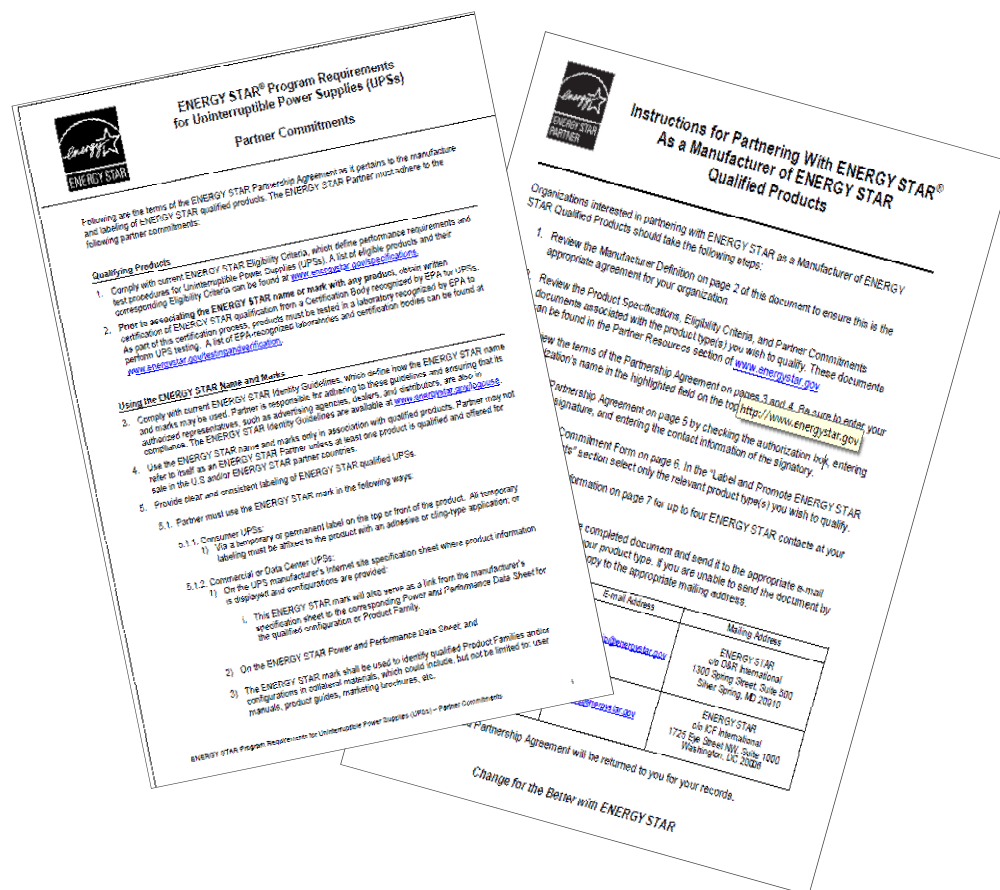
ENERGY STAR Partnership & Recognition Process



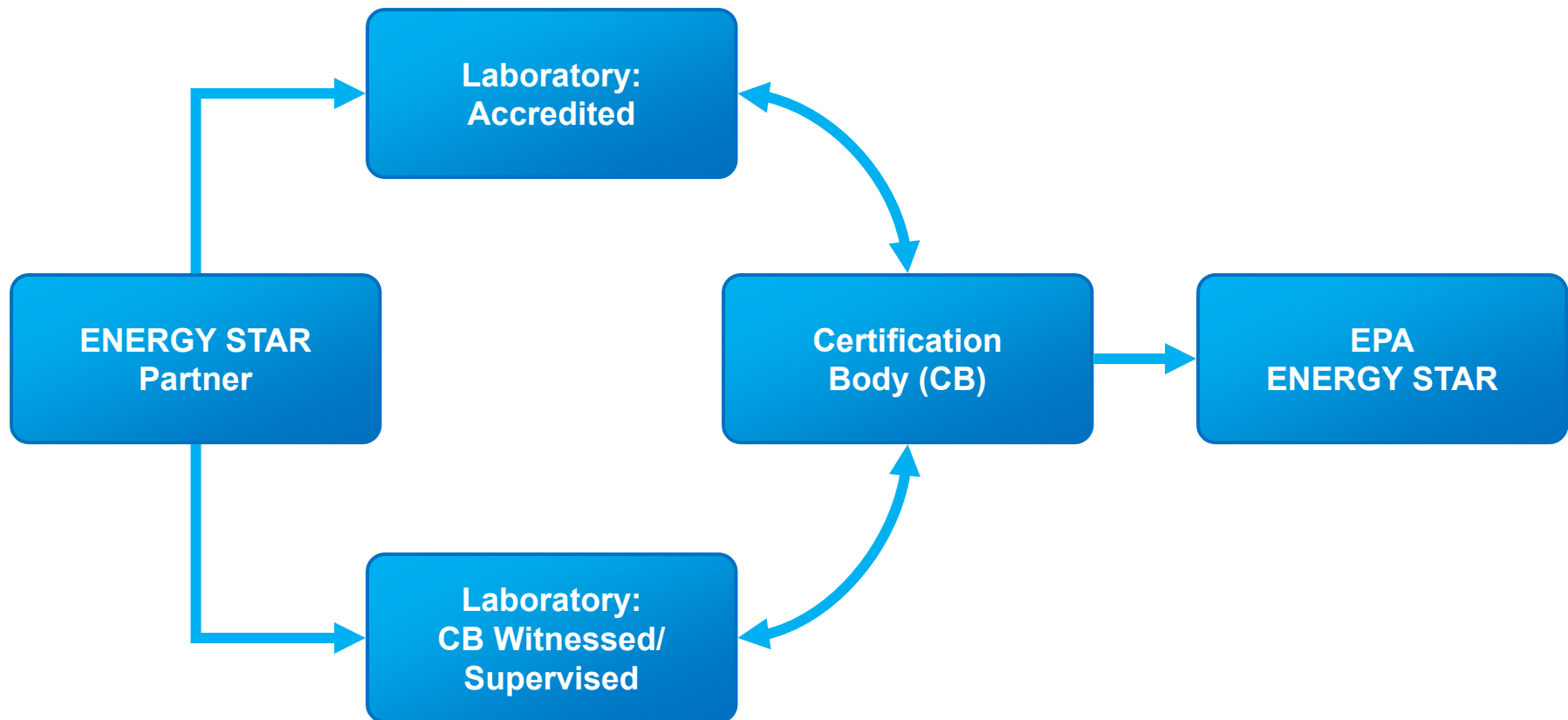
ENERGY STAR Manufacturer Partner Commitments



- Draft UPS Partner Commitments released for review
- Once UPS Program Requirements are finalized, Manufacturers submit a Partnership Agreement



Product Qualification Process



Laboratories for UPS Testing



- Units may be tested in a **third-party** EPA Recognized accredited Laboratory

-or-

- CB may operate a program to accept test data from a **first-party** lab operating under witness or supervision
 - i.e. a witnessed or supervised manufacturer's test lab (WMTL/SMTL)

ENERGY STAR Recognized Certification Bodies for UPSs

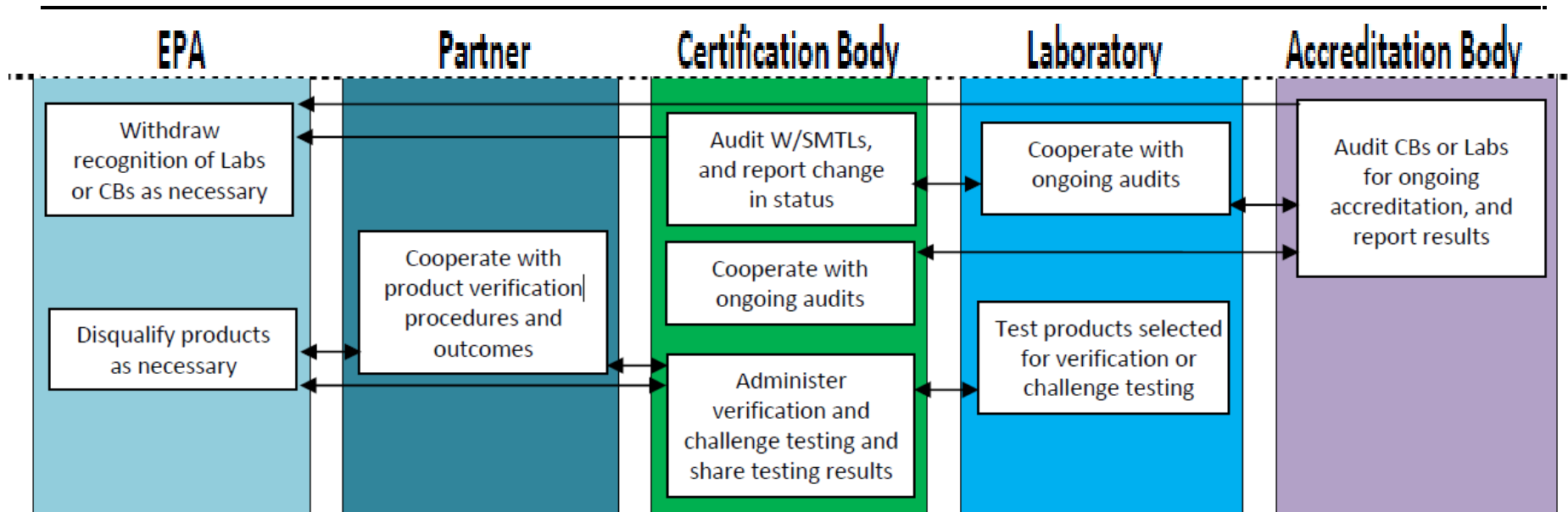


- CB is responsible for operating product certification program compliant with ISO/IEC Guide 65
 - After certification process is completed, CB will notify partner of qualification or rejection, or request additional information
 - If CB determines the product is qualified, it will provide EPA with appropriate data so the product may be added to the ENERGY STAR Qualified Product List
- EPA encourages interested Certification Bodies to participate in the UPS specification development process

ENERGY STAR Ongoing Testing and Verification



- EPA conducts ongoing verification – at least 10% of models qualified by each CB to be tested per year, taking product families into account



ENERGY STAR Verification & Challenge Testing Processes

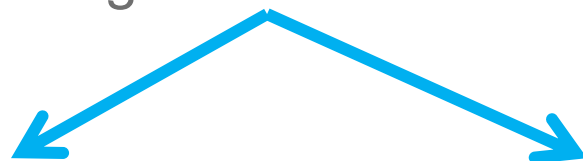


- Certification Body to administer verification testing:
 - Combination of random and pre-selected models
 - Unit procurement: off-the-shelf where feasible; other channels possible as long as 3rd party personnel selects units
 - 3rd party laboratory must be used (if not feasible, CB witnesses testing)
- Certification Bodies also have a challenge testing procedure in place with the following conditions of initiation:
 - Challengee has been notified
 - Model number has been clearly identified
 - Sound basis has been established

ENERGY STAR Testing and Verification Approaches



- EPA and DOE require that products be tested for purposes of verification consistent with how they were tested for purposes of qualification using one of the following approaches:



If a product was qualified based on a single test, then verification testing will involve a single test.

If a product was qualified based on multiple test samples, then 4 units will be procured at once for verification testing.

If a spot check on the first unit fails by 5% or more, the additional 3 units will be tested and statistical methods applied to the results to determine failure.

- Stakeholders commented that there may be **unit-to-unit variation within the same UPS model**

Manufacturing Variation & Representative Models



- Representative Models shall be selected for testing
 - Multiple internal configurations?
 - Report Representative Model/configuration on the PPDS or other centralized location?
- EPA welcomes further stakeholder information and comment on this issue

Specification Effective Date



Proposed Specification Effective Date

Friday, October 14, 2011

- By this date, all Program Requirements will be finalized:
 - Manufacturers may submit Partnership Agreements to ups@energystar.gov
 - Accreditation Bodies, Certification Bodies, & Laboratories may become recognized by EPA

Testing and Verification Resources



- For more information regarding testing and verification please visit:

www.energystar.gov/TestingAndVerification

- Access final requirements for accreditation bodies, laboratories, and certification bodies
- Find answers to frequently asked questions
- View complete ENERGY STAR Third-Party Certification Process Flow Diagram

Open Comment



- EPA would now like to open up the line for any comments from stakeholders pertaining to:

Qualification Processes

Additional Topics



Time (Eastern Time)	Topic
10:00 – 10:15	Meeting Introduction
10:15 – 10:35	Stakeholder Presentations
10:35 – 11:30	Ac-output UPS Efficiency Requirements
11:30 – Noon	Draft ENERGY STAR Test Method Revisions
Noon – 12:30	Dc-output UPS/Rectifiers Efficiency Requirements and Test Method
12:30 – 1:00	Lunch/Break
1:00 – 1:30	Toxicity and Recyclability Requirements
1:30 – 2:00	Qualification Processes
2:00 – 2:30	Additional Topics
2:30 – 3:00	Next Steps

Refurbished UPS



- 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
- 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



Refurbished UPS Market and Processes



- EPA invites stakeholders to comment on:
 - Refurbished v. Remanufactured UPSs
 - Refurbished UPS market share and potential
 - Typical refurbished UPS end-users
 - The typical process for refurbishing UPS units
 - Benefit of an ENERGY STAR label for refurbished UPSs.



Product Labeling



- Consumer:
 - Temporary or permanent physical label on product
- Commercial and Data Center:
 - Place ENERGY STAR mark on product's electronic specification sheet, with link to PPDS.
 - Place mark on PPDS.
 - Use in collateral materials such as manuals, product guides, brochures, etc.

Open Comment



- EPA would now like to open up the line for any comments from stakeholders pertaining to:

Refurbished UPSs and Product Labeling

Next Steps



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Upcoming ENERGY STAR Buildings Webinar



- Communications capability is common in Data Center UPS
 - However, stakeholders commented that requiring meters to be placed on the output of UPS units could lead to additional costs and power consumption
- EPA intends to hold a webinar with the ENERGY STAR Buildings group to further discuss communications capability and metering options related to both Data Centers and UPSs
 - An announcement with agenda and RSVP information will be sent

ENERGY STAR Buildings Group and UPS Webinar

Monday, August 8, 2011, 3-5 PM EDT

Discussion of Datacenter Energy Efficiency Metrics



Data Center Industry Leaders Reach Agreement on Guiding Principles for Energy Efficiency Metrics February 1, 2010

As business demands and energy costs for data centers rise, owners and operators have focused on the energy efficiency of the data center as a whole, frequently using energy efficiency metrics. However, the metrics are not always applied clearly and consistently. To address these inconsistencies, a group of leaders from across the industry met on January 13, 2010 to agree on data center energy efficiency measurements, metrics, and reporting conventions. Organizations represented were the 7x24 Exchange, ASHRAE, The Green Grid, Silicon Valley Leadership Group, U.S. Department of Energy's Save Energy Now and Federal Energy Management Programs, U.S. Environmental Protection Agency's ENERGY STAR Program, U.S. Green Building Council, and Uptime Institute.

The following guiding principles were agreed to:

- Power Usage Effectiveness (PUE) using source energy consumption is the preferred energy efficiency metric for data centers. PUE is a measurement of the total energy of the data center divided by the IT energy consumption.

This guidance

that can gen

Member organizations are committed to applying and promoting these guidelines to their programs.

A task force, consisting of the organizations listed below, has been created to further refine these metrics and to identify a roadmap for the future. The group also aspires to address IT productivity and carbon accounting in the future.

If you are a member of one of groups listed below, please contact them directly for further details.

- 7x24 Exchange: <http://www.7x24exchange.org/eemetrics.html>
- ASHRAE: <http://tc99.ashraetcs.org/>
- The Green Grid: gdcmetrics@lists.thegreengrid.org
- Silicon Valley Leadership Group: tim.crawford@datacenterpulse.org
- U.S. Department of Energy Save Energy Now Program: <http://www1.eere.energy.gov/industry/datacenters/contacts.html>
- U.S. Environmental Protection Agency's ENERGY STAR Program: ENERGYSTARdatacenters@icfi.com
- U.S. Green Building Council: leedinfo@usgbc.org
- Uptime Institute: <http://www.uptimeinstitute.org>



Harmonizing Global Metrics for Data Center Energy Efficiency

The United States of America, European Union and Japan Reach Agreement on Guiding Principles for Data Center Energy Efficiency Metrics
February 2, 2010

As business demands and energy costs for data centers rise, owners and operators have focused on the energy efficiency of the data center as a whole, frequently using energy efficiency metrics. However, the metrics are not always applied clearly and consistently at a global level. To address these inconsistencies, a group of global leaders met on February 2, 2010 to agree on data center energy efficiency measurements, metrics, and reporting conventions. Organizations represented were the U.S. Department of Energy's Save Now and Federal Energy Management Programs,

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For more details, please visit
www.energystar.gov/datacenters

1. Identify an initial set of metrics
2. Define each metric
3. Define the process for measurement of each metric
4. Establish on-going dialog for development of additional metrics

Desired Outcomes:

Effective energy efficiency metrics that:

1. Measure the actual IT work output of the data center compared to actual energy consumption. It is of note that in the process to define IT work output, the following interim measurements are being defined and / or validated:
 - a. IT - Measure the potential IT work output compared to expected energy consumption; and measure operational utilization of IT equipment
 - b. Data center facility and infrastructure - Measure the data center infrastructure efficiency (PUE)
2. Measure renewable energy technologies and re-use of energy to reduce carbon

Next Round: Draft 3 or Draft Final Specification?



- EPA is open to stakeholder feedback on the publication of a Draft 3 Specification before the Final Specification

Anticipated Specification Development Timeline



- **August/Early September:**
 - Receive comment on Draft 2 Specification and revised Test Method by **Thursday, August 11**
 - Draft 2 revisions
 - Publish Final Draft Specification
- **Late September/October:**
 - Stakeholder Webinar
 - Receive comment on Final Draft Specification and Test Method
 - Final Specification published

Proposed Specification Effective Date

Friday, October 14, 2011

Comments



- In addition to making verbal comments during today's meeting, stakeholders are strongly encouraged to submit written comments and data
- Please send all comments to: ups@energystar.gov

Comment Deadline

Thursday, August 11, 2011

Open Comment



- EPA would now like to open up the line for any general comments from stakeholders.

Meeting Adjourn



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References and Resources

- Energy Star UPS specification development:
Go to www.energystar.gov/NewSpecs and Click on “Uninterruptible Power Supplies”
- Energy Star Data Center efficiency initiatives:
http://www.energystar.gov/index.cfm?c=prod_development.server_efficiency
- US Task Force Leaders Agreement on Measuring Efficiency in a Data Center (energy must be measured at output of UPS):
http://www.energystar.gov/ia/partners/prod_development/downloads/DataCenters_AgreementGuidingPrinciples.pdf
- Global Task Force Leaders Agreement on Measuring Efficiency in a Data Center (energy must be measured at output of UPS):
http://www.energystar.gov/ia/partners/prod_development/downloads/Harmonizing_Global_Metrics_for_Data_Center_Energy_Efficiency.pdf



Thank You!

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