



ENERGY STAR, SERT, and Energy Savings in the Datacenter

SERT Demo/Training Meeting
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Learn more at energystar.gov

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ICFI: ICF International. Primary EPA contractor

NCI: Navigant Consulting International. Primary DOE contractor

LBNL: Lawrence Berkeley National Laboratory

ENERGY STAR Overview



- Federal government product and building labeling program
 - Established in 1992
 - EPA and DOE
 - Voluntary participation by private sector
 - Federal agencies required to buy EStar products
- Label awarded for superior energy efficiency.
- Also promote better practices.
 - Power management
 - Efficiency of buildings
- Save money, protect environment, add value to products.
- Influential brand recognized by over 80% of Americans

What does the ENERGY STAR Label Mean?

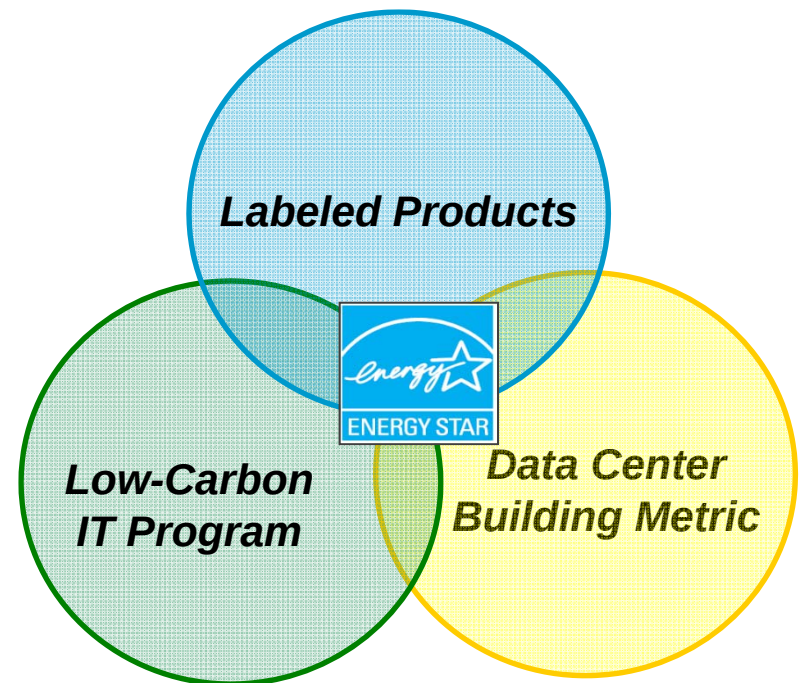


- A labeled product is:
 - More energy efficient than a conventional one
 - Cost effective
 - Payback in energy saved
 - Capable of delivering same or better performance compared to non-labeled products.
 - Better for the climate.

ENERGY STAR in the Data Center



- Product specifications for
 - Servers: v2.0 in Q1 2013
 - Storage: v1.0 in Q2 2013
 - UPS: v1.0 effective as of 8/1/12
 - Large Network Equipment: In progress
- Development may start soon on
 - Data Center Cooling Equipment
- Provide information to users to control energy costs.
 - Buildings: Portfolio Manager
 - Products: Labeling, Power and Performance Datasheet
 - Efficiency Strategies: Low-carbon IT Program's "Top 12 Data Center Efficiency Strategies"



Role of ENERGY STAR



- Addresses “coordination problem”
 - Phenomenon established in social sciences, game theory
 - “...situations in which all parties can realize mutual gains, but only by making mutually consistent decisions.”
- Focal point for energy efficiency
 - External to industry
 - Create/increase collaboration
 - Ask questions, get things moving
 - Develop/intensify “ecosystem” of contacts
- Explore and define efficiency
 - Metrics to use?
 - Configurations to recognize?
 - Test procedure(s) to use or develop?
- Provide purchasers with data needed to select products for energy efficiency and functionality.
- International coordination

History of Data Center Products in ENERGY STAR



- “The spark”
 - 2007 Report to Congress on Servers and Data Center Energy Efficiency, Public Law 109-431
 - http://www.energystar.gov/index.cfm?c=prod_development.server_efficiency_study
- Sample of findings:
 - 2006: Data centers consumed ~1.5% of US elect.
 - 2011: Data centers will consume ~3% of US elect.
 - Main energy users:
 - Servers, cooling equip, storage, network equip, UPS.
 - Projections:
 - Historical trend leads to 125 billion kWh consumed in 2011, absent any action.
 - Annual savings of 23 - 74 billion kWh possible by 2011 with use of best practices, state of the art equipment, etc.

Timeline of Data Center Product Specifications



- 2009:
 - Servers v1.0
- 2012:
 - UPS v1.0
- 2013:
 - Servers v2.0
 - Storage v1.0
- 2014:
 - Large Network Equipment v1.0

Server Spec Comparison



	Version 1.1	Version 2.0
Scope	1 – 4 socket RP	1 – 4 RP 1 – 4 BS 1 – 4 RS
Idle limits	1 socket: 55W, 65W* 2 socket: 100W, 150W*	1 socket: 47W, 57W* 2 socket: 92W, 142W*
		Resilient servers: 205W
Memory adder	2 W/GB, applies after 4GB	0.75 W/GB, applies after 4GB
APAs**		Adding idle testing option
PSU reqs.	Single output: 80+ Silver/Gold	Single output: 80+ Gold
	Multi output: 80+ Bronze	Multi output: 80+ Silver
PSU testing		Adding 3-phase power
Power manage	3 – 4 RP	All

RP = rack/pedestal, BS = blade server, RS = resilient server.

*Level applies to managed servers

**APA = Auxiliary Processing Accelerator. ESTAR-created term for add-in processing, GPU cards, etc. that are being used more frequently in servers now.





Future Servers v3.0

- Active mode requirements
 - Use SERT results to set active levels
 - Power/performance metrics, etc.
- More standardized data reporting
 - Power and Performance Datasheet
 - New Qualified Product List
- Explore greater thermal reporting

SERT



- Developed by SPEC, in partnership with ENERGY STAR.
- Designed as a tool set to measure energy performance of computer servers in active mode.
- Intended for global use, beyond our program.
- Expandable with new workloads, etc.
- Cornerstone of v2.0 and future ENERGY STAR Servers testing.

International Harmonization



- ENERGY STAR supports international adoption of common test procedures
- Ideally, test once, ship anywhere
- Want to see SERT adopted internationally
- Interest from:
 - China
 - South Korea
 - EU
 - Canada
 - Others

Utility of ENERGY STAR in Data Centers?



- Go beyond the label
- Identify energy efficient products
- Standardization
 - “All together now!”
 - See: Problem of coordination, earlier slide
 - Provide standardized data reporting
 - Provide standard test procedure (may be existing industry procedure)
- Example: UPS
 - All certified UPS products must report efficiency at 25, 50, 75, and 100% load (differs for AC vs. DC)

Power and Performance Datasheet (PPDS)



- Contains information on product energy performance
- Helps purchasers understand energy efficiency of their products, make comparisons
- Developing online “PPDS widget” to search ESTAR database

The screenshot shows a web-based "ENERGY STAR Product Comparison" widget. It has a header with the Energy Star logo, the title "ENERGY STAR Product Comparison", and links for "Print Results" and "Save as Excel file". The main content is a table comparing four manufacturers across various characteristics. The table is divided into sections: General Characteristics, Electrical Characteristics, and ENERGY STAR Efficiency Values. The table has a scroll bar on the right side.

	Manufacturer 1 XXX-1500-120	Manufacturer 2 YYY-2000-120	Manufacturer 3 ZZZ-2200-120	Manufacturer 4 111-1500-120
General Characteristics				
Manufacturer	Manufacturer 1	Manufacturer 2	Manufacturer 3	Manufacturer 4
Model Name	XXX-1500-120	YYY-2000-120	ZZZ-2200-120	111-1500-120
Model Number	XXX-1500-120	YYY-2000-120	ZZZ-2200-120	111-1500-120
Electrical Characteristics				
Energy Conversion Mechanism	Static	Static	Static	Static
Topology	Double-conversion	Double-conversion	Double-conversion	Double-conversion
Model Meets Definition of Modular UPS (Y/N)	N	N	N	N
Single-normal-mode UPS or Multiple-normal-mode UPS?	Single-normal-mode	Single-normal-mode	Single-normal-mode	Single-normal-mode
Total Number of Outlets	6	6	6	4
Number of Backup Outlets	6	6	6	4
Number of Surge Outlets	0	0	0	0
Minimum Input Voltage	110 V rms	90 V rms	90 V rms	89 V rms
Maximum Input Voltage	130 V rms	150 V rms	150 V rms	142 V rms
Minimum Output Voltage	110 V rms	110 V rms	110 V rms	100 V rms
Maximum Output Voltage	127 V rms	127 V rms	127 V rms	127 V rms
Minimum Output Frequency	60 Hz	50 Hz	50 Hz	50 Hz
Maximum Output Frequency	60 Hz	60 Hz	60 Hz	60 Hz
ENERGY STAR Efficiency Values¹				
Test Input Frequency	120 V rms	120 V rms	120 V rms	120 V rms
Test Output Voltage	60 V rms	60 V rms	60 V rms	60 V rms
Test Output Frequency	120 Hz	120 Hz	120 Hz	120 Hz

Qualified Product List (QPL)



- Was an Excel spreadsheet of all qualified products.
 - Limited information, updated every two weeks, kind of awkward document
- Is/will be a more dynamic web platform for searching list of products
 - Data downloadable in variety of formats
 - Updated every 24 – 48 hrs
 - Much more information available
 - Example: Clothes Washers
 - <https://data.energystar.gov/Government/ENERGY-STAR-Certified-Residential-Clothes-Washers/cmae-djp4>



Final Note: Workstations

- ENERGY STAR Computer v6.0 almost complete
- Computer Workstations included in scope
 - Current approach needs to change
 - Holdover from v4.0, never intended to be permanent
- Trying to find good, universally accepted benchmark.
- SPEC involvement?
 - Workstation benchmark effort before my time, back around 2006 (Computers v4.0)
 - Interested in reopening this work
 - Successful SERT development partnership as model
- Interested in further discussion with SPEC Workstation group
- Develop benchmark in time for v7.0.

Thank you!



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