ENERGY STAR
Computers Draft 3
Stakeholder Webinar

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Outline

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Introduction

Definitions and Scope

Product Categorization

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Introduction

- Version 6.0 has been under development since early 2011.

- Large number of changes from Version 5.2 plus data set issues have led to a longer revision process
  - Changes are leading to a better accounting of Computer energy consumption
  - Informing improvements in ENERGY STAR data set management and review

- Draft 2 Specification released May 15, 2012
- Several calls, preliminary slides circulated over summer and fall.
- Draft 3 Specification and Test Method released November 29, 2012

Written Comments

- Thank you to everyone for your helpful feedback on the Draft 2 specification and Draft 1 test method

- In addition to making verbal comments during today's call, stakeholders are encouraged to submit written comments to computers@energystar.gov

Comment Deadline

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Definitions

- ## Notebook Computer
  - Slate Computing Device definition removed from Draft 3
  - Slates will be addressed in future Version 6.1

- ## Computer Components
  - GPU definition has been updated
  - Integrated Graphics definition added

Definitions

- ## Displays
  - The Display and Enhanced-performance Integrated Display definitions have been updated to harmonize with ENERGY STAR Displays Version 6.0 specification

- ## Networking and Additional Capabilities
  - Definition for Switchable Graphics has been added

Scope

- ## Inclusion
  - Slates currently listed as included
  - Largely TBD, will be worked on as part of v6.1 update

- ## Exclusions
  - Point of Sale products added to the list of exclusions
  - Computer Servers have been removed from the list of exclusions
    - Covered by another specification, so exclusion is automatic

Outline

Desktop and Notebook Categorization

- Desktops: Retain Ecma categorization
- Notebooks: Change to the ITI proposal
  - ITI category system makes better distinctions between mobile (notebook) products based on capabilities and end uses

Desktop Ecma Categorization

- Ecma categorization for desktops
  - Ecma categorization remains a better representation of desktop computer products on the market

Table 3: Categorization of Desktop and Integrated Desktop Computers

Category	DT 0	DT 1	DT 2	DT 3
CPU Cores	Any	Cores ≤ 2	Cores ≥ 3	Cores ≥ 3
Channels of Memory	Channels = 1	Channels = 2	Channels ≥ 2	Channels ≥ 2
Base Memory	1 GB	2 GB	2 GB	4 GB
Base Graphics[ii]	Integrated Graphics	Integrated Graphics	Integrated Graphics	dGfx = G5
Graphics Adders[ii]	dGfx ≤ G7	dGfx ≤ G7	dGfx ≤ G7	G5 < dGfx ≤ G7

Notebook ITI Categorization

- Based on Performance Score:
  - [# CPU cores] * [CPU clock speed (GHz)]
- Notebooks further categorized by Graphics

Table 4: Categorization of Notebook Computers

Category	NB 0	NB I1	NB I2	NB I3	NB D1	NB D2
Performance Score, P^{iii}	$P \leq 2$	$2 < P \leq 5.2$	$5.2 < P \leq 9$	$P > 9$	$2 < P \leq 9$	$P > 9$
Base Memory	None	None			None	
Base Graphics[ii]	Any Graphics	Integrated Graphics			Discrete Graphics	
Graphics Adders[ii]	dGfx $\leq$ G7	N/A			dGfx $\leq$ G7	

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Switchable Graphics

- Products with switchable graphics may not apply the Discrete Graphics allowance $TEC_{GRAPHICS}$

- Desktops and Integrated Desktops:
  - Allowance equal to 50% of the G1 graphics allowance

Product Type	Switchable Graphics Allowance (kWh)
Desktops and Integrated Desktops	18

Switchable Graphics (cont.)

- Notebooks do not receive Switchable Graphics adder because functionality is widespread
  - But systems different from typical Integrated Graphics
- NB I3 category added to original ITI proposal
  - Covers most Notebooks with Switchable graphics

Table 4: Categorization of Notebook Computers

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Base TEC Allowances: Desktops, Integrated Desktops, Notebooks

- Revised base TEC levels based on:
  - Qualified products list 2009–2011
  - Data submitted by manufacturers in 2011
  - Sampling of data from ENERGY STAR Qualified Product List in 2012

- Incorporates revised graphics and other adders
  - Decreases in allowances are reflected in higher adders and vice-versa
  - Qualification rates will provide choice within each category while recognizing top performers

Base TEC Allowances: Desktops and Integrated Desktops

Table 8: Base TEC Allowances for Desktop and Integrated Desktop Computers

Product Category	TEC_{BASE} (kWh)
DT 0	65.0
DT 1	115.0
DT 2	130.0
DT 3	205.0

Base TEC Allowances: Notebooks

Table 9: Base TEC Allowances for Notebook Computers

Product Category	TEC$_{BASE}$ (kWh)
NB 0	14.0
NB I1	22.0
NB I2	24.0
NB I3	28.0
NB D1	16.0
NB D2	18.0

Most higher end Switchable Graphics Notebooks

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Integrated Display Adder (TEC$_{INT\_DISPLAY}$)

Now include the TEC conversion factor $8.76 \times T_{SHORT\_IDLE}$

- Integrated Desktop adder:

$$8.76 \times T_{SHORT\_IDLE\_DESKTOP} \times (1+EP) \times (4 \times r + 0.05 \times A)$$

- Notebook adder:

$$8.76 \times T_{SHORT\_IDLE\_NOTEBOOK} \times (1+EP) \times (2 \times r + 0.02 \times A)$$

- Adders are different because of differences in luminance during testing.

  – Using the same adder value for both would result in no qualifying Integrated Desktops.

Enhanced-Performance Display Adder

- The enhanced-performance display adder has been revised to harmonize with the Final Version 6.0 ENERGY STAR Displays specification

Equation 3: Calculation of Allowance for Enhanced-performance Integrated Displays

$$EP = \begin{cases} 0, & No\ Enhanced\ Performance\ Display \\ 0.3, & Enhanced\ Performance\ Display, d < 27 \\ 0.75, & Enhanced\ Performance\ Display, d \geq 27 \end{cases}$$

Where:
- d is the diagonal of the screen, in inches;

Graphics Adders (TEC$_{GRAPHICS}$)

- In response to Draft 2, stakeholders commented on three assumptions contributing to Discrete Graphics adders:
    1. Ac-dc conversion efficiency used to calculate adders
    2. Relationship between graphics power in Short Idle vs. Long Idle
    3. Relationship between graphics power in Notebooks vs. Desktops (Notebook GPUs consume approximately 50% the energy of Desktop GPUs.)

- EPA reviewed the input and adjusted most of the levels upward.

- Subsequent discussion with stakeholders resulted in a lowering of many levels, with Base TEC changes resulting.

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Graphics Adders (TEC$_{GRAPHICS}$)

Function			Desktop	Integrated Desktop	Notebook
TEC$_{GRAPHICS}$ (kWh)[vii]	**Graphics Category[viii]**	**G1** (FB_BW ≤ 16)		36	11
		G2 (16< FB_BW ≤ 32)		51	18
		G3 (32 < FB_BW ≤ 64)		64	24
		G4 (64 < FB_BW ≤ 96)		83	32
		G5 (96 < FB_BW ≤ 128)		113	42
		G6 (128 < FB_BW < 192)		125	48
		G7 (FB_BW ≥ 192)		157	60

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Power Supply Efficiency Incentive

- EPA is retaining the power supply requirements from Version 5.2

- However, in response to stakeholder feedback, EPA is proposing an <u>optional</u> power supply allowance to reward use of higher efficiency PSUs

    – Focuses on efficiency at 10% load, where computers spend the majority of their time

Power Supply Efficiency Incentive

Table 5: Power Supply Efficiency Allowance

Power Supply Type	Computer Type	Minimum Efficiency at Specified Proportion of Rated Output Current[iv]				Minimum Average Efficiency[v]	Allowance$_{PSU}$
		10%	20%	50%	100%		
IPS	Desktop	0.81	0.85	0.88	0.85	-	0.015
		0.84	0.87	0.90	0.87	-	0.03
	Integrated Desktop	0.81	0.85	0.88	0.85	-	0.015
		0.84	0.87	0.90	0.87	-	0.04
EPS	Notebook	0.83	-	-	-	0.88	0.0075
		0.84	-	-	-	0.89	0.015
	Integrated Desktop	0.83	-	-	-	0.88	0.0075
		0.84	-	-	-	0.89	0.015

- Note typographical error in Draft 3:
  should read 0.0075 (0.75%), not 0.075

Maximum TEC Requirement

- Revised E_{TEC_MAX} equation:

$$E_{TEC\_MAX} = (1 + ALLOWANCE_{PSU}) \times$$
$$(TEC_{BASE} +$$
$$TEC_{MEMORY} +$$
$$TEC_{GRAPHICS} +$$
$$TEC_{STORAGE} +$$
$$TEC_{INT\_DISPLAY})$$

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Workstation Requirements

- To qualify a workstation for ENERGY STAR, performance must be tested against the following benchmarks:

  1. Linpack
  2. SPECviewperf
  3. CINEBENCH
  4. SPEC CPU 2006

- Report: results, time per test, total time of all tests, energy consumed per test, total energy consumed over all tests

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Thin Client Requirements

- Converted to TEC requirements
- New thin client E_{TEC_MAX} equation:

$$E_{TEC\_MAX} = TEC_{BASE} + TEC_{GRAPHICS} + TEC_{WOL} + TEC_{INT\_DISPLAY}$$

- Additionally, EPA proposes that thin clients can only claim the first category of desktop graphics adders
- NOTE:
  - Base TEC should be 60 kWh

Table 14: Adder Allowances for Thin Clients

Adder	Allowance (kWh)
TEC_{BASE}	55
$TEC_{GRAPHICS}$	36
TEC_{WOL}	2

Small-scale Servers

- EPA considered a proposal to use TEC for Small-scale Servers

- Lack of data on Small-scale Server usage

- Assumed usage pattern has been nearly 100% idle

- Retained Off and Idle Mode requirements from Draft 1

  - $P_{OFF\_MAX} = P_{OFF\_BASE} + P_{OFF\_WOL}$
  - $P_{IDLE\_MAX} = P_{IDLE\_BASE} + (N - 1) \times P_{IDLE\_HDD}$

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Number of Units Required for Testing

- EPA has removed the requirement for additional testing of units if within 10% of requirement level
  - Verification testing conducted by certification bodies indicates this requirement is no longer needed
  - This change is consistent with other CE/IT ENERGY STAR specifications

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Test Method Updates

- Three main updates to the test method
    1. Workstation Active Mode Testing
    2. Dark Room Requirements Removed
    3. Display Warm-up and Brightness Settings

Update 1: Workstation Active Mode Testing

- *Issue*: Maximum power test specified in Draft 2 Test Method is not representative of real world workstation use

- Ideally, active mode test should be representative of real world applications and loading profiles for workstations

- DOE plans to include four workstation benchmarks for data collection purposes in Version 6.0
  - All 4 benchmarks shall be tested separately

Update 1: Workstation Active Mode Testing

	Proposed Benchmark	Description
1	LINPACK	Tests processor performance by solving linear equations
2	SPECviewperf 11	Contains 8 benchmarks to test graphics and processor performance
3	SPEC CPU 2006	Contains integer and floating point workloads
4	CINEBENCH	Tests graphics and processor performance

Update 1: Workstation Active Mode Testing

Plan for Version 6.0 Test Method:

Draft	Content
Draft 3	Includes 4 benchmarks for stakeholder feedback
Final Draft	Include additional configuration and setup details for the 4 benchmarks.
Final	Require testing and reporting with the 4 benchmarks

Update 1: Workstation Active Mode Testing

- DOE and EPA welcome feedback on the proposed benchmarks for evaluating workstation active mode
  - LINPACK
  - SPECviewperf 11
  - SPEC CPU 2006
  - CINEBENCH

- Are these benchmarks representative of real world applications for computer workstations?

- Are there other benchmarks that should be considered?

Update 2: Dark Room Requirements Removed

- *Issue*: Dark room conditions defined in Draft 2 Test Method are not used in the test conduct
  - Stakeholders recommended removing the definition

- Removed dark room conditions from Draft 3 Test Method
  - Integrated desktops and notebooks are tested with ABC disabled which does not require a dark room

Update 3: Display Warm up and Brightness Settings

- *Issue*: Display brightness settings could change when system is restarted after warm up
  - Stakeholder expressed concern and requested additional details

- Draft 3 Test Method updated as follows:
  - Display brightness shall be set after warm up period is complete
  - UUT shall not be rebooted until after the power measurement for all modes is complete

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Open Questions

- The line is now open for any other questions.

Timeline

Topic	Date
Draft 3 Distributed	November 29, 2012
Stakeholder Webinar	December 10, 2012
Draft 3 Comment Deadline	January 9, 2013
Final Draft	Early February 2013
Final	Early March 2013

Written Comments

- Thank you to everyone for your helpful feedback on the Draft 3 specification and test method

- In addition to making verbal comments during today's call, stakeholders are encouraged to submit written comments to computers@energystar.gov

Comment Deadline

Thank you!

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