



ENERGY STAR[®] Computers (Ver. 6) Product Specification Discussion

ITI Presentation

March 10, 2011

Agenda

Topic	Duration
<i>Intro/Data Collection approach for establishing Energy Star V6 targets (new)</i>	10 min
<i>Slates and Mobile Computing (scope, testing, approach)</i>	20 min
<i>Testing enhancements (Ecma383, displays and display power, TEC patterns)</i>	20 min
<i>Notebooks (incl. mobile thin clients) and Desktops</i>	15 min
<i>Graphics (drivers in market developments, categories, approach)</i>	15 min
<i>Workstations, Thin Clients and Small-scale Servers (Ultrathin Clients, shared desktop computing, market developments, updated categories)</i>	20 min
<i>Other environmental benefits (PAIA, delivering on other consumer environmental interests [e.g., reduced toxics])</i>	15 min
<i>Product labeling and disclosure requirements</i>	10 min

Energy Star V6 Data Collection Approach - I

Issues with Energy Star V5 data collection and TEC/Adder targets

- Energy Star voluntary specification is being used under a mandatory regulatory scheme in many geographies (ErP Lot 3, AUS MEPS, China PC Standards/Regs). ENERGY STAR® V5 was never intended for this purpose.
- Energy Star program only focused on computer SKUs marketed in the US and specifically those configurations designed to be Energy Star compliant, and systems sold into the existing Energy Star preferred segments (government and corporate IT segments) versus the entire PC marketplace, resulting in two issues:
 - Existing Computer market segments not comprehended or covered by the program, and
 - Not covering new market segments that emerged since the program.
- Allowances: 2008 Energy Star V5.0 dataset shows discrete graphics allowances were not adequate (8-11% inclusive - for desktop in particular). No allowances for TV tuners or discrete audio devices.

Energy Star V6 Data Collection Approach - II

Impact:

- ErP Lot 3 and AUS MEPs adopting ENERGY STAR[®] V5 targets as-is for their upcoming programs. Simply relying on ENERGY STAR[®] V5 to cover all market segments under a mandatory program will cause a large number of systems to be excluded from the market. In effect you are applying a 25% top performance measure to 100% of the market. Even top 25% targets were established based on a narrow set of data .
 - Example: As of August, 2010, the Energy Star 5.0 qualified products in the EU do not have meaningful inclusion of discrete graphics, especially for desktop platforms
 - Globally and within the EU marketplace, Energy Star V5.0 is assessed to be less than 2% inclusive of Category D platforms high > 128-bit graphics
 - Within Category D, approximately 4% of platforms can be shown to contain > 128-bit graphics (despite >128-bit graphics being included in the category definition)
- Global regulations are pushing back on additional ingredient adders, not covered under Energy Star program – example TV Tuner, Discrete audio, HE dGfx systems (Risks: Market entry and consumer choice).

Energy Star V6 Data Collection Approach - III

Recommendation:

- Ensure Energy Star V6 data collection includes broad PC segments and systems that will be in scope of the program
- Work with Industry to collect TEC /adder data based on proportionate number of Energy Star and Non-Energy Star system population, within agreed system categories
- Products that are NOT in scope should be explicitly stated in the specification, to avoid being regulated in other regions
- Data collection and TEC/adder target methodology should be open and transparent
- Align with Ecma-383/IEC 62623 on discrete graphics classification, duty cycles, test methods, and proposed categories (subject to refinement)
- Take into consideration global impact of Energy Star V6 program (fix Energy Star V5 issues). The reality is that V6 program specification will be used for mandatory global regulations.



Slates and Mobile Computing

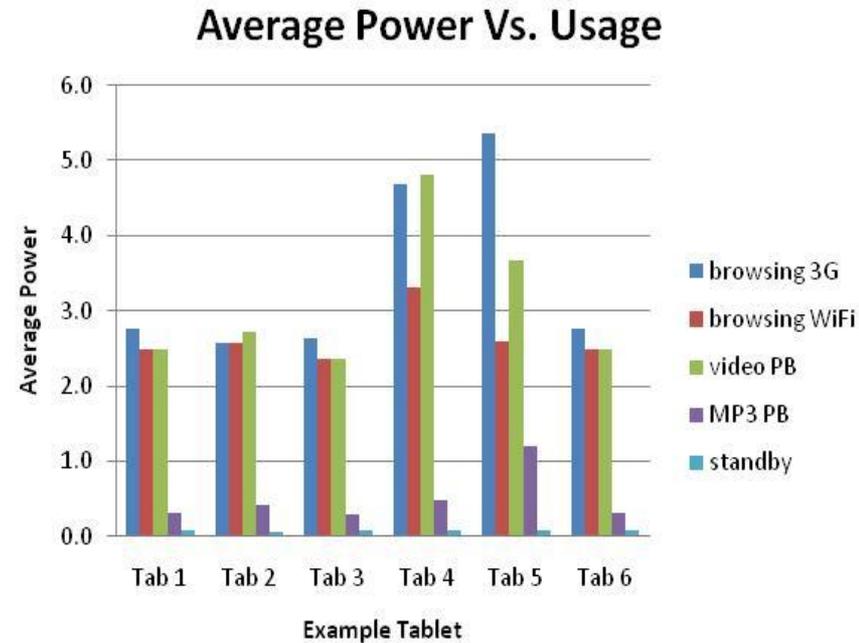
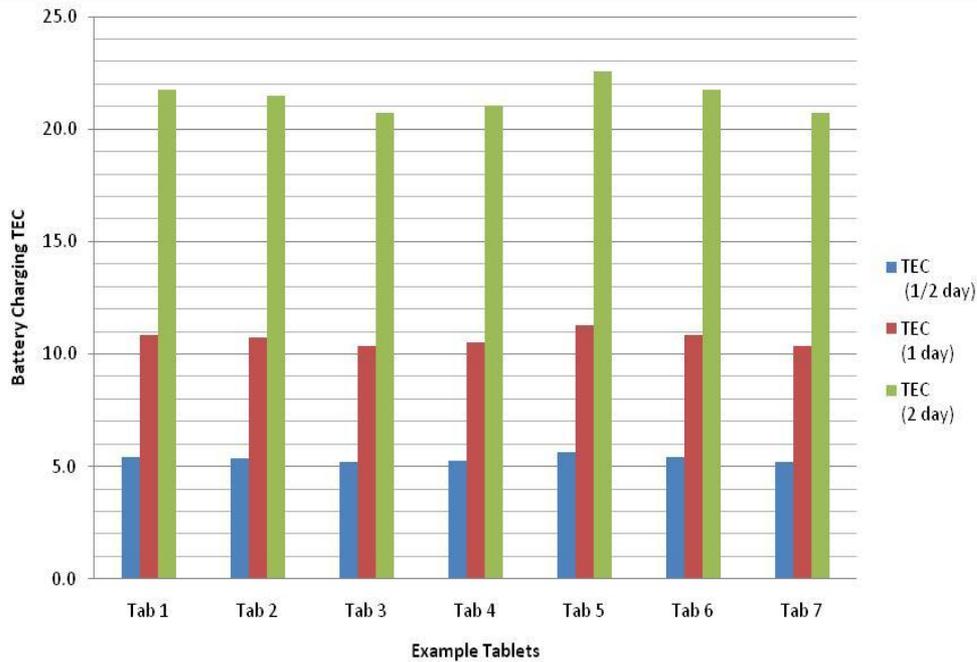
Slates/Tablets

- Tablets should be out of scope for Energy Star since as a class of products, they are energy efficient by definition
- Highly mobile
 - Battery powered
 - Not typically operated when connected to charger (AC power)
 - Long battery life a critical feature (e.g. 10 hours)
- Efficiency
 - Efficient components
 - Low energy SoC processors
 - LED backlighting
 - Li-ion batteries
 - Energy efficient radios
 - Aggressive power management
 - Auto power down occurs quickly when inactive (e.g. 2 minutes)
 - Automatic brightness control of display based on ambient lighting
 - Applications and services optimized for efficiency

Slates/Tablets: Energy Efficient By Definition

- Very Low Energy Consumption - Typical energy use 5-10 kWh/year (\$0.55-\$1.10 per year)
 - Assumes 5 hours of active use per day, power adapter always plugged-in, full charge every 2-3 days
- Global regulations for external power supplies will already ensure efficient power supplies are shipped with tablets (e.g. DOE, NRCAN, ErP Lot 7, Australia MEPS)
- N. American regulations related to efficiency of battery charging systems will ensure that a minimum level of efficiency is maintained during charging and battery maintenance

Slates/Tablets



- Data shows a variety of recent tablets based on ~10 hour battery life and different charging intervals
 - Majority of tablets would be charged less than once a day (between 5-10 KWh/year)
 - Charging efficiency is already covered in ENERGY STAR for Battery Charging Systems



Testing Enhancements

Challenges with Ecma-383 (Short idle for integrated displays)

- Industry supports Ecma-383 methodology but see the following challenges for implementation:
 - New methodology requires more industry vetting including test methodology
 - TEC limits need to account for display size and performance
 - Impact on integrated display categories (NB, integrated DT)
 - Increase in measured TEC (Would require EPA to increase TEC targets)
 - Not enough time for V6 data collection to get it right
 - Global proliferation will make it worse without proper vetting

Testing Enhancements



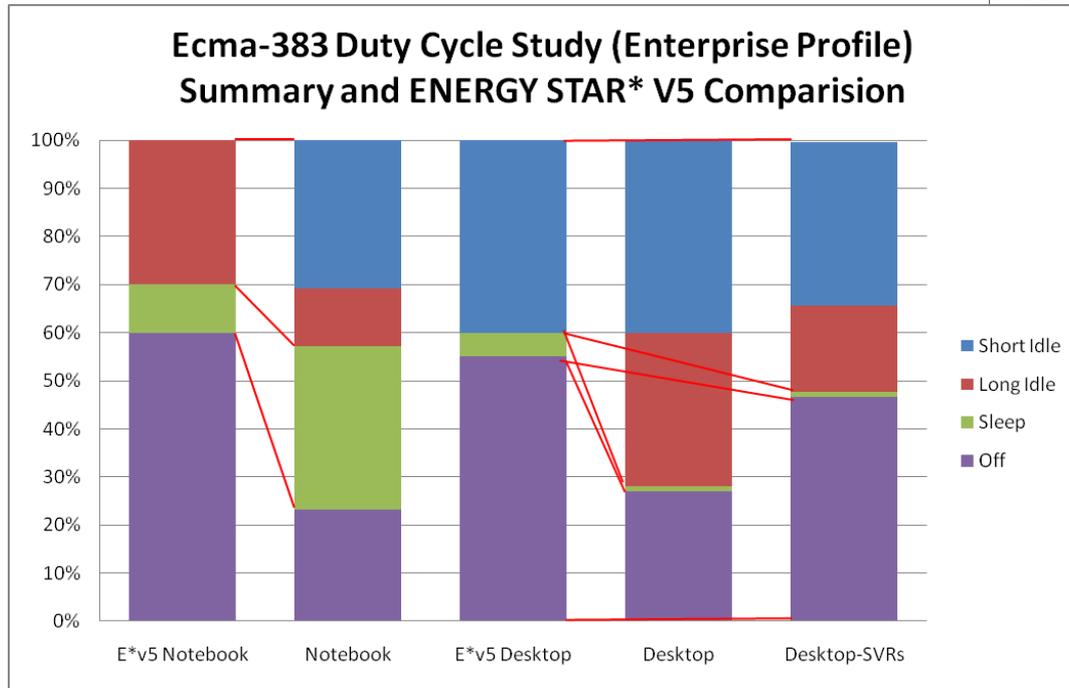
- Issues with testing integrated devices with displays on
 - Has been addressed in the Ecma-383 standard, but not verified
 - On utilization of the display (usage study for enterprise usage)
 - Brightness of the display when tested (as shipped)
 - Ambient light conditions for technologies dealing with ABC
 - TEC limits for notebooks will increase significantly (display is a large contributor to energy, which was ignored in ENERGY STAR V5), if the EPA uses short idle expect the limits to increase
 - But TEC estimation will be more accurate
- Long and short Idle latencies
 - The Ecma-383 usage patterns were based off the ENERGY definition for the idle display timer
 - Long idle, after 15 minutes display blanking. These were based off usage spec and are driven by the power management requirements of ENERGY STAR (15 minute idle period for display blanking).
 - Short idle, before the display idle timer expires and enough time for the OS to quiesce (5 minutes)

Testing Enhancements questions

- What special testing considerations should EPA consider for small-form factor and all-in-one desktops (e.g., applicability of internal power supply requirements for supplies less than 75 watts, passive cooling)?
 - 80plus limits should not be applicable for <75W or use the EPS spec
- Is powering a computer via low-voltage DC (e.g., Power over Ethernet, USB) expected to become more common in the coming years? How prominent is it today?
 - Industry doesn't feel this is a dominant method for powering devices in this time frame.
- Do requirements and test methods need to account for USB-powered devices? For other low-voltage DC powering (Power over Ethernet)? If so, how?
 - There are many systems that provide powered ports (i.e. USB) in sleep and off states for the convenience of end users and this will continue. The EPA should consider an energy/power adder for the sleep and off states for systems supporting such a feature as it impacts off and sleep power for each port supporting such a function.

NB/DT Usage Patterns

- Ecma-383 just published AC usage patterns on notebooks and desktops which should be relevant to ENERGY STAR V6 development. We know of no AC usage studies for tablets/slates or netbooks (which are primarily used on battery, and therefore an AC study would involve when they are charging their batteries).



Ecma-383 3rd edition Profile Study Summary

Type	Count	Idle %	Short Idle	Long Idle	Sleep	Off
Notebook	511	41.7%	30.4%	11.3%	33.3%	23.2%
Desktop	55	71.7%	39.9%	31.8%	0.7%	26.8%
Desktop-SVRs	29	51.9%	34.0%	17.9%	1.2%	46.6%
Existing ENERGY STAR* V5 Values						
E*v5 Notebook		30%	0%	30%	10%	60%
E*v5 Desktop		40%	40%	0%	5%	55%

Source: Includes system data from Intel*, Sony*, Lenovo*, and Lexmark* from Asia, Europe and USA Enterprises



Notebooks and Desktops

Notebooks and Desktops

- Netbooks:
 - Three competing architectures will be used in Netbooks.
 1. “Pentium” based – higher performance, higher power
 2. “Atom” based - lower performance, lower power
 3. ARM based – still lower performance, still lower power (?). Will Win8 power management for ARM be robust ?
 - Industry agrees Netbooks are closely related to traditional notebooks, but have lower power signature. Netbooks would need their own category else traditional notebooks would be forced out in the 25% cut. With Netbook screen sizes increasing, multiple power footprints, how does Industry categorize a Netbook ?

Notebooks and Desktops

- Netbooks Recommendation:
 - Until the Netbook picture becomes clearer, Industry suggest Energy Star continue with the current Netbook paradigm.
- Mobile Thin Clients:
 - A mobile thin client tends to be a traditional notebook without mass storage.
 - Mobile thin clients are often sold with processors that have a reduced power management feature set.
- Recommendation:
 - Keep Mobile thin clients within traditional Notebooks categories

Notebooks and Desktops

- Mobile Workstations and Enthusiast Desktops:
 - Industry experience with mandatory, Energy Star based programs like ErP Lot 3 produced two system types that have small markets and relatively large energy footprints. To minimize loopholes
 - Recommendation: Industry proposes to create specific definition and category for these classes of systems.
 - Mobile Workstation
 - Be marketed as a (mobile) workstation
 - MTBF \geq 13,000 hours
 - Be qualified by at least 2 Independent Software Vendors (ISV) product certifications; these certifications can be in process, but must be completed within 3 months of qualification
 - Open GL Certified
 - \geq G3 Discrete GPU
 - Integrated Docking Station Design

Notebooks and Desktops

- Mobile Workstations and Enthusiast Desktops
 - **Enthusiast Desktop Category (proposal)**

Desktop	CAT D High-end Exemption
CPU	≥ 4 Cores
dGfx	dGfx ≥ G5 based on 7-class dGfx classes (any additional dGfx allowed)
Mem size	≥ 6 GB
Mem channels	≥ 2 channels
PCIe	≥2 PCIe slots/end points of x8 or x16 config
PSU Rating	≥ 500W

Power Supplies

- Power Supply Efficiency Recommendation:
 - Leave current PSU requirement at 80plus Bronze and EPS V.
 - Consumer systems will have the option of taking advantage of the falling prices of Bronze and EPS 2.0 PSUs. This will allow greater presence of the Energy Star label in the Consumer PC market where it is now all but ignored.
 - Ensure 80plus limits not applicable for <75W or use the EPS spec
 - OEMs could submit more Consumer systems into the Energy Star data base that reflect what they actually sell in the marketplace.
 - Europe, Australia/New Zealand, China etc. are determined to make Energy Star x.0 mandatory for market access within 3-4 years of its inception. An accurate Energy Star data base would greatly facilitate that process.

Power Supplies

- Power Supply Efficiency
 - Increasing PSU efficiency isn't cost linear. Going from Bronze to Silver is more expensive than going from 80+ to 80plus Bronze. PSU doesn't pay for itself over life expectancy of the system.
 - Practical limit for multi-output Client PSU is Gold. Single output power supplies force OEMs into tough choices. Boards can't be shared between regions with differing demands for efficiency. Single output supplies must be mated with single output boards.
 - Consumer customers traditionally won't pay the delta for 80+. Bronze is coming down in price. Continuously driving up PSU efficiency creates a cycle that prevents significant presence of the Energy Star label in the Consumer market.



Graphics

Discrete Graphics Recommendations

- **Problem:** The adoption of Energy Star V5.0 definitions and methodologies in mandatory energy regulations risks excluding discrete graphics in many regions around the world
- **Industry recommendations for inclusion of platforms with efficient discrete graphics:**
 1. **Separate discrete graphics allowances from base system requirements**
 - Discrete graphics is an optional 'adder' and orthogonal to other requirements (RAM, HDD, CPU cores, etc)
 2. **Move to the ECMA-383 (7-group) based frame buffer bandwidth classification for discrete graphics**
 - Scalable and congruent with new GPU technology innovations
 - Create appropriate TEC allowances for each discrete graphics group

High Performance Discrete Graphics in Context with other High Performance Components

- Discrete GPUs can be the most complex device in the entire PC
 - Capabilities and complexity are driven by market requirements of very high performance and task efficiency

Device Comparison	
Product	Transistor Count (Millions)
High Performance Quad Core CPU	450
High Performance 6 Core CPU	758
High Performance G7 Class AMD Discrete Graphics	2640
High Performance G7 Class Nvidia Discrete Graphics	3000

- Discrete graphics is an **entire subsystem** (not just a chip)
 - Modern discrete graphics interface can be **256-bit or 384-bit**
 - CPUs by comparison are typically **128-bit**
- Very high end discrete GPUs are essential for high performance professional and consumer applications
 - Essential for digital content creation, high performance computing, workstation applications
 - Creates and drives ecosystem adoption of new technologies: DirectX 11, DisplayPort, Stereoscopic 3D, PCI Express Gen2, compute parallelism

Issue Summary

- Discrete Graphics allowances not inclusive of Energy Star top 25% methodology
 - Targets largely based on iGfx based systems
- Category definition issues (DT CAT C/D)
 - Not high enough allowances for dGfx leading to lower dGfx attach rate
 - Resulted in Energy Star compliant systems to be primarily iGfx systems with large RAM
- Discrete graphics definition (Frame buffer width)
 - FB_W not scalable with new dGfx technologies
 - Not a reliable proxy for performance
- Risking exclusion of discrete graphics based systems
 - Issues amplified for mandatory global product energy regulations (EU, China, AUS, etc)

2008 Era Product Comparison

Graphics Category	Segment	AMD Product				NVIDIA Product			
		2008 Generation	2008 BUS Width (bits)	2008 TEC	Meets Energy Star 5 Adjustment	2008 Generation	2008 BUS Width (bits)	2008 TEC	Meets Energy Star 5 Adjustment
G1	Entry	ATI Radeon™ HD 4550	64	33	TBD*	NVIDIA GeForce™ 8400 GS	64	37	No
G2	Mainstream	ATI Radeon™ HD 4670	128	40	No	NVIDIA GeForce™ 9500 GT	128	75	No
G3	Performance mainstream	ATI Radeon™ HD 4850	256	140	No	NVIDIA GeForce™ 9600 GT	256	98	No
G4	Performance	Not Offered				NVIDIA GeForce™ GTS 250	256	112	No
G5	High Performance	ATI Radeon™ HD 4870	256	420	No	NVIDIA GeForce™ GTX 260	448	280	No
G6	Ultra High Performance	Not Offered				Not Offered			
G7	Extreme Performance	Not Offered				NVIDIA GeForce™ GTX 280	512	304	No

*Energy Star V5.0 desktop category definition does not dedicate the allowance to discrete graphics; the graphics allowance is often consumed by non-graphics components to the exclusion of discrete graphics in the marketplace



2010/2011 Era Product Comparison

Graphics Category	Segment	AMD Product				NVIDIA Product			
		2010/11 Generation	2010/11 BUS width (bits)	2010/11 TEC	Meets Energy Star 5 Adjustment	2010/11 Generation	2010/11 BUS width (bits)	2010/11 TEC	Meets Energy Star 5 Adjustment
G1	Entry	ATI Radeon™ HD 5450	64	30	TBD*	NVIDIA GeForce™ 210	64	33	TBD**
G2	Mainstream	ATI Radeon™ HD 5570	128	47	No	NVIDIA GeForce™ GT 220	128	51	No
G3	Performance mainstream	ATI Radeon™ HD 5670	128	70	No	NVIDIA GeForce™ GT 240	128	65	No
G4	Performance	ATI Radeon™ HD 5770	128	84	No	NVIDIA GeForce™ GTX 460	192	126	No
G5	High Performance	ATI Radeon™ HD 5850	256	126	No	NVIDIA GeForce™ GTX 460	256	140	No
G6	Ultra High Performance	Not Offered				Not Offered			
G7	Extreme Performance	ATI Radeon™ HD 5870 E6	256	159	No	NVIDIA GeForce™ GTX 480	384	280	No

*Energy Star V5.0 desktop category definition does not dedicate the allowance to discrete graphics; the graphics allowance is often consumed by non-graphics components to the exclusion of discrete graphics in the marketplace

Despite significant improvements to idle power in high performance products from 2008, the Energy Star V5.0 outlook is not changed

ECMA-383 Discrete Graphics Methodology

- Energy Star V5.0 provides adders based on frame buffer bus width
 - Highly outdated means of defining GPU performance classes
 - Not scalable to new technologies (GDDR5; smaller and more compact packages, etc)
 - Contains at most 2 rigid discrete graphics categories for any given platform with limited applicability to certain platforms
- A solution exists based on a standardized framework known as ECMA-383
 - SCALABLE: Provides discrete graphics categorization based on frame buffer BANDWIDTH
 - Created with industry consultation and support
 - Contains 5 or 7 scalable categories for discrete graphics that can be applied to any type of platform
 - It is expected that emerging regulations in other regions will use this framework

ECMA-383: <http://www.ecma-international.org/publications/standards/Ecma-383.htm>

ECMA-383 Categories: http://www.ecma-international.org/publications/standards/Categories_to_be_used_with_Ecma-383.htm

ECMA-383 Categories and Allowances for Desktop and Notebook Discrete Graphics

Desktop			
Graphics Group	Ecma-383 Definition (GB/s)	Graphics Group	Industry Proposed Definition (GB/s)
G1	$FB_BW \leq 16$	G1	$FB_BW \leq 16$
G2	$16 < FB_BW \leq 32$	G2	$16 < FB_BW \leq 32$
G3	$32 < FB_BW \leq 64$	G3	$32 < FB_BW \leq 64$
G4	$64 < FB_BW \leq 128$	G4	$64 < FB_BW \leq 96$
		G5	$96 < FB_BW \leq 128$
G5	$FB_BW > 128$	G6	$FB_BW > 128 (< 192\text{-bit})$
		G7	$FB_BW > 128 (\geq 192\text{-bit})$

Notebook			
Graphics Group	Ecma-383 Definition (GB/s)	Graphics Group	Industry Proposed Definition (GB/s)
G1	$FB_BW \leq 16$	G1	$FB_BW \leq 16$
G2	$16 < FB_BW \leq 32$	G2	$16 < FB_BW \leq 32$
G3	$32 < FB_BW \leq 64$	G3	$32 < FB_BW \leq 64$
G4	$64 < FB_BW \leq 128$	G4	$64 < FB_BW \leq 96$
		G5	$96 < FB_BW \leq 128$
G5	$FB_BW > 128$	G6	$FB_BW > 128 (< 192\text{-bit})$
		G7	$FB_BW > 128 (\geq 192\text{-bit})$

- Methodology is intended to replace the existing definitions based on frame buffer BUS width
- Can applied in a manner that is independent of the desktop/notebook category definitions
- ECMA-383 currently uses a 5 group definition
- A 7 group proposal has been submitted to ECMA-383
 - The 7 group proposal helps ensure that mainstream graphics allowances can be more tightly controlled to enable more efficient platforms
 - The requirement for the 7 group proposal is as a result of discussions with the EU on ErP Lot 3 regulations
- TEC adder allowances are based on a 25th percentile inclusion of discrete graphics



WS, Thin Clients, and Small-Scale Servers

Workstations-summary

- Very few ENERGY STAR partners (6) and products (97) in this category.
 - Limits have not changed since Energy Star Ver. 4
 - Low percentage of total configurations in this category qualify for ENERGY STAR
- Recommend: No changes are needed in this category. Keep current requirements unchanged.
 - Given the relatively small number of manufacturers and models participating in ENERGY STAR, we recommend no changes to the TEC or PSU criteria until the manufacturer participation and quantity of workstations qualifying for ENERGY STAR warrants a change

Workstations-questions

EPA proposes incorporation of an active mode benchmark to create a data disclosure requirement for Workstations. How could EPA structure the Workstation requirements to incorporate such a testing requirement?

Industry response:

- Active mode or performance benchmarks vary based on end user targeted applications. As such, a variety of performance indicators are requested depending on the customer requests.
- No common benchmarks that spans across OS and architectures (typically requires ~5 years of development)
- Generally, IT equipment manufacturers already publish product environmental information . Mandating product data reporting as part of the ENERGY STAR program requirements will further complicate the product qualification process.
- Given the variability in end user requests on performance details and configurations, and the overhead in providing additional specific information just for ENERGY STAR, we do not recommend power and performance reporting as part of the ENERGY STAR requirements

Workstations-questions

EPA is currently developing an active mode efficiency disclosure requirement for computer servers. This approach is in part predicated on a customer base that is both motivated to pursue such information and has the resources and capacity to make use of the information. Do commercial Workstation purchasers share these characteristics to any degree?

Industry response:

- No, workstations do not share common power/performance characteristics with servers
- Even within Servers they do not have common power/performance characteristics
 - Effort are underway but not proven as yet!

Small-Scale Servers Summary

- There exists extremely few partners (4) and products (58) in this category. The data suggests the limits and criteria are already too restrictive.
- Recommendation:
 - Given the extremely low level of participation, we do not recommend any changes that either restricts or divides this category any further.
 - Share Energy Star V5 data before discussing changes

Small Scale Servers-questions

EPA plans to revisit the power allowances and category definition. Rationale is that these limits and descriptions have not changed since v4.0.

Industry response:

- As noted previously, the base of ENERGY STAR manufacturers and models in this category does not warrant tightening the limits or restricting or further subdividing this category.

Thin Clients

The current categories for Thin Clients are divided by support for “local multimedia encode/decode.” If there is a better means of delineating Thin Client categories (e.g., based on specific product features), what is suggested? Is there any feedback on the effectiveness of the current categories?

Industry response:

- Current Thin Client categories should remain unchanged
- Thin Client systems has a small number of ENERGY STAR systems (57) for 2 categories. Further division may reduce the number further.



Environmental considerations

Industry Position to Evaluate Environmental Benefits Beyond Product Energy Efficiency

- Industry opposes expansion of ENERGY STAR program beyond product energy efficiency during use of product
- Eco-labels /standards already exist that address environmental attributes beyond product energy efficiency
 - Example IEEE 1680 EPEAT standard (OMB A-119, NTAA Section 12)
- Expanding the program beyond product efficiency (LCA, PAIA, etc.) will dilute the ENERGY STAR brand
 - LCA methodology is not mature (several years away)
 - It may also discourage some manufacturers from participating in ENERGY STAR program

Investigate study or reporting of life-cycle energy (including Laptop PAIA)

- Industry opposes inclusion of provisions involving life-cycle energy beyond use phase of the product life cycle
- Regarding potential use of the Laptop PAIA associated with the ENERGY STAR program:
 - Although there has been some progress in developing a model (PAIA) for assessing the carbon footprint throughout the life-cycle of products, the PAIA tool is not yet mature to a point where it will yield results that could be used to make valid comparisons between products.

Investigate study or reporting of life-cycle energy (including Laptop PAIA) (Continued)

- PAIA model still has significant variability in the results making it difficult to compare products embodied carbon, given the large uncertainty in the results.
 - Obtaining sufficient data to enable product differentiation using the PAIA tool is a couple of years off at the earliest
- There are a number of research studies supporting ITI position that use of LCA methodology (including the PAIA tool) is not mature to a point where it will yield results enabling making valid comparisons between products
- When LCA methodology (including PAIA) become mature, they should be considered for inclusion in other multi-faceted eco-labels / standards
 - I.e. IEEE1680EPEAT
 - Several years away
- LCA methodology (including PAIA) should not be included in ENERGY STAR now or in the future



Product Labeling and disclosure requirements

Product Energy Disclosure (PPDS Requirement)

- ITI opposes adding product energy disclosure requirements to ENERGY STAR program
- IT equipment manufacturers already publish product environmental information
 - Using mechanisms of that best meets manufacturer's customers' needs
 - Information provided by manufacturers already includes product energy efficiency data (product energy consumption in use)
- Mandating product data reporting as part of the ENERGY STAR program requirements will further complicate the ENERGY STAR product qualification process
 - Unclear how CBs would interpret their obligations to verify product data disclosures of the type being suggested.
- IT equipment manufacturers prefer to communicate product environmental information using mechanisms of their own choosing and oppose ENERGY STAR including environmental reporting in the ENERGY STAR program requirements
- Manufacturers already educate users on the ENERGY STAR program and efficient use of their products
 - Per existing user education requirements in ENERGY STAR program specifications



Product Labeling requirements

Product Labeling and disclosure requirements

- Physical product labeling should be optional
 - Customer research of product features and benefits are predominately conducted on the internet (manufacturer's web site, CNET, online reviews, etc.)
 - Government, education, and enterprise customers rely upon contractual specifications that require Energy Star
 - Growing trend for customers to purchase computer products online, not brick and mortar retail stores
 - Energy Star designation on packaging, user guide, manufacturer web sites provides sufficient notification of Energy Star compliance

Optional Product Labeling

- Surface area on the product available for labeling is shrinking
 - Computers are smaller and more compact
 - Bezel around displays shrinking
 - Surfaces of product fulfill specialized purposes (speakers, palm rests, track pad, displays) – labels interfere with
 - Surfaces of mobile devices subject to high wear which degrades the label
- Computers are now designed to be more personal
 - Customers now expect their computer to reflect their lifestyle (e.g. mobile accessory, blending into home décor, etc.)
 - Colors, design, and materials all strongly influence the customer's purchasing decision
 - Clean lines and minimalist design is a significant product differentiator
 - Great attention given to the surface finish of the product
 - Labels interfere with OEM design/marketing preferences

Next Steps/Q&A

- Next Steps:
 - Industry will provide to EPA the detailed questionnaire response and today's presentation
- Q&A



Back-up



Energy Star V5.0 Final Dataset Analysis

- **Energy Star V5.0 was NEVER 25th percentile inclusive of platforms with discrete graphics**
 - This limited the ability of the specification to cover energy efficient high performance products
- Energy Star V5.0 was at most inclusive of desktop discrete graphics to 8-11th percentiles
 - In practice, high performance desktop **Category D only includes ~4%** of discrete graphics
- Thorough analysis of the Energy Star V5.0 final data set shows that **discrete graphics allowances should be broken out separately from platform category TEC adders**
 - Ensures that the most efficient discrete graphics products can be appropriately captured in a manner that can be broadly applied across the full range of commercial and consumer PCs
- Analysis of Category C desktop platforms shows that making a discrete graphics device an optional requirement as opposed to a hard requirement (such as for CPU cores and system RAM) ‘squeezes out’ the discrete device
 - Category C is 11% inclusive of the discrete graphics defined in its category definition
- Analysis of Category D desktop platforms shows that the ‘built-in’ adder is not representative of the discrete graphics products that are in the category definition
 - Category D is 8% inclusive of the discrete graphics defined in its category definition
 - Actual representation of discrete graphics in the market is far lower than 8%

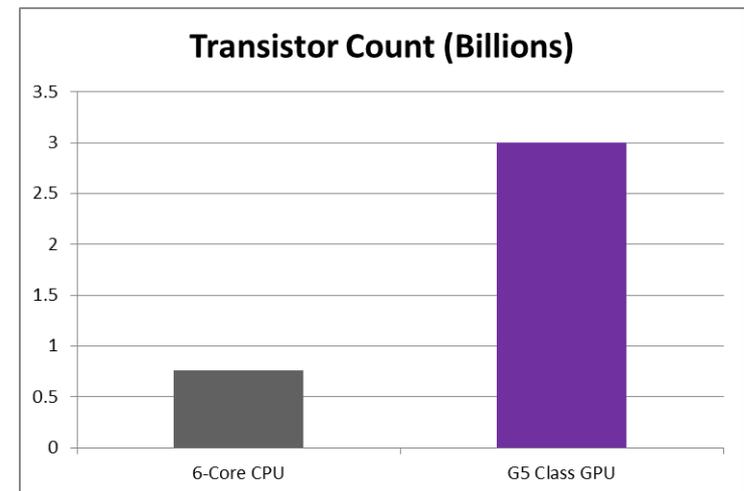
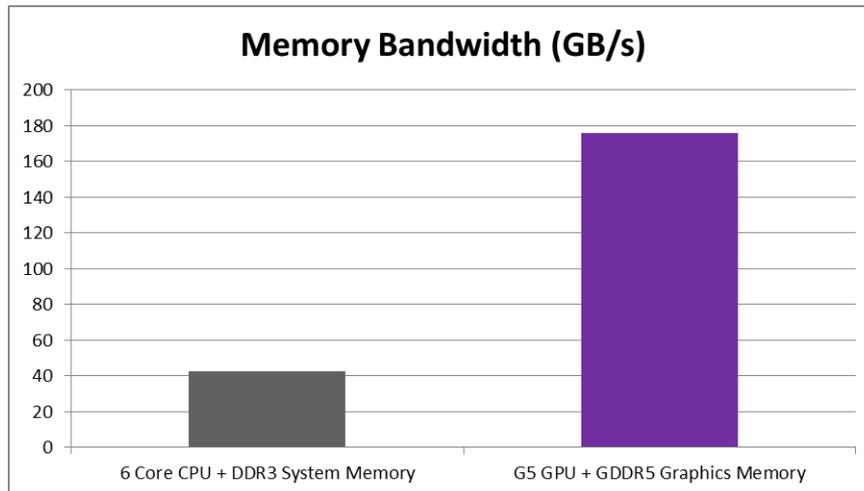


Concerns with Energy Star V5.0 Category Definitions

- Excludes high performance GPUs by definition
 - >Category D example: >128-bit GPU(G3) vs. 4GB RAM is not realistic
 - In practice, most (sometimes all) GPUs are excluded from the category
- Discrete graphics definitions are consistent with advancements in technologies
 - High performance GPUs have moved to smaller packages and newer memory technologies that make the frame buffer bit width classification outdated
- High performance GPUs are increasingly sophisticated and can exceed the size and performance characteristics of high performance CPUs (see next slide)

Further Comparison

- Very High End GPUs are significantly larger devices than even the largest 6-core CPUs
- The industry proposed discrete graphics allowances reflect the need to provide added allowances for the highest performing devices
- High performance GPUs are still performance managed to minimize power draw in the idle state
- The comparison below compares a modern G5 class GPU to a modern 6-core CPU to provide further perspective on the capabilities and relative size of large, high performance GPUs
 - The G5 class GPU with a much larger memory controller and significantly faster specialized memory has far greater memory bandwidth than a very high performance 6-core CPU
 - A 256-bit G5 GPU with 1375 MHz quad pumped GDDR5 memory is compared to 6-core 128-bit CPU with 1333 MHz DDR3
 - The G5 class GPU is significantly larger in overall transistor count than a very high performance 6-core GPU





Analysis of 2010 Energy Star V5.0 Datasets (Details)

- In the 2010 EPA master database, Energy Star V5.0 is assessed to be less than 2% inclusive of Category D platforms high > 128-bit graphics
- Within Category D, approximately 4% of platforms can be shown to contain > 128-bit graphics (despite >128-bit graphics being included in the core category definition)
 - Of these Category D platforms, none appear to have > 256-bit graphics (rough equivalent to G4 or greater)
 - Of these Category D platforms, none are truly very-high performance machines inclusive of the most advanced system configurations including hex core CPUs, G4 and faster graphics, etc



Analysis of 2010 EPA Energy Star V5.0 Datasets (Details)

Category D Analysis	> 128-bit Desktop Systems (Excluding Integrated Desktop)	Total Number of Cat D Platforms in Database	Percentage Inclusion of > 128-bit graphics within Category D	Total Systems (Cat A-D) in database	Percentage Inclusion of > 128-bit graphics within Energy Star
115V Systems	14	242	5.8%	613	2.3%
230V Systems	25	712	3.5%	1463	1.7%
Total	39	954	4.1%	2076	1.9%



Analysis of the EU Energy Star Database Desktop Category D (August 19, 2010)

GPU Analysis of 35 EU-Energy Star Category D Systems with the highest Energy Star V5.0 Idle Power

Database is accurate at the following link as of August 19

http://www.eu-energystar.org/en/database.htm?ce_desktop

Methodology

Take Primary Rank of Database by Category

Secondary Rank of Database by Idle Power

Record the highest idling platforms in Category D and examine the discrete graphics type (supporting data where available)

Since EU Energy Star database does not specify discrete graphics type, each submission is researched individually

Directly Pulled from EU Energy Star Database on August 19, 2010															Independent Analysis of Graphics Inclusion					
Make	Model	Model	Category	Idle (W)	Standby	Sleep	TEC	CPU	CPU Speed	System Mem	Discrete	TV Tuner	Hard Disk	Hard Disk	Power Su	Operating System	Discrete Graphics Type	Discrete Graphics Category	Supporting Links	
Fujitsu	CELSIUS WBLUE	D	60.5	2.1	2.9	222.1	Intel Core2 Quad	1	2.8	16*						Windows Vista	NVIDIA QUADRO NVS 290	G1	https://globalsp.ts.fujitsu.com/dmsp/docs/ds-celsius-w370.pdf	http://www.nvidia.com
Fujitsu	CELSIUS W370 E-STAR	D	60.5	2.1	2.9	222.1	Intel Core2 Quad	1	2.8	16*						Windows Vista	NVIDIA QUADRO NVS 290	G1	https://globalsp.ts.fujitsu.com/dmsp/docs/ds-celsius-w370.pdf	http://www.nvidia.com
ACTINA	SIERRA 500X ES05	D	60.7	0.9	3.2	218.5	Intel Core i5	1	2.7	8*							Integrated	NA	http://www.actina.pl/download/ACTINA%20SIERRA%20V8%20500X.pdf	
TAROX	Minitower MT350	CD	61.8	0.7	2.4	221	Intel Core i7	1	2.8	8*			320	350	Windows 7	No Data Found	No Data Found	No Data Found		
>>es on<<	MT-I09XX-101	D	62.2	1	1.9	223.6	Intel Core2 Quad	1	3	4*						Windows Vista	No Data Found	No Data Found	No Data Found	
KOMPARS	ATOMIK AS78-6	D	64.2	1.2	2.3	231.8	AMD Phenom X4	1	3.4	4*	C		1	1000	300	Windows 7 Pro	Integrated	NA	http://pigu.lt/stacionarus_kompiuteriai/atomik_as78_2?id=648329	http://tra
KOMPARS	ATOMIK AS78-5	D	64.2	1.2	2.3	231.8	AMD Phenom X4	1	3.4	4*	C		1	1000	300	Windows 7 Pro	Integrated	NA	http://pigu.lt/stacionarus_kompiuteriai/atomik_as78_2?id=648329	http://tra
KOMPARS	ATOMIK AS78-4	D	64.2	1.2	2.3	231.8	AMD Phenom X4	1	3.4	4*	C		1	1000	300	Windows 7 Pro	Integrated	NA	http://pigu.lt/stacionarus_kompiuteriai/atomik_as78_2?id=648329	http://tra
KOMPARS	ATOMIK AS78-3	D	64.2	1.2	2.3	231.8	AMD Phenom X4	1	3.4	4*	C		1	1000	300	Windows 7 Pro	Integrated	NA	http://pigu.lt/stacionarus_kompiuteriai/atomik_as78_2?id=648329	http://tra
KOMPARS	ATOMIK AS78-2	D	64.2	1.2	2.3	231.8	AMD Phenom X4	1	3.4	4*	C		1	1000	300	Windows 7 Pro	Integrated	NA	http://pigu.lt/stacionarus_kompiuteriai/atomik_as78_2?id=648329	http://tra
KOMPARS	ATOMIK AS78-1	D	64.2	1.2	2.3	231.8	AMD Phenom X4	1	3.4	4*	C		1	1000	300	Windows 7 Pro	Integrated	NA	http://pigu.lt/stacionarus_kompiuteriai/atomik_as78_2?id=648329	http://tra
WJR	GOV C2Q250	D	64.8	1	2.8	233	Intel Core2 Quad	1	3	8*			2	2048	550	Windows 7	No Data Found	No Data Found	No Data Found	
WJR	GOV C2Q266	D	64.8	1	2.8	233	Intel Core2 Quad	1	3	8*			2	2048	550	Windows 7	No Data Found	No Data Found	No Data Found	
WJR	GOV C2Q283	D	64.8	1	2.8	233	Intel Core2 Quad	1	3	8*			2	2048	550	Windows 7	No Data Found	No Data Found	No Data Found	
WJR	GOV C2Q300	D	64.8	1	2.8	233	Intel Core2 Quad	1	3	8*			2	2048	550	Windows 7	No Data Found	No Data Found	No Data Found	
WJR	GOV C2Q	D	64.8	1	2.8	233	Intel Core2 Quad	1	3	8*			2	2048	550	Windows 7	No Data Found	No Data Found	No Data Found	
Dell	OptiPlex 4 Mini-Tow	D	66.1	1.9	3	240.8	Intel Core2 Quad	1	2.9	16*			2	1000	255	Windows Vista	RADEON HD 3450 / 4550	G1, G2	http://www.dell.com/downloads/global/products/optix/en/optiplex-980-customer-br	
ACTINA	SIERRA V8D	D	66.8	1.6	3.5	243.3	Intel Core2 Quad	1	2.7	4*			2			Windows Vista Business	Integrated	NA	http://www.actina.pl/download/ACTINA%20SIERRA%20V8%20700X.pdf	
ACTINA	MONTAN	D	69.1	0.8	2.3	247.1	AMD Athlon II X4	1	2.8	8*			2				No Data Found	No Data Found	No Data Found	
ACTINA	SIERRA 70D	D	69.4	0.7	2.1	247.5	Intel Core2 Quad	1	3	8*			2				Integrated	NA	http://www.actina.pl/download/ACTINA%20SIERRA%20V8%20700X.pdf	
ADAX	DELTA VB/D	D	70.4	1.7	2.1	255.5	Intel Core2 Quad	1	2.8	4*			2	320		Windows Vista	No Data Found	No Data Found	No Data Found	
ADAX	DELTA VB/D	D	70.4	1.7	2	255.5	Intel Core2 Quad	1	2.8	4*			2	320		Windows 7	No Data Found	No Data Found	No Data Found	
ADAX	DELTA VB/D	D	70.4	1.7	2	255.5	Intel Core2 Quad	1	2.8	4*			2	320		Windows XP	No Data Found	No Data Found	No Data Found	
ADAX	DELTA VB/D	D	70.4	1.7	2	255.5	Intel Core2 Quad	1	2.8	4*			2	320		Windows Vista	No Data Found	No Data Found	No Data Found	
ADAX	DELTA VB/D	D	70.4	1.7	2.1	255.5	Intel Core2 Quad	1	2.8	4*			2	320		Windows 7	No Data Found	No Data Found	No Data Found	
ACTINA	SIERRA V8D	D	70.7	1.8	4	258.2	Intel Core2 Quad	1	2.7	4*			2				Integrated	NA	http://www.actina.pl/download/ACTINA%20SIERRA%20V8%20700X.pdf	
NTT Syste	NTT Busin ES01	D	70.8	1.5	3.3	256.8	Intel Core2 Quad	1		8*						Windows 7 / Vista / XP	No Data Found	No Data Found	No Data Found	
ACTINA	SIERRA V8D	D	71.2	1.9	4	260.2	Intel Core2 Quad	1	3	4*			2			Windows Vista Business	Integrated	NA	http://www.actina.pl/download/ACTINA%20SIERRA%20V8%20700X.pdf	
Dell	Inspiron 5 (Inspiron D)	D	71.4	1.2	2.1	255.8	Intel Core2 Quad (Q9400)	1	2.7	8*			2	300		Windows XP	NA	NA	http://www.dell.com/downloads/global/corporate/environ/comp	Datasheet shows G2
NTT Syste	NTT Busin ES04	D	71.5	1.5	2.5	258.8	Intel Core i5	1		4*						Windows 7 / Vista / XP	No Data Found	No Data Found	No Data Found	
NTT Syste	NTT Busin ES02	D	71.8	1.5	2.6	260	Intel Core2 Quad	1		8*			2			Windows Vista	No Data Found	No Data Found	No Data Found	
Dell	Inspiron 546 DCMF	D	71.9	0.8	2.5	256.4	AMD (E5200)	1	2.8	8*			2	1500	300	Windows Vista	NA	NA	http://www.dell.com/downloads/global/corporate/environ/comp	Datasheet shows G2
ACTINA	NEVADA 700X ES02	D	72.1	0.8	2.3	257.6	AMD Phenom II X4	1	3.4	8*			2				No Data Found	No Data Found	No Data Found	
NTT Syste	NTT Busin ES01	D	72.3	1.5	2.6	261.8	Intel Core2 Quad Q8300	1	2.5	8*			2	4000	500	Windows 7 / Vista / XP	No Data Found	No Data Found	No Data Found	
NTT Syste	NTT Busin ES12	D	73	2.4	3.4	268.8	Intel Core2 Quad Q9550	1	2.8	4*			2	1000	350	Windows 7 / Vista / XP	Integrated	NA	http://www.ntt.pl/index.php?c=1202&l=pl&	

- Only 3 out of the top 35 'highest power' systems can be concluded to *potentially* contain discrete graphics



Summary of Energy Star V5.0 Discrete Graphics Impact

- The Energy Star V5.0 framework was never inclusive of the entire PC market in the context of discrete graphics
 - The existing framework specifically lacks any real inclusion of systems with anything greater than the lowest performing and lowest featured entry level graphics
 - High performing and efficient discrete graphics products which are essential for professional and consumer applications have been excluded
- Significant improvements in performance discrete graphics idle power were realized between 2008 and 2011
 - However, there remains a very large gap between the most efficient 2011 discrete graphics products and the Energy Star V5.0 allowances

Slates/Tablets

- Any device which is primary used on battery (like tablets/slates) should be out of scope for ENERGY STAR for computers as
 - their low energy consumption is already driven by battery usage and are already best in class energy efficient products and excluding 75% of these devices from an ENERGY STAR label would be counterproductive to reducing the energy footprint of ITC devices.
 - Their primary energy consumption is through battery charging, which is already being addressed by the ENERGY STAR for battery charging systems
 - Battery capacity + efficiency of charging battery

Grouping of Slates/Tablets, Netbooks and Notebooks question

- Ultra-low Energy Mobile (ULEM) Computer product classification to group Netbook and Tablet (Slate)
 - Slates and tablets are easy to classify as not having a physical keyboard integrated
 - Because of their primary use on battery, and because ENERGY STAR for Battery Charging Systems cover their AC use, they should be excluded from ENERGY STAR
 - Netbooks and Notebooks have different power and capabilities, but have been very difficult to provide a functional classification to separate them
 - Netbooks should be categorized differently from notebooks, but the definition has been challenging