Information Technology Industry Council
Leading Policy for the Innovation Economy

ENERGY STAR® Computer 6.0 Proposal
Product Specification Discussion

Industry Response to EPA Questionnaire

April 1, 2011

On behalf of the Information Technology Industry Council, ITI, I am happy to submit the repsonses of the assoiciation's Energy Star Working Group, which consists of the leading global information and communications technology manufactures from the U.S. and other countries and regions, including Canada, China, the Europe Union and Japan.

We welcome the opportunity to once again contribute to the discussion on the revision of a new ENERGY STAR® computer specification via a response to questions posed by the Environmental Protection Agency's (EPA) Energy Star Office. To help readers track the key issues, we have included some of the charts and the questions contained in the original EPA Computer 6.0 proposal. In addition, ITI's responses to the questions are highlighted in blue text.

We welcome questions and inquiries from EPA and other goverments, manufacturers and organizations that have an interest or participate in the ENERGY STAR program. I can be reached at ksalaets@itic.org.

Thank you for the opportunity to provide this input.

Sincerely,

Ken J. Salaets
Director

II. Key Discussion Topics

- **Scope**

  EPA proposes the following updates to the existing scope of the ENERGY STAR computer program.

Table 5: Discussion Topics - Scope

Topic Description	Proposed Action	Rationale
New Mobile Computing Platforms. EPA is considering an Ultra-low Energy Mobile (ULEM) Computer product classification to group Netbook and Tablet (Slate) computers under the same set of efficiency requirements.	• Group netbook and Tablet (Slate) computers under the same set of efficiency criteria. Consider feature-based requirements that foster development of energy-efficient technologies that may not be adequately identified in a TEC structure, as well as those that help optimize energy use to mobile usage patterns. • Clarify the ***Notebook Computer*** definition to include Clamshell-Tablets and exclude Tablet (Slate) computers. • Define ***Tablet (Slate) Computer*** as follows: *A portable computer lacking a physical keyboard, relying primarily on touch-screen input, lacking integral wired network capability (e.g., Ethernet), and primarily powered from an internal battery charged via an external power supply or low-voltage dc (e.g., USB cable). For a computer to be considered a Tablet, any wired power connection to the mains must be designed to charge the battery and to be disconnected from device during normal operation.*	EPA sees Tablet (Slate) computers and other sub-notebook devices in particular as an area of both sales and market share growth during the lifetime of this specification. Grouping these products together would recognize similarities in assumed usage patterns and operation. Further, EPA believes that this product category sees more extensive operation while on battery power than notebooks which calls for a tailored TEC profile instead of relying on the Notebook Computer TEC profile.

Topic Description	Proposed Action	Rationale
Ultra-thin Clients. EPA intends to investigate the addition of "Ultra-thin Clients" to the program's scope.	• Work with stakeholders to investigate common sales practices (e.g., bundling), available operating systems, and effect on existing power management criteria, among other issues. • Define ***Ultra-thin Client*** as follows: *A Thin Client that lacks a traditional operating system, has no internal storage capability, and is controlled by a kernel that provides capability only for network initialization and display of graphics generated from remote computing resources.*	There are similarities between the ultra-thin client computing model and approaches underway for thin client set-top boxes: a single higher-power device serves a series of low-power devices, yielding a net energy savings for the system. Further investigation would allow validation of this hypothesis.
Mobile Thin Clients	• Include mobile Thin Clients under the Notebook categorization.	In discussions with stakeholders, EPA was presented expected power levels for Mobile Thin Clients on the same order as standard Notebooks (10-15 W in Idle, < 3 Watts in Sleep/Off).
Desktops, Notebooks, Workstations, and Small-scale Servers	• Maintain the existing scope for these product types.	Existing product scopes are sufficiently broad to capture the computer market.

Scope - Questions for Discussion:

1) **What, if any, products are missing from the list of products under consideration that EPA should consider?**

   - In general, the EPA coverage list seems adequate, but there is a problem with Energy Star target setting methodology. The Industry feels the Computer Specification should be based on broad coverage, i.e. both Enterprise and Industry consumer PC platforms (both Energy Star and Non Energy Star) for establishing energy targets (TEC).

- Within the rational PC platform list however, Industry believes the EPA must either provide more coverage or explicitly indicate no intention to cover devices outside of the mainstream space such as low-power platforms with extended battery operation and high-end desktop, notebook, and workstation platforms characterized by high-performance graphics, high-capacity memory, and high-core-count processors. The Industry believes including preface text that outlines the goals and coverage of the ENERGY STAR program would greatly benefit all parties and guide 3rd parties interested in adapting the ENERGY STAR specification as a starting point for other purposes such as whole-market-entry regulations.

- Issues with Energy Star V5 Computers data collection approach:

    - Energy Star voluntary specification is being used under a mandatory regulatory scheme in many geographic regions (ErP Lot 3, AUS MEPs, and China PC Standards/). 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.

- 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

a. 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

b. 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).

- 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.

2) What product development trends in the computer Industry should be considered that may have an impact on power consumption or proper categorization of devices?

- The biggest trend Industry faces as a whole is the increased implementation of market entry regulations across the globe based on ENERGY STAR v5. The impact is significant as Industry is now working with many different regulatory bodies and governments to ensure the specifications are more inclusive of the PC market space while properly segmenting off other derivative and closely related products such as tablets, game consoles, and workstations. In addition, many challenges now exist in terms of gaining as much harmonization as possible to simplify product development and testing requirements. The use of resources such as the ECMA 383 specification and registry are very important in this regard.

- Other trends that affect power and categorization are as follows:

- Higher speed IO interfaces (e.g. HDMI 1.3, Display Port, USB 3.0, Thunderbolt, SATA II, PCIe Gen 3, etc.) for display, storage, mobile device synch
- Increased manageability requirements / functionality for enterprise class systems that affects S3 power
- Higher resolution, larger size monitors on desktops and all-in-one products

3) **Does EPA need to address any other disruptive technology trends that may substantially change the way energy is distributed or consumed in the computing Industry in the Version 6.0 specification (e.g., lower powered mobile products, new power management strategies)? If so what are these trends and how do they affect aspects of the computer program?**

- Development of more fixed, low power mobile products such as tablets and netbooks that contain many of the same attributes as mainstream PC products but operate either primarily on battery power and / or are more geared towards data consumption (e.g. music, web browsing, video watching) than creation (office productivity, video editing, photo editing, etc…). However, tablets/slate class of products should be out of scope of Energy Star (primary DC operation, very energy efficient and very low TEC footprint 5-10kWh/yr)
- Increased S3 / Sleep residency for devices that continues trend of minimizing impact of idle and off power on overall TEC. EPA needs to factor in these new duty cycles to understand the positive impact on TEC usage.

4) **Should EPA handle low power, mobile devices (Tablet [Slate], Thin Client, etc.) differently from standard Notebook computers? Given the pace of change in markets for these categories, how can EPA create a program flexible enough to encompass these products during the lifetime of the Version 6 specification?**

Slates and Mobile Computing Scope

- Any device which is primary used on battery (like tablets/slates) should not be regulated as part of 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 ICT devices.

<u>Key characteristics of tablets/slates:</u>

- 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
- 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

5) How can combined systems savings be accounted for in the Thin Client computing model in addition to individual product savings? Are there any standard ultra-thin client sales patterns that support this concept (e.g., ten ultra-thin clients sold with one ENERGY STAR base computer as a packaged purchase)? Is it suggested that EPA develop requirements to recognize purchase of ENERGY STAR base computers and ultra-thin clients together?

- Ultra-thin Clients:
    - These devices will have annual energy usage on the order of low power states (S3/S4). These devices all have CPU's. What they don't always have is a hard disk drive and or an operating system. These types of devices remove the local storage for data to applications to operating system depending on the level of "Thin" implemented by the IT organization. One of the distinct problems here is that many versions of the product cannot be tested with the software they will run in real world use. The software will exist only on Enterprise customer's servers. If the EPA attempted to create a generic test environment, it will unlikely to correlate to actual use. The vast majority of the energy consumed in these operating scenarios will be in the data center and broadband infrastructures
- Mobile Thin Clients

- As in the DT case above Mobile thin clients are clients with local storage removed or simply act as terminals. These could be potentially lower performance processing system if much of the processing is done on a server somewhere. The issues and arguments are the same for these as the desk top case except the annual energy consumption of these devices could be similar or lower power signature than traditional notebooks. There is no justification to regulate these devices as the energy savings are imperceptible in total energy consumption scheme. They are already some of the most energy efficient computing platforms (ignoring the data center and communications piece). They are a small market segment with relatively low energy consumption footprint.

6) Given the minimal amount of internal processing Ultra-thin Clients perform, are such products truly computers? What separates an ultra-thin client from a series of KVM switches? Is the product name "Terminal" likely to be clearly understood if applied as an alternative description of this product type?

- The terms KVM=Keyboard-Video-Mouse or KMM=Keyboard-Monitor-Mouse are somewhat interchangeable. Example: the current Dell 1U KVM / KMM Console enables customers to mount a system administrator's control station directly into a Dell rack without sacrificing rack space needed for servers and other peripherals. Combining a height-adjustable 17-inch LCD Screen with a specially designed Touchpad Keyboard, this unit can be attached to Dell console switches to manage the setup, administration, and maintenance of rack-mount servers. Keyboards and track pads are powered off of PS/2 for current model and USB only for future models, so yes the video can operate independently. This is a panel that is specific to the KMM, and is not used other places within Dell.

This design of these unique products does not include any compute capabilities. Industry preference would be to have the Computer monitor qualified to the Energy Star specification for Computer Monitors including the External Power Supply (EPS) to efficiency level V.

Industry support Energy Star including these in the Energy Star specification but believe they would be better served in the Display specification to better represent the intended use of these unique product types.

7) What are the use patterns for ULEM computers? How can they be tested to accurately represent their power consumption, given these use patterns?

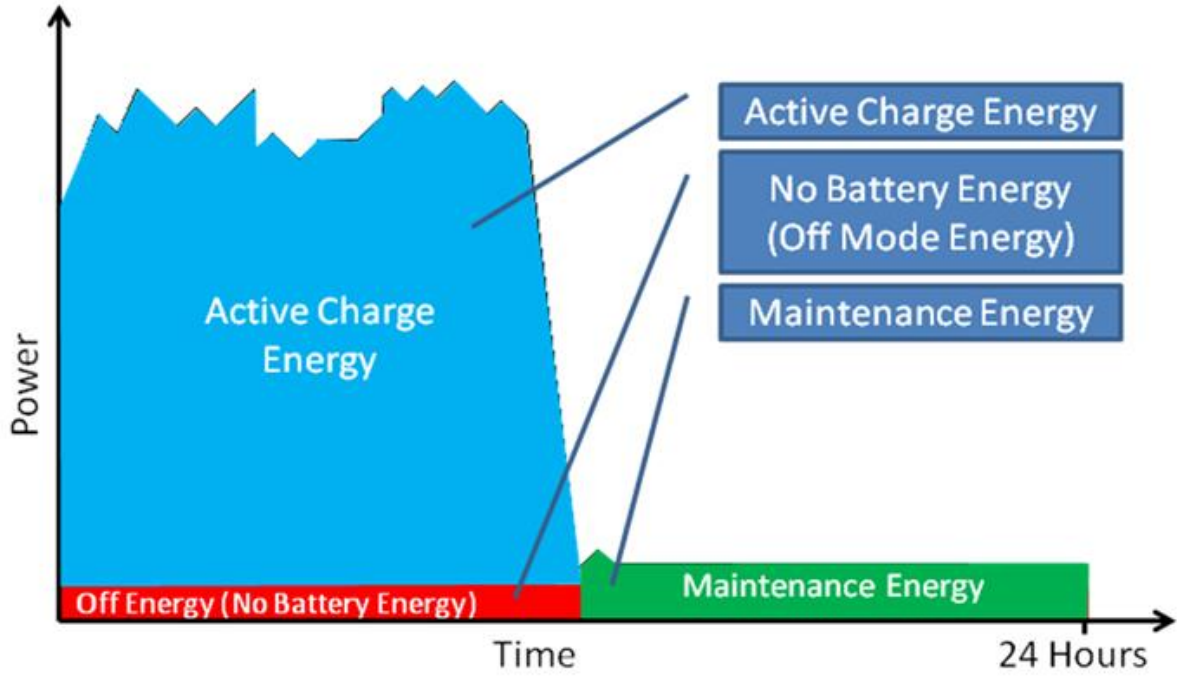
- Since ULEM Computers are an emerging segment there is very limited usage study conducted for ULEM devices. However if they are primarily operated on battery, and their typical battery life is longer than an office day (>9hours), then typical energy use is probably very close to the energy needed to charge the battery over-night, plus the no-load energy of the EPS (used to charge the system, but when not plugged into the system).

- Use patterns for ULEM computers: :
  - Highly mobile
    - Battery powered (Primary DC operation)
    - 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

How can they be tested to accurately represent their power consumption, given these use patterns?

The Battery Charging System (BCS) tests the following:

- No-battery power (off power)
- 24-hour battery charging energy (measure the energy to charge the battery over a 24 hour period
- Initial curve below shows the charge energy
- Last few hours show maintenance energy



Because the AC energy foot print is mainly the time spent in recharging the system every-night (active charge energy and the maintenance energy), this can be used to estimate the yearly TEC.

The BCS regulations will regulate the off energy, maintenance energy and active charge energy. Industry is proposing the following (subject to further validation):

- Off Energy: 1 W (2010+); < 0.5W (after 2013 to harmonize with ErP Lot 6 in Europe)
- Maintenance Energy 1.2 W (2010+); < 0.7W (2013)
- 24 Hour Charging Energy (2013): < 0.7*24hr + 1.6*[Battery Capacity)
    - Maintenance energy over 24 hours, 60% battery charge efficiency

8) What are the power management savings strategies for low power devices (Tablet [Slate], Thin Client, etc.)?

- ULE devices (Tablets/Slates) employ 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
- If the device is primarily used on battery power, then market dynamics will ensure the lowest energy footprint (largely driven by battery life)
- If the device is primarily used on AC, then a TEC model should be used to encourage the use of low power technologies to minimize TEC.

9) Is it relevant to group Net book and Tablet (Slate) computers in a single class?

- Netbooks and Tablets/Slate should not be grouped in a single class.
    - 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 (Industry working on it)

Other Considerations:

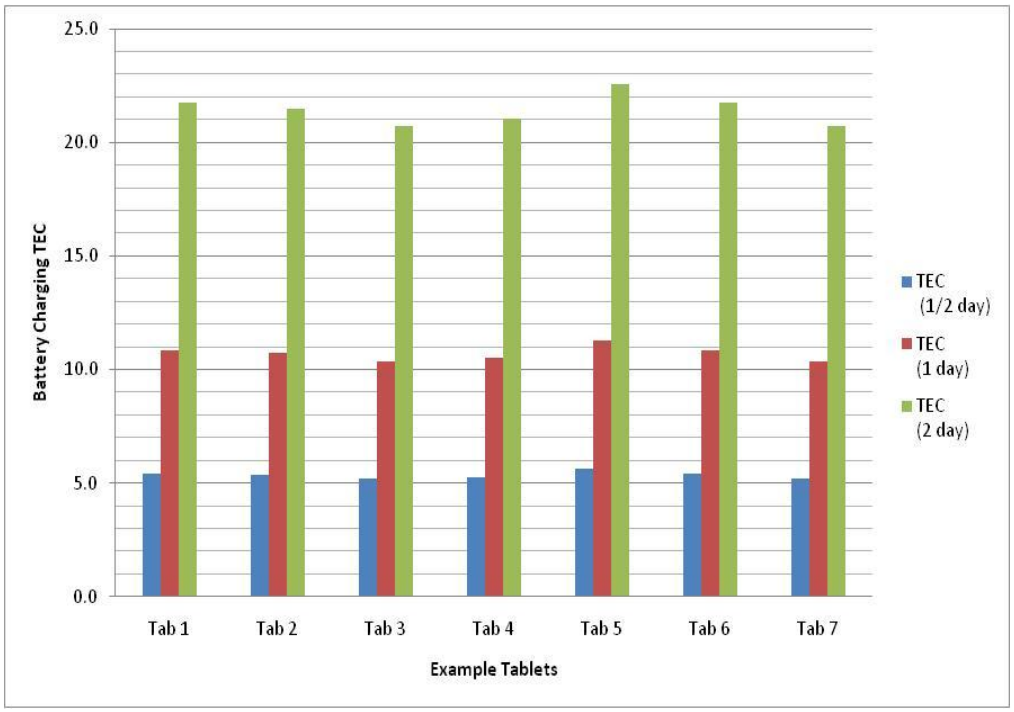
- Devices are already energy-efficient for purposes of increasing battery life - the overall annual energy consumption of a tablet device is very small
- Arbitrary efficiency limits should not be imposed at this time since these devices are in the early stages of innovation and the full potential functionality

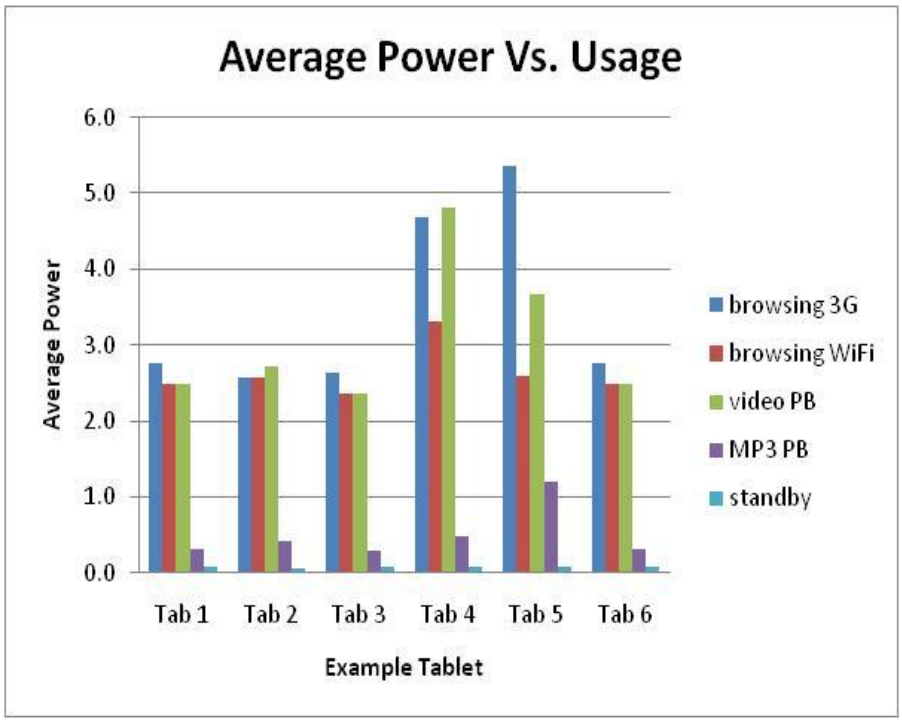
(and the power required to support that functionality) has not yet been established

  - These devices have a very small form factor and do not lend themselves to physical labeling. In addition, since most of these devices are instant on, requiring an electronic label at startup would be a serious customer satisfaction problem

- Recommendation: Any device under a given Ultra-low energy (ULE) footprint should be excluded from the Energy Star program.

10) Are there any studies available on battery charging patterns for ULEM and Notebook computers? Do manufacturers currently consider the efficiency of the battery charger in their designs for either category, and if so, how?





- 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 CEC BCS regulation, the DOE BCS regulation and the ENERGY STAR for Battery Charging Systems

• Test Methods

Table 7 includes a list of topics dealing with the process for testing of ENERGY STAR Computer equipment and related development concerns.

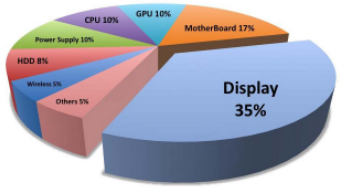
Table 7: Discussion Topics - Test Methods

Topic Description	Proposed Action	Rationale
Harmonization, where appropriate, with developments in product energy efficiency international standards	• Evaluate changes to the existing ENERGY STAR test method for further alignment with the Ecma-383 standard.	EPA and stakeholders would have the opportunity to identify the impact on existing test methods to allow for a smooth transition to greater harmonization.

Topic Description	Proposed Action	Rationale
Testing enhancements – Long/Short Idle and Display Power	• Modify test methods to account for the Long and Short Idle States. • Define Long and Short Idle as follows: ***Short Idle**: The mode where the computer has reached Idle State (e.g. 5 minutes after OS boot, after completing an active workload, or after resuming from sleep), the computer display is on and set to its as-shipped brightness, and Long Idle power management features have not engaged (e.g., the HDD is spinning and the computer is prevented from entering Sleep Mode).* ***Long Idle**: The mode where the computer has reached Idle State (e.g., 15 minutes after OS boot, after completing an active workload, or after resuming from sleep), the computer display has entered a low-power state where the screen contents cannot be observed (e.g., backlight has been turned off turning the screen black), and the computer remains in ACPI G0/S0.* • Incorporate the energy consumption of integral displays into the TEC metric. A possible option is to provide a display TEC allowance equal to the relative TEC performance of an equally-sized ENERGY STAR Display.	Partitioning Idle State presents an opportunity for innovation in fine-grained power management during brief periods of Idle. Also, the state of the display in Short Idle allows for display power to be referenced in TEC efficiency requirements, recognizing the impact of display power on overall system energy consumption (roughly 30% of notebook power consumption, for example – see *Figure 1*).

Topic Description	Proposed Action	Rationale
TEC pattern research	• Consider new sources of data on existing TEC weightings. Review the relative impact of non-idle active mode in usage patterns.	Accounting for any updated usage pattern data will ensure the continued applicability of TEC metric to product use.

Figure 1: Power Consumption Breakdown: Notebook Computer



Source: *STMicroelectronics*

- ## Test Method - Questions for Discussion

1) What specific challenges exist for testing of products with integrated displays enabled? What modifications are required to the existing ENERGY STAR test method to allow for such testing?

- 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
- 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 and AIO desktops (any platform with an integrated display) will increase significantly (display is a large contributor to energy, which was ignored in ENERYG STAR V5), if the EPA uses short idle expect the limits to increase. Desktop TEC accuracy will not be impacted much (display energy is isolated through a separate power cord).

        - But TEC estimation will be more accurate for integrated display devices

2) **The definitions for Short and Long Idle reference work done in the Ecma-383 working group. What, if any, levels of acceptable latency describe the Short and Long Idle modes? Under the definitions, where are individual sub-systems power managed (e.g., GPU, Memory, I/O devices)?**

    - The Ecma-383 usage patterns were based off the ENERGY definition for the idle display timer
        - Long idle, after15 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 quiese (5 minutes)
    - Industry feels this is a good usage distinguishing point as it happens naturally (by regulation) and allows many of the long idle timer power management functions to engage naturally (HDD spin-down, display blank).
    - While the short idle uses a shorter latency where the long idle power management features do not engage and the system is still in a relatively high performance, highly responsive state.

3) **What special testing considerations should EPA consider for small-form factor and all-inone 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

4) **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.

5) **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.

- **Efficiency Requirements**

Table 8: Discussion Topics - Efficiency Requirements

Topic Description	Proposed Action	Rationale
Typical Energy Consumption levels	• Develop more stringent energy-efficiency requirements for existing products based on qualified and non-qualified product data, market observations, recent ENERGY STAR market share indications, and future data collection efforts. • Evaluate the existing TEC category structure.	The 2009 ENERGY STAR Unit Shipment Data effort presented market penetration rates of 74% for Notebook Computers and 27% for Desktops. Qualification data has shown a wide spread in TEC performance among products in the same TEC categories. EPA will assemble and analyze data associated with non qualified products, as needed.
Power Supplies	• Evaluate the appropriateness of existing performance levels for internal and external power supplies and cost/benefits of increasing the stringency.	Efficiency and power factor requirements for internal and external power supplies will remain an important component of the Computers specification. EPA will work with stakeholders to evaluate the cost versus efficiency benefit of more stringent internal power supply efficiency criteria and to assess the role of low-output internal power supplies in future system designs.

Topic Description	Proposed Action	Rationale
Graphics Capability	• Consider if allowances should be developed for graphics capability. Consider scaled allowances based on graphics categories as presented in Ecma-383.	Stakeholders have suggested that requirements for graphics capability need to be revised to account for new technologies and features. EPA has also received input that the power used in graphics processing in computers is both increasing and needs to be monitored.
Energy Efficiency – Desktops and Notebooks	• Assemble a dataset to allow study of power consumption for products within the scope of the program.	EPA strives to ensure continued rigorous efficiency levels in the program. Resulting data will be analyzed to support this goal or to revise TEC categories as determined to be relevant.
Energy Efficiency – Workstations	• Reinstate efforts from Version 5.0 specification development to incorporate active mode efficiency into the requirements for Workstations. EPA proposes development of an active mode reporting requirement - similar to what is being developed within the ENERGY STAR Computer Server effort - using an industry-standard benchmark.	EPA believes that workstation purchasers are performance-focused and deeply knowledgeable about their computing needs, traits shared with purchasers of Computer Servers but not necessarily purchasers of other product types in the Computer program. Adding a reporting requirement will give Workstation purchasers information helpful in finding the right balance of performance and power consumption.
Energy Efficiency – Small-scale Servers	• Revisit Small-scale Server categories and power allowances based on data received as part of the Version 5.0 qualification process.	Power allowances in this category date back to Version 4.0. While data remains limited, data associated with qualification under Version 5 will be evaluated.

Topic Description	Proposed Action	Rationale
Energy Efficiency – Thin Clients	• Revisit Thin Client categorization and evaluate related definitions (e.g., graphics capability within Thin Clients). • Consider whether Ultra-thin Clients are a fit for the computer program.	The requirements for Thin Clients were developed with limited data. Evaluation of the continued applicability of categories and performance levels is necessary.

- ## Efficiency Requirements - Questions for Discussion

1) Power Supplies: What is the price premium for an internal power supply meeting ENERGY STAR requirements versus a standard model (retail and wholesale)?

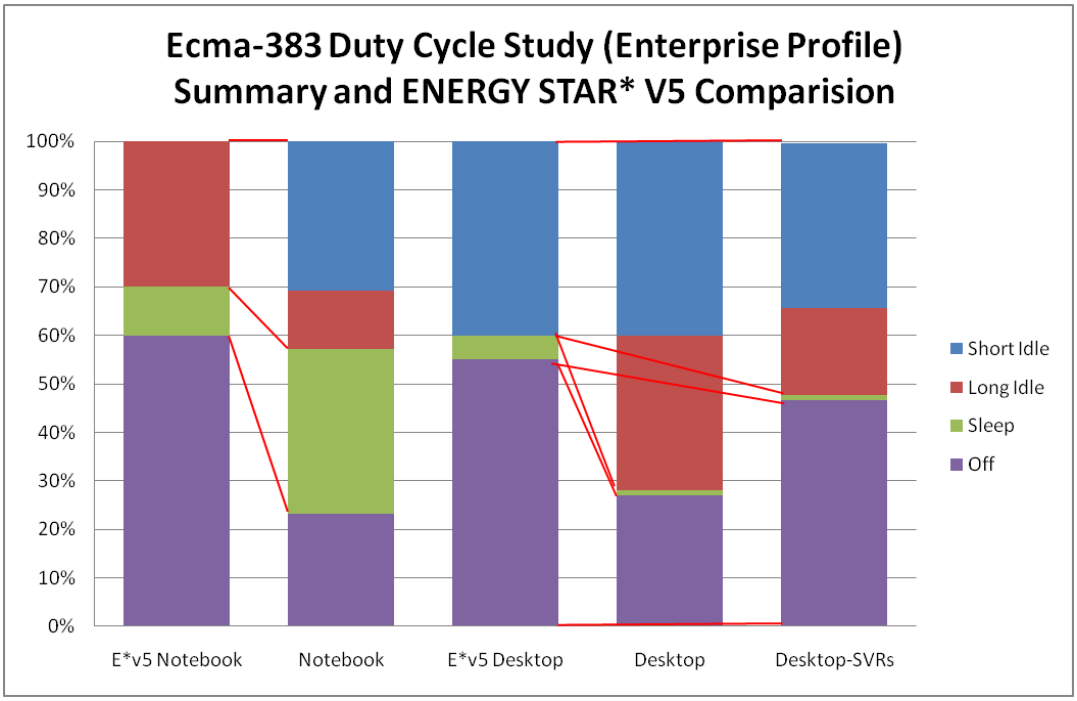
- Increasing PSU efficiency isn't cost linear. Going from Bronze to Silver is more expensive than going from 80+ to 80plus Bronze. PSU doesn't pay for itself over life expectancy of the system.
- Practical limit for multi-output Client PSU is Gold. Single output power supplies force OEMs into tough choices. Boards can't be shared between regions with differing demands for efficiency. Single output supplies must be mated with single output boards.
- Consumer customer 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.

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.

2) **Usage Patterns: Which, if any, product studies or sources of data on computer usage patterns should EPA review to develop usage pattern assumptions in the specification?**

- 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 notebooks 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

3) **Efficiency Criteria - Desktops/Notebooks: How do provisions for graphics capability (e.g., integrated/discrete GPU) in Notebooks and Desktops need to be revised to account for current and upcoming technologies?**

Industry Recommendation:

- 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

Discrete Graphics 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)

4) **Efficiency Criteria - 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 recommendation (Thin Clients):

- Current Thin Client categories should remain unchanged
- Thin Client systems have a small number of ENERGY STAR systems (57) for 2 categories. Further division may reduce the number further.
- Industry feels that the local multimedia encode/decode is still the appropriate means to delineate Thin Client categories. Recommend that the existing ver. 5.2 requirements be left as-is.

Industry recommendation (Small-Scale Servers):

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

5) **Efficiency Criteria – Workstations: 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

6) **Efficiency Criteria – Workstations: 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
    - Efforts are underway but not proven as yet!

- **Power Management**

Table 9: Discussion Topics - Power Management

Topic Description	Proposed Action	Rationale
Power Management Criteria	• Maintain Version 5.2 power management requirements. • Seek information on relevant power management criteria for new areas of the program (e.g., ULEM) as well as any recent advances in power management technologies that could be encouraged through the program. • Consider network-based reporting standards to enable efficient operation of networked devices (e.g., IETF Energy Management effort)	EPA intends to maintain the successes of the power management program and support efforts for continued innovation.
Energy Efficient Ethernet and Efficient Networking	• Consider requirements for incorporating EEE-compliant network hardware into ENERGY STAR computers and seek input from stakeholders on implementation measures. • Discuss opportunities for energy-efficient Wi-Fi networking.	The IEEE 802.3az standard for Energy Efficient Ethernet (EEE) was approved in September 2010. Products complying with the standard have been available since 2010.

Topic Description	Proposed Action	Rationale
Full Network Connectivity	• Revisit the proposed TEC weightings for Notebook computers using proxying technology. • Seek information on Full Network Connectivity over Wi-Fi.	EPA retained its initial proposal for full network connectivity ("proxying") requirements when finalizing the Version 5.2 specification for computers, but some stakeholders raised concerns that the weightings for notebook computers did not provide appropriate benefits in the TEC evaluation.

- **Power Management – Questions for Discussion**

1) What (if any) emerging power management techniques should EPA become aware of for reference in the program requirements?

- There is a host of technologies from battery operation which are very effective for reducing energy, but won't be deployed in AC modes simply because they won't have any impact on energy because of the way ENERGYSTAR V5.2 measures energy (notebook display is off, desktop display is on).
- Some examples of testing methodologies which don't encourage certain well know power management techniques:
  - Desktop screen blank power techniques (screen is tested ON only)
  - Notebook screen on power techniques (screen tested off only)
  - HDD spinning down (HDD required to be spinning when tested)
  - Auto-screen brightness techniques (screen off in notebook, and no benefit can be shown by a desktop controlling the brightness of a remote display whose energy impact is not considered)
- The proxy weightings are a good example of changing the TEC calculations to encourage the use of these network technologies designed to save energy.
  - The notebook weightings need to be addressed, as they do not encourage the use of network proxying for notebooks on AC power. The following table shows the "TEC idle headroom calculated for desktop and notebook systems based off the ENERGYSTAR V5.2 Proxy weightings (versus the Conventional weightings).

	Desktop	TEC				
Desktop	**Pwr**	**Conv**	**base**	**RW**	**SD/NS**	**Full**
Toff	1.0	181.8	167.0	155.7	152.7	145.4
Tsleep	4.0	TEC HR	14.8	26.1	29.1	36.4
Tidle	50.0		8.9%	16.8%	19.0%	25.0%

	Notebook	TEC				
Notebook	**Pwr**	**Conv**	**base**	**RW**	**SD/NS**	**Full**
Toff	0.5	30.5	29.7	29.6	29.0	28.6
Tsleep	1.8	TEC HR	0.8	0.9	1.5	1.9
Tidle	10.0		2.5%	3.1%	5.2%	6.6%

As can be seen, the desktop TEC headroom starts at 9% and moves to 25% for full proxy weightings, while the notebook TEC headroom starts at 2.5% and moves to 6.6% for full proxy weightings. It is suggested to adjust the weightings to have similar headroom values (match notebook to desktop) as follows:

New Proxy TEC weightings with similar headroom to desktop

Notebook	**Conv**	**base**	**RW**	**SD/NS**	**Full**
Toff	60%	54%	49%	48%	45%
Tsleep	10%	18%	27%	34%	37%
Tidle	30%	28%	24%	18%	18%

To achieve the following TEC headroom:

New Proxy TEC weightings with similar headroom to desktop

Notebook	**Pwr**	**Conv**	**base**	**RW**	**SD/NS**	**Full**
Toff	0.5	30.5	29.7	27.4	23.2	23.6
Tsleep	1.8	TEC HR	0.8	3.1	7.3	6.9
Tidle	10.0		2.5%	10.0%	23.8%	22.7%

- Emerging power management techniques that should be represented via test method, weighting, etc.
    - energy-efficient Ethernet (proposal in ecma-383)
    - network sleep proxy
    - automatic brightness control (proposal in ecma-383)
    - Wake on Wireless
    - Network availability and its impact on low power states and need for network availability of EUT

2) Is USB Selective Suspend a feature commonly implemented by default?

- Selective suspend is enabled today on Desktops and Notebooks
- Only works on “appropriate devices” due to long exit latencies (new USB LPM spec addresses this)
- The Industry feels that power management techniques are encouraged by energy metrics (battery life, TEC limits, and testing procedures) and that there is no need to call out specific power management features.
- There is thousands of power management features enabled in every box that we ship, but if we are too aggressive customer dissatisfaction comes into play and they would either disable the features or possibly ship it back as broken. The environmental impact of servicing products due to aggressive power management schemes far outweighs any potential energy savings.

3) How can intermediate display power management features, such as turning off backlighting for a period of time before completely switching off a display, be added to an idle test based on the concepts of Short and Long Idle?

- The Industry feels that ENERGY STAR should not require any sorts of power management beyond the existing requirements (idle timers to display blank and sleep) and that ENERGY STAR should encourage the use of effective power management techniques through its testing methodology. Today most systems (except desktops) will turn off the display engine when the screen is blanked on notebooks as it saves power (and is done to save battery life on notebooks, and energy in TEC calculations), however it is not done for desktops as it would have no impact on the desktop TEC calculations because desktop systems are measured with the screen on.
- If ENERGY STAR requires the disabling of active brightness control during TEC measurements, then don’t expect systems to have active brightness control to conserve energy in AC modes.
- In general, the testing methodology and TEC calculations should be done in a way that demonstrate the benefit of bringing to market energy saving technologies; if there is no benefit then the technology will not be brought to market. Should features as brightness control or diming prior to switching off can be captured by the ecma-383 short idle test method which measures and averages the power over a 5 minute period (where such techniques can take place).

- **Other Requirements**

Table 10: Discussion Topics - Other Requirements

Topic Description	Proposed Action	Rationale
Consumer information	• Provide consumers with relevant product information on a range of computing products regarding features, benefits, and energy-efficient performance. • Evaluate various means to effectively provide energy performance information to consumers (e.g., the ENERGY STAR Power and Performance Datasheet ["PPDS"]).	The Version 5.2 Computers specification requires manufacturers to distribute only limited marketing materials related to power management. EPA plans to expand user information requirements in Version 6.0 to ensure that purchasers have the information necessary to operate their computer in the most energy-efficient manner possible.

Topic Description	Proposed Action	Rationale
Multi-attribute Environmental Requirements	• Evaluate requirements for environmental benefits outside of the energy efficiency scope. • Investigate study or reporting of life-cycle energy. Discuss with stakeholders how the results of the Laptop PAIA project can be applied to the requirements for Notebook Computers.	In order to guard against unintended consequences where ENERGY STAR (ES) recommends a product based on use phase data exclusively, EPA has screened many product categories for opportunities or risks represented by non use-phase greenhouse gas (GHG) emissions. Where non-use phase GHG impacts are similar to or exceed use phase impact, EPA has initiated more detailed research into the life cycle costs and benefits of specific life cycle options. For the screening effort, EPA worked with Dr. Sangwon Suh, Bren School of Environmental Science & Management at UC Santa Barbara, to run an economic input output life cycle assessment (LCA) of many ES products. This analysis cannot compare different products within a product category, but served to flag product categories that justify additional research to further evaluate opportunities for reducing GHG emissions. Dr. Suh's analysis showed that short lived products, as expected, presented a potential vulnerability for the program as well as an opportunity for EPA to offer consumers a higher level of environmental benefit. To follow up on this result for laptops while recognizing that process-based LCA does not align with the lifetimes of short-lived products, EPA has also supported the development of a laptop Product Attribute to Impact Algorithm (PAIA). This is a research-based shortcut process LCA that will associate life cycle GHG impacts with product attributes. EPA will propose consideration of the results of the laptop PAIA project in the V6 specification. Further, as the ES program and the marketplace mature, EPA is considering how it can respond to consumer interest in other environmental benefits such as lower toxicity in their ENERGY STAR products. EPA plans to look at existing, tested industry standards for a source of such environmental criteria.

- Evaluate requirements for environmental benefits outside of the energy efficiency scope

Industry Response:

- Industry opposes expansion of ENERGY STAR program beyond product energy efficiency during use of product.

- **Background:** Environmental eco labels and standards that are intended to be multi-faceted from their inception are more appropriate for evaluating product environmental benefits beyond product energy efficiency during the use of the product. For example, the IEEE 1680 EPEAT environmental labeling scheme already addresses multi-faceted product environmental attributes and is better structured for specifying product energy environmental attributes outside the scope of product energy efficiency

    - Example: IEEE 1680 EPEAT standard

    - There are Government directives "....emphasizing where possible the use of standards developed by private, consensus organizations" (I.e. IEEE 1680 EPEAT standard)

    - Ref.OMB A-119 – establishes policies on Federal use and development of voluntary consensus standards and on conformity assessment activities http://www.whitehouse.gov/omb/circulars_a119/

    - National Technology Transfers and Advancement Act

    - http://standards.gov/standards_gov/nttaa.cfm

    - Section 12(a)(3) "....emphasizing where possible the use of standards developed by private, consensus organizations"

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

    - Much of the success of the ENERGY STAR program is due to the fact that it is simple, objectively measurable and verifiable.

    - By focusing solely on the attribute of a product's energy consumption, ENERGY STAR offers purchasers a clear, objective means for identifying products that can help them become more effective stewards of their energy investments. As a result, ENERGY STAR is now the most widely recognized energy efficiency label in the world, and is being embraced by governments and businesses around the globe.

    - *- Energy Star is the most widely recognized and understood endorsement for electronics per a recent Harrison Group study but the recognition is less than*

50%. Other Eco-label with multiple attributes has recognition less than 20%. Further Harrison Group research indicates that consumers do not understand LCAs with consumer understanding ranging from 10-25% for a given LCA carbon input areas (manufacturing, transportation, use, packaging, etc). Increasing E complexity by adding LCA, may diminish ENERGY STAR's recognition and use and further confuse consumers.*

- There is still much work to be done in educating the public about the ENERGY STAR program and the benefits of power management and energy efficiency in general.
- Adding requirements to the program beyond product efficiency will confuse customers and divert limited resources.
- It may also discourage some manufacturers from voluntarily seeking to qualify products under ENERGY STAR.
- In addition, the non-efficiency requirements may conflict with regulations that have already been adopted in various jurisdictions, thereby discouraging wider acceptance of the ENERGY STAR label.
- For these and other reasons, INDUSTRY opposes the introduction of requirements into ENERGY STAR product specifications that do not directly relate to a product's efficient use of electricity and to user experience.

Investigate study or reporting of life-cycle energy. Discuss with stakeholders how the results of the laptop PAIA project can be applied to the requirements of Notebook Computer

Industry Response

- Consistent with Industry's position on the previous question involving potential for including environmental benefits outside of product energy efficiency, Industry opposes inclusion of provisions involving life-cycle energy beyond power consumption of products during use.
- The ENERGY STAR program scope should remain focused on product energy during the use phase of the product life cycle.
- Regarding potential use of the Laptop Product Attribute to Impact Algorithm (*PAIA*) associated with the ENERGY STAR program:
- Although there has been some progress in developing a model for assessing the carbon footprint throughout the life-cycle of products, Life Cycle Analysis (LCA) tools (including PAIA) are not yet mature enough for use in quantifying results beyond the product use phase. For example :

    - When comparing products using the PAIA model, the resulting embedded carbon values for a 17" laptop will be identical except for differences resulting from a power use profile.
    - If the power consumption values for two 17" Notebooks during the use phase were the same, the PAIA results would also be the same due to the extensive use of standardized values for the impacts during manufacturing phase.

- Furthermore, the 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 that support our position that use of LCA methodology including the PAIA tool is not mature to a point where it will yield results that could be used to make valid comparisons between products.
- A recent study by Christopher Weber at Carnegie Mellon University titled *Uncertainty and Variability in Carbon Foot printing for Electronics Case Study of an IBM Rack--mount Server* concluded that there is large uncertainty in calculating multi-attribute environmental impacts such as carbon footprint. For more information about Christopher Weber's study, please see a study summary at: http://gdi.ce.cmu.edu/
- A study performed by ANEC in 2010 concluded that "a static PCF stand-alone label providing a total CO2 footprint on products does not make sense and is not very relevant for consumer decision making" (http://www.anec.eu/attachments/ANEC-R&T-2010-ENV-001final.pdf).
- A similar conclusion was made in a study called the *German PCF Pilot Project* which stated: "Providing a total CO2 footprint figure in the form of a static carbon label, as is already practiced by some companies, does not make sense and is not very relevant for consumer decision making. A figure of this kind suggests a precision and conclusiveness which cannot be achieved using the current state of methodology" (http://www.pcf-projekt.de/files/1241103260/lessons-learned_2009.pdf).
- When LCA tools reach the point in development where they will yield meaningful/comparable results, the outputs of these LCA tools should be considered for inclusion into eco labels and standards that are intended to be multi-faceted from their inception. Examples may include but are not limited to: The IEEE 1680 EPEAT environmental labeling scheme and other multi-criteria environmental standards that may result from LCA development projects such as PAIA and the Sustainability Consortium, etc.
- Therefore INDUSTRY opposes the introduction of requirements into ENERGY STAR product specifications that do not directly relate to a product's efficient use of electricity and to user experience (including LCA analysis tools such as PAIA).

- **Other Requirements - Questions for Discussion**

1) **Would adding a PPDS-like requirement be useful to customers for any of the existing or suggested product classifications in the program (Desktops, Workstations, etc.)? What data/metrics should be included in this documentation, how should it be presented, and where should it be presented?**

Industry Response: 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:

- 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 retail packaging, user guide, manufacturer web sites provides sufficient notification of Energy Star compliance

- 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

LONG IDLE VERSUS SHORT IDLE IMPACT ON TEC CALCULATIONS

In the face to face it was requested to calculate the TEC error relative to actual energy of using long idle (Pidle) versus short idle (Psidle) when estimating computer Energy. These calculations are shown below:

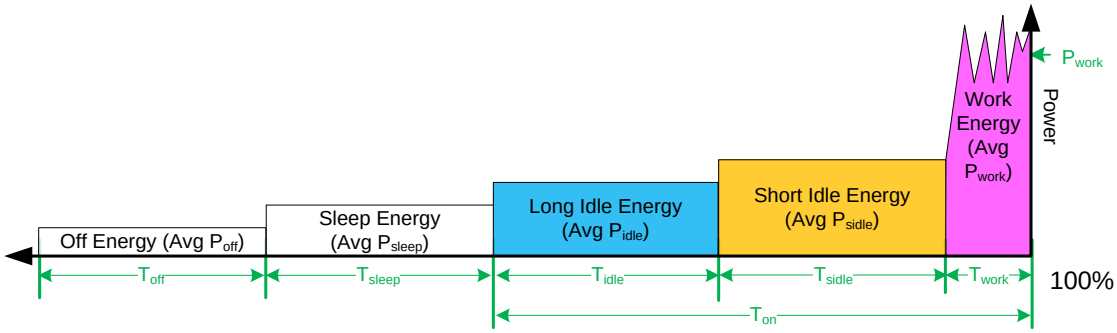
	Measured AC power					TEC Error Calculation				
Users	Active	Short idle	Long idle	Sleep	Off	TECact	TECcalc sidle	TEC calc idle	% Error sidle	% Error idle
1	42.8	42.7	36.7	1.5	0.5	160	160	144	0.1%	10.3%
2	32.1	32.0	26.0	1.5	0.5	120	120	103	0.3%	13.8%
3	33.8	33.9	23.9	1.5	0.5	123	123	96	0.2%	22.0%
4	36.2	35.7	29.7	1.5	0.5	134	134	117	0.5%	12.6%
5	21.2	21.0	15.0	1.5	0.5	79	78	62	0.6%	21.3%
6	33.2	33.2	25.6	1.5	0.5	123	123	102	0.1%	16.8%
7	35.1	35.0	26.1	1.5	0.5	128	128	104	0.2%	18.9%
8	22.2	21.9	20.5	1.5	0.5	87	87	83	0.7%	5.2%
9	40.4	39.7	33.7	1.5	0.5	149	149	132	0.4%	11.3%
10	44.4	42.6	37.7	1.5	0.5	165	161	148	2.5%	10.5%
11	28.4	27.9	17.7	1.5	0.5	101	100	72	1.2%	28.5%
12	25.3	25.3	18.6	1.5	0.5	94	94	75	0.0%	19.5%
13	22.1	22.1	10.8	1.5	0.5	77	77	46	0.0%	39.9%
14	19.9	18.6	17.8	1.5	0.5	75	75	73	0.4%	3.3%
15	30.4	29.6	21.8	1.5	0.5	111	109	88	1.7%	20.8%
16	12.0	9.0	9.0	1.5	0.5	43	39	39	8.7%	8.7%
17	72.4	35.9	29.9	1.5	0.5	139	134	118	3.0%	14.7%

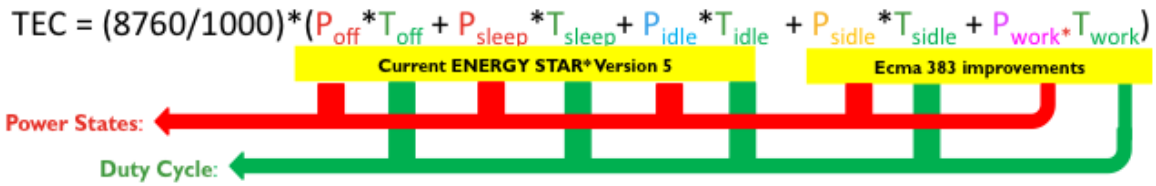
- Ecma-383 Energy Study showed that (for Enterprise Usage), Psidle can be used as a proxy for Pwork without introducing much TEC error

Small average TEC error when using Psidle (short) as a proxy for Pwork (~1.2% TEC error)

- Same data shows a much larger TEC error when using Pidle (long) as a proxy for Pwork (~16.4% TEC error)

EXPLANATION





TEC is calculated from common computer Power States weighted with yearly Duty Cycles determined by a specific usage profile (Majority Profile, in this case the enterprise profile). In ENERGYSTAR V5 the energy was made up of modal power measurements of off (Poff), sleep (Psleep) and idle (Pidle). In this case ENERGY STAR V5 was really representing all On power by a single idle measurement (Pidle) where Pidle was measured with the screen on for desktops and screen off for notebooks and AIO desktops. This goes back to ENERGYSTAR wanting to have a similar testing methodology for desktops and notebooks, and desktops the screen power was covered by a separate ENERGY STAR specification for displays (the thought being by turning off the integrated displays, you where measuring the computers in a similar way, doesn't really make too much sense, but that was what was done).

This creates a large TEC error for devices with integrated displays because the display power does represent a large portion of the energy for these types of devices and the calculated TEC would have a large error compared to a user measuring the actual energy use of the system under similar circumstances (as the user would use the system with the display on). However desktops would not see such an error because the power of their display occurs on a different AC power cord (which is then regulated by the ENERGYSTAR for displays).

Because of this, it is expected that there will be very little error for desktops using Pidle or Psidle as the power difference is very little (when a desktops display is on, the display energy increases but does not impact the energy of the desktop (much).

Also it would show that devices with integrated displays would show large errors due to the fact that the display ON does represent a large amount of On power, and the profile study showed that end users spend a large amount of time using the system with the display on.

The energy study proved that if you use Psidle to estimate the TEC without an active workload, there was very little error on either notebooks/AIOs or desktops versus the true energy. And as expected, if you used long idle to estimate TEC, then desktops would show very little TEC error (versus real energy usage) but notebooks and AIOS would show a large error (up to 40% error, with an average of 16.4% error).

The Ecma-383 workgroup never considered the use of Pidle as a proxy for active work, as this is what ENERGY STAR V5 already did, and it was common knowledge of the TEC error it created for notebooks and AIO devices.