ENERGY STAR Computer Stakeholder Meeting

Draft 2 Version 5.0 Specification

September 26, 2008

EPA

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Welcome and Introductions

Katharine Kaplan

US Environmental Protection Agency

Meeting Goals

- Summarize Draft 2 proposals and rationale for stakeholders
- Discuss proposals included in Draft 2 specification and stakeholder reactions
- Identify action items required to develop Draft 3 and Final specification
- Ensure clarity regarding next steps and timeline

Agenda

• **Welcome**	8:30 a.m. - 8:45 a.m.
• **EU Perspective**	8:45 a.m. - 9:00 a.m.
• **Overview of Draft 2 V5.0**	9:00 a.m. - 9:20 a.m.
• **Desktop/Notebook Levels**	9:20 a.m. -10:30 a.m.
• **Stakeholder Presentation**	10:30 a.m. - 10:45 a.m.
• **Break**	10:45 a.m. - 11:00 a.m.
• **Workstations Levels**	11:00 a.m. - 11:45 a.m.
• **Stakeholder Presentation**	11:45 a.m. - 12:00 p.m.

Agenda

• **Working Lunch: Verification Testing**	12:00 p.m. - 1:30 p.m.
• **Thin Client Levels**	1:30 p.m. - 1:50 p.m.
• **Stakeholder Presentation**	1:50 p.m. - 2:05 p.m.
• **Game Console Requirement Update**	2:05 p.m. - 2:30 p.m.
• **Break**	2:30 p.m. - 2:45 p.m.
• **Power Management/Power Supply Efficiency**	2:45 p.m. - 3:30 p.m.
• **Timeline and Action Items**	3:30 p.m. - 4:00 p.m.
• **Adjourn**	4:00 p.m.

EU Perspective

Paolo Bertoldi

European Commission

ENERGY STAR Agreement US - EU

- Agreement US Government – European Community on office equipment (2000, 2006)
- New and revised specifications developed together
  - US EPA and European Commission
- Both sides need to approve specifications before taking effect
- Product groups:
  - Computers
  - Monitors
  - Imaging Equipment
  - Servers

Close collaboration

- Input to specifications
- Commenting papers
- Attending meetings

The EU Approval Process

- European Commission approves new specification

- Member States consulted
  - MS technical experts group
  - ECESB – European Community Energy Star Board with all Member States and 3rd party stakeholders

Stringent Levels Required

- Target: 25 % compliance level
- Member States focus on levels

The Governments Buy ENERGY STAR

- Energy Star regulation: EC and central governments should specify energy-efficiency requirements not less demanding than Energy Star for larger contracts

- National procurement initiatives
  - Topten for 14 EU countries - www.topten.info
  - The Netherlands: Senter-Novem government procurement
  - Denmark: Danish Electricity Saving Trust Purchasing Guidelines www.savingtrust.dk
  - Other Member States

EU Registration and Database

- Registration is possible in EU for manufacturers on the EU market
- US registered products available for EU transferred to EU database
- Web site www.eu-energystar.org

Ecodesign of Energy Using Products

- Directive in place
- Implementing Measures under preparation
- For further information:
  http://ec.europa.eu/enterprise/eco_design/index_en.htm

Overview of Draft 2 Version 5.0 Specification

Katharine Kaplan

US Environmental Protection Agency

Key Changes for Draft 2

- **Desktops and Notebooks**: Typical Electricity Consumption (TEC) framework (Idle, Sleep, Standby); levels, categories included
- **Workstations**: Updates on use of V4.0 metrics provided in this meeting
- **Game Consoles**: Levels for Idle and Auto Power Down (when no games are loaded); TV/Display sleep capability; requirements for 5.0 and forward-looking tentative requirements included
- **Small-Scale Servers**: requirements return to V4.0 levels
- **Thin Clients**: Levels included; flexibility for low power mode (either sleep or off) to account for thin clients without sleep capability
- **Power Management**: WOL requirement has been modified to allow systems to ship without the feature enabled for enterprise shipment provided these features are easily accessible (all systems except for Game Consoles
- **Other Updates**: Draft 2 incorporates other policy decisions from EPA stakeholder discussions – pre-provisioned software loads, verification testing, family qualification language

Desktop and Notebook Requirements

Thomas Bolioli

Terra Novum

Bruce Nordman

Lawrence Berkeley National Laboratory

Evan Haines

ICF International

Typical Energy Consumption (TEC)

- Draft 2 evaluates Desktop and Notebook products using a TEC formula, weighing the modal power measurements (Off, Sleep, and Idle) by percentages of a year spent in each mode

- Structure allows EPA to reevaluate presence of the active computational power component upon availability of further data and measurement benchmarks

$$E_{annual} = (8760/1000)*(P_{off}*T_{off} + P_{sleep}*T_{sleep} + P_{idle}*T_{idle})$$

Typical Energy Consumption (TEC)

- Usage pattern weighting based on EPA's peer reviewed savings estimates for the ENERGY STAR program, developed and maintained by Lawrence Berkeley National Lab, and recently completed industry study capturing millions of computers

Table 2: Operational Mode Weighting

	Desktop		Notebook	
	Conventional	Proxying*	Conventional	Proxying*
Toff	55%	30%	60%	40%
Tsleep	5%	50%	10%	45%
Tidle	40%	20%	30%	15%
Note: Proxying *refers to a computer that maintains Full Network Connectivity as defined in Section 1 of this specification.*				

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Proxying – ENERGY STAR

- Computer Performance and Energy Assessment Tool Stakeholder Meeting, June 20, 2007, Washington, D.C.

Background
- Most energy used by desktop PCs in U.S. when no one is present
- Enabling power management could save > 50% of desktop PC energy use
- Network connectivity the major impediment to enabling sleep moving forward
- Topic dates back to beginning of Energy Star PC process in 2004
- Intent is to enable sleep without requiring any changes to existing protocols and applications used on great majority of PCs
- Wake On LAN inadequate for general solution for many reasons

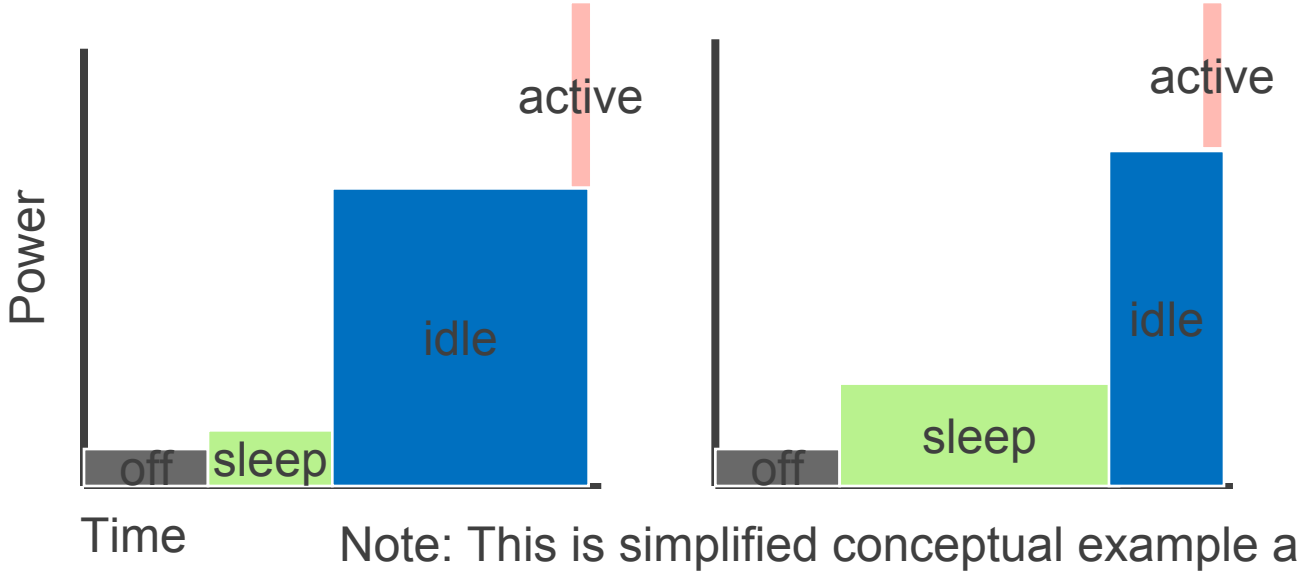
Goal
- Drive proxying functionality into all networked electronic products that have significant On / Sleep power difference (printers, consumer electronics, etc.)

- EPA Announcement of V4.0 Process, September 2004

Tier 2
I) Fix the “network problem” with power management

Proxying – Ecma TC38-TG2 - May, 2006*

- Goal = save energy by reducing the area under the curve, not to specify any particular height or width of boxes

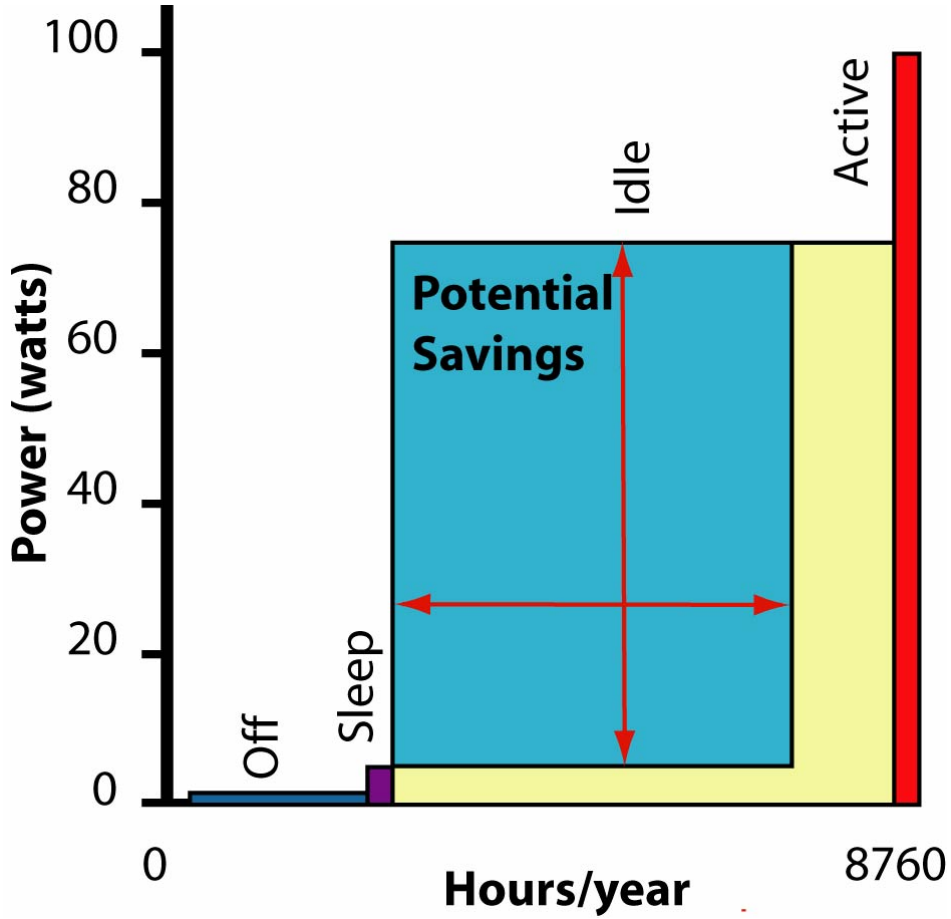


Note: This is simplified conceptual example and represents a sum of activities in each state

*Note: Active rectangle adjusted from original

Proxying - Savings Goal

- Core Fact: Most PC energy use occurs when no one present



- All time for year sorted by power level
- Most of time when idle, could be asleep
- PC savings potential is most of current consumption
- Similar patterns apply to set-top boxes, for TVs, printer, …

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Data Collection

- **August 8**: Provisional approach announced and data collection for Draft 2 Desktops and Notebooks commences
  - Off, Sleep, Idle, configuration/component information

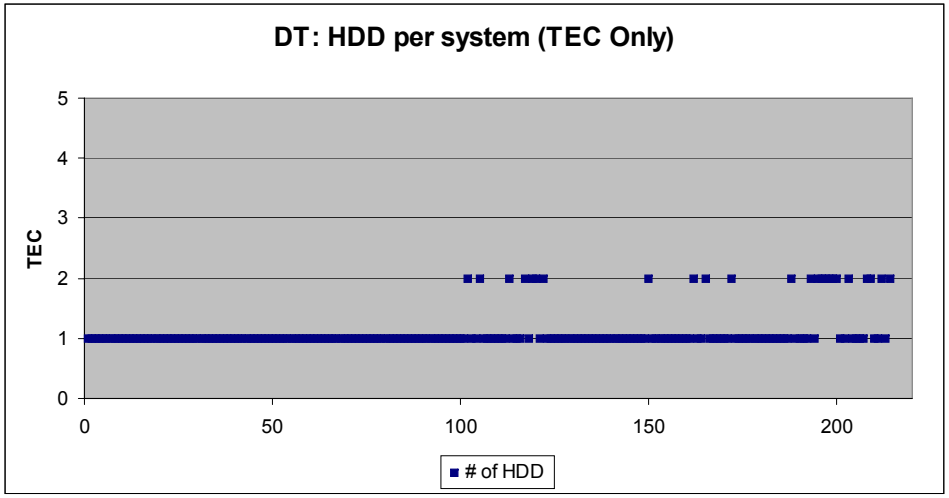
- **September 4**: Data collection complete
  - 456 total computers from 11 Stakeholders
  - 214 desktops (9 manufacturers)
  - 242 notebooks (19 manufacturers)

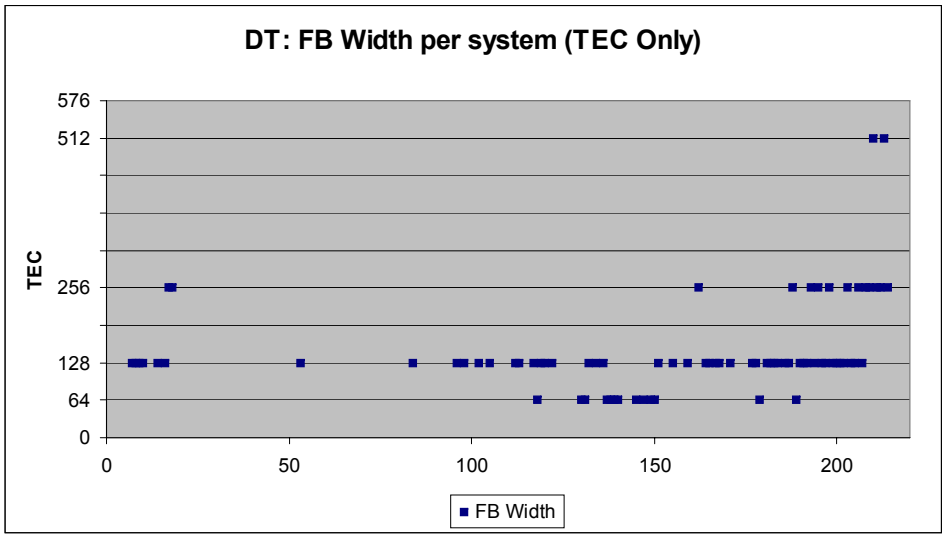
- **Frame Buffer Width**: appended to compiled dataset where data was available and provided by graphics manufacturers
  - Suggested by stakeholders as a more appropriate proxy for graphics system power requirements than non-shared memory
  - Data incomplete for some systems
    - Desktops: 9 systems could not be correlated with FB width data
    - Notebooks: 2 systems could not be correlated with FB width data
    - Reevaluated prior to Draft 3

Desktops and Integrated Desktops

- Three categories for TEC annual energy levels:
  - **Category A:** All desktop computers that do not meet the definition of either Category B or Category C
  - **Category B:** Desktops must have a discrete graphics card
  - **Category C:** Must have ≥ 3 cores per discrete processor and at least one of the following:
    - 2 or more Hard Drives; and/or
    - Discrete graphics with >128-bit frame buffer width

Desktop and Integrated Desktop Dataset





Stakeholder Comments –
Desktop Categories

- Improve segmentation of Category A – broad idle range within category of systems with integrated graphics
- Revise role of FB Width in Category C determination

Notebooks

- Two categories for TEC annual energy levels:
  - **Category A:** All notebook computers that do not meet the definition of Category B
  - **Category B:** Notebooks must have a discrete graphics card with > 64-bit frame buffer width

Stakeholder Comments –
Notebook Categories

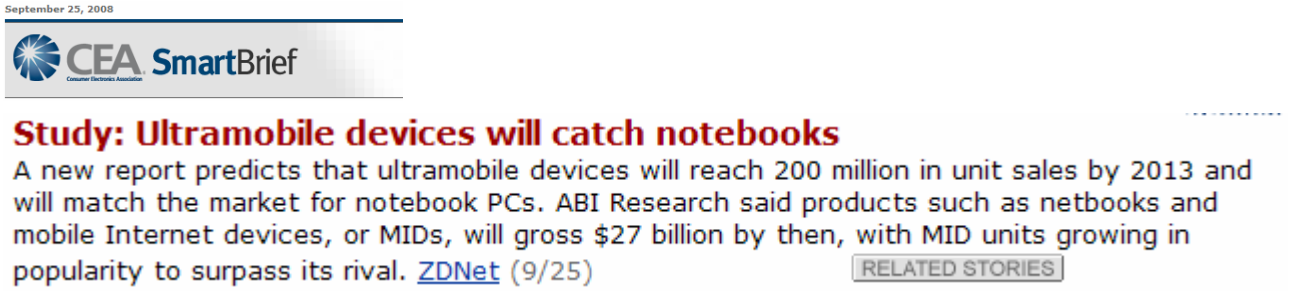
- Create Netbook category
- Maintain Class A and B definitions, but add a category in between for systems with Discrete GPU with up to 64-bit FBW

Notebook Dataset

- Over half of notebooks included in manufacturer data ≥ 4GB Memory

- Impact of Netbooks on ENERGY STAR Dataset:
  - 11/238 notebook models (~5% - identified by processor type)
  - All Category A
  - Level Effect:
    - Draft 2: 30 kWh
    - Category A w/o Netbooks (non-230V models only): 32 kWh

Netbooks


September 25, 2008

CEA SmartBrief

Study: Ultramobile devices will catch notebooks

A new report predicts that ultramobile devices will reach 200 million in unit sales by 2013 and will match the market for notebook PCs. ABI Research said products such as netbooks and mobile Internet devices, or MIDs, will gross $27 billion by then, with MID units growing in popularity to surpass its rival. ZDNet (9/25)

RELATED STORIES

*… **Gartner** is predicting 5.2 million Netbooks will sell this year, but reach 50 million in 2012. **IDC** has said recently it sees 3.5 million Netbooks shipped this year, 5 million next year, and 9.2 million by 2012.* – Cnet News.com 9/10/08

- Is the market segment here to stay?
- What hardware characteristics will properly describe this category through the life of the Version 5.0 Specification? ≤ 8.9” screen size? ≤ 1GB Memory?

Annual Energy Consumption Levels

	Desktops and Integrated Computers (kWh)	Notebook Computers (kWh)
TEC (kWh)	**Category A**: ≤ 155 **Category B**: ≤ 188 **Category C**: ≤ 275	**Category A**: ≤ 30 **Category B**: ≤ 49
Capability Adjustments		
Memory (for computers with ≥ 4 GB)	- 15 kWh	- 10 kWh

- In addition to kWh allowances, Table 1 provides adjustments for Memory capability
- WOL, enabled during testing in >65% of the dataset, is assumed active in the allowances above.

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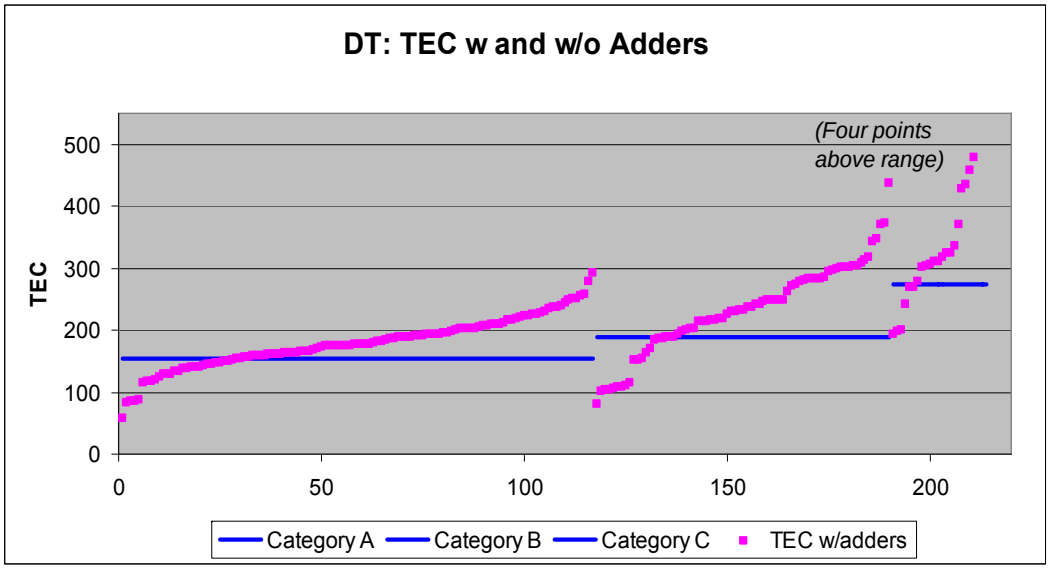
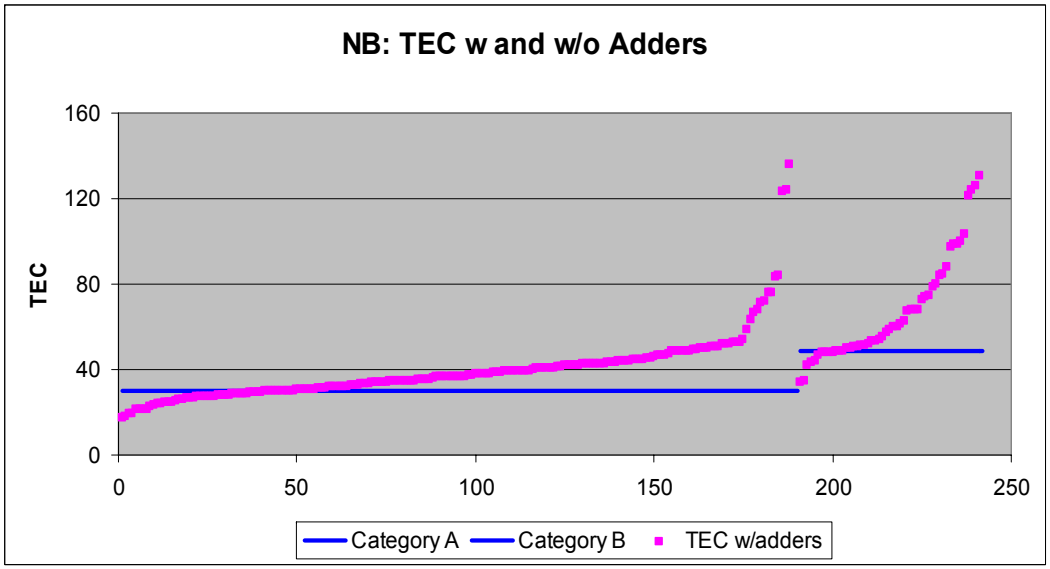
Pass Rates

- Desktops
  - Category A: 30/117 (25.6%)
  - Category B: 18/73 (24.7%)
  - Category C: 6/24 (25%)
- Notebooks
  - Category A: 45/190 (23.7%)
  - Category B: 13/52 (25%)





Discussion of Approach and Levels

Stakeholder Presentation:
ITI Proposal (Notebooks)

Jim Kardach

Intel

Stakeholder Presentation:
ITI Proposal (Desktops)

Paul Zagacki
Intel

Break

Workstation Requirements

Thomas Bolioli

Terra Novum

Data Collection and Comments

- Use of Workstation Benchmark for Version 5.0 under discussion throughout the development process
- Test effort using the Standard Performance Evaluation Corporation (SPEC) benchmark initiated by EPA on August 8th
- Limited Response: EPA received workstation data from one system manufacturer. While valued, a credible dataset and level setting process with the SPEC benchmark is not possible at this time
- As forecasted in the Draft 2 Computer Specification released on September 15, 2008, the Agency will maintain the 4.0 approach for workstations but proposes reducing the 4.0 workstation TEC levels by 25%, using the same weightings proposed in Table 4 of the Draft 2 Version 5.0 Specification

Approach

- TEC calculation of annual energy consumption used to evaluate workstations
- Product type-specific mode weighing and evaluation (similar to relationship in V4.0)

	Weighting
Toff	35%
Tsleep	10%
Tidle	55%

- Proposed Revision:

4.0:

$P_{TEC} = 0.1 * P_{off} + 0.2\ P_{sleep} + 0.7 * P_{idle}$

5.0:

$P_{TEC} = 0.35 * P_{off} + 0.10 * P_{sleep} + 0.55 * P_{idle}$

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Levels and Discussion

- Reduction of 4.0 levels

$$P_{TEC} \leq 0.25*[P_{max} + (\#\ HDD * 5)]$$

Discussion of Approach and Levels

Lunch

EPA ENERGY STAR Computer Verification Testing

Kathleen Vokes

US Environmental Protection Agency

Background and Purpose

- Through over 15 years of shared effort, EPA and our computer partners have built something of real value – the ENERGY STAR brand
- Maintaining the value of this brand requires ensuring products labeled with the ENERGY STAR deliver on their promise to the consumer
- This draft approach to verification testing presents a way to protect the integrity of our brand and reflects the input of our partners

Overview of Draft Guidelines

- Verification Testing Requirements
- Lab Accreditation
- Procurement
- Testing
- Product Failure
- Timeline

Verification Testing Requirements

- EPA selection of models on annual basis
- No more than 5 models per mfg
- One sample per test
- Third-party test laboratory to ensure credibility

In-house laboratory testing issues

Laboratory Accreditation

- Ensure that laboratory results are valid

- ***The computer must be tested in a laboratory that is accredited by an accreditation body that is a signatory, in good standing, to a mutual recognition arrangement of a laboratory accreditation cooperation (i.e. ILAC, APLAC, etc.) that verifies, by evaluation and peer assessment, that its signatory members are in full compliance with ISO/IEC 17011 and that their accredited laboratories comply with ISO/IEC 17025.***

- ***Laboratories must be specifically qualified to carry out tests to determine whether computers meet the ENERGY STAR criteria as outlined in the ENERGY STAR Program Requirements for Computers.***

Procurement

- Partner provides laboratory with a list of at least three retail sites to purchase product (including the manufacturer retail website)

Possible exceptions if samples only available directly from Partner

Testing

- Testing based on ENERGY STAR Program Requirements
- Includes internal and external power supplies
- Includes ENERGY STAR Labeling and User Information requirements

Requirements for making sure the laboratory has the correct test setup and supplies for testing models with internal power supplies.

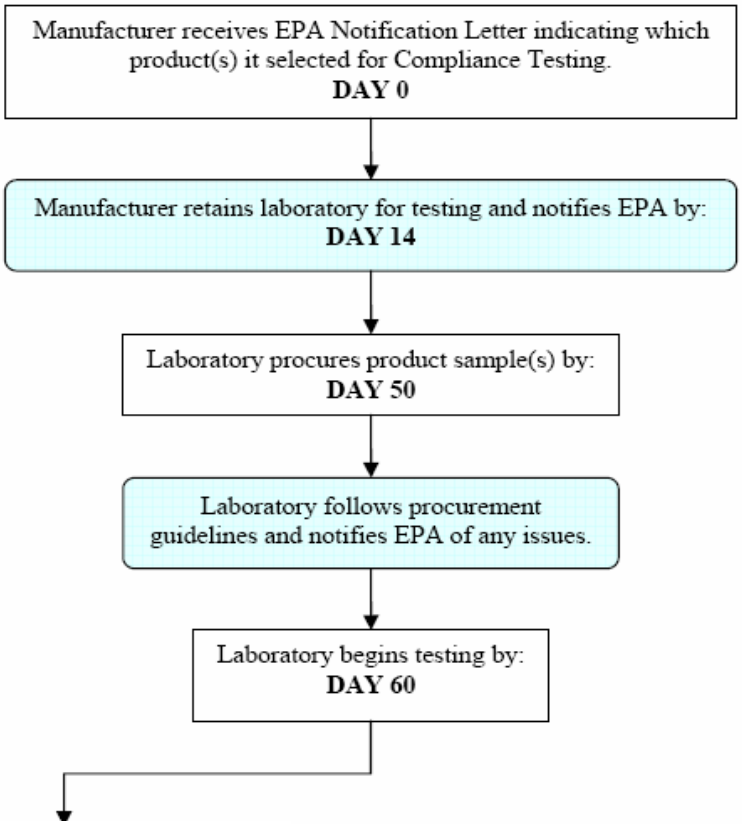
What if a Product Fails?

- Follow standard EPA process
  - Dispute resolution
  - Corrective Action Plan
  - Public Accountability

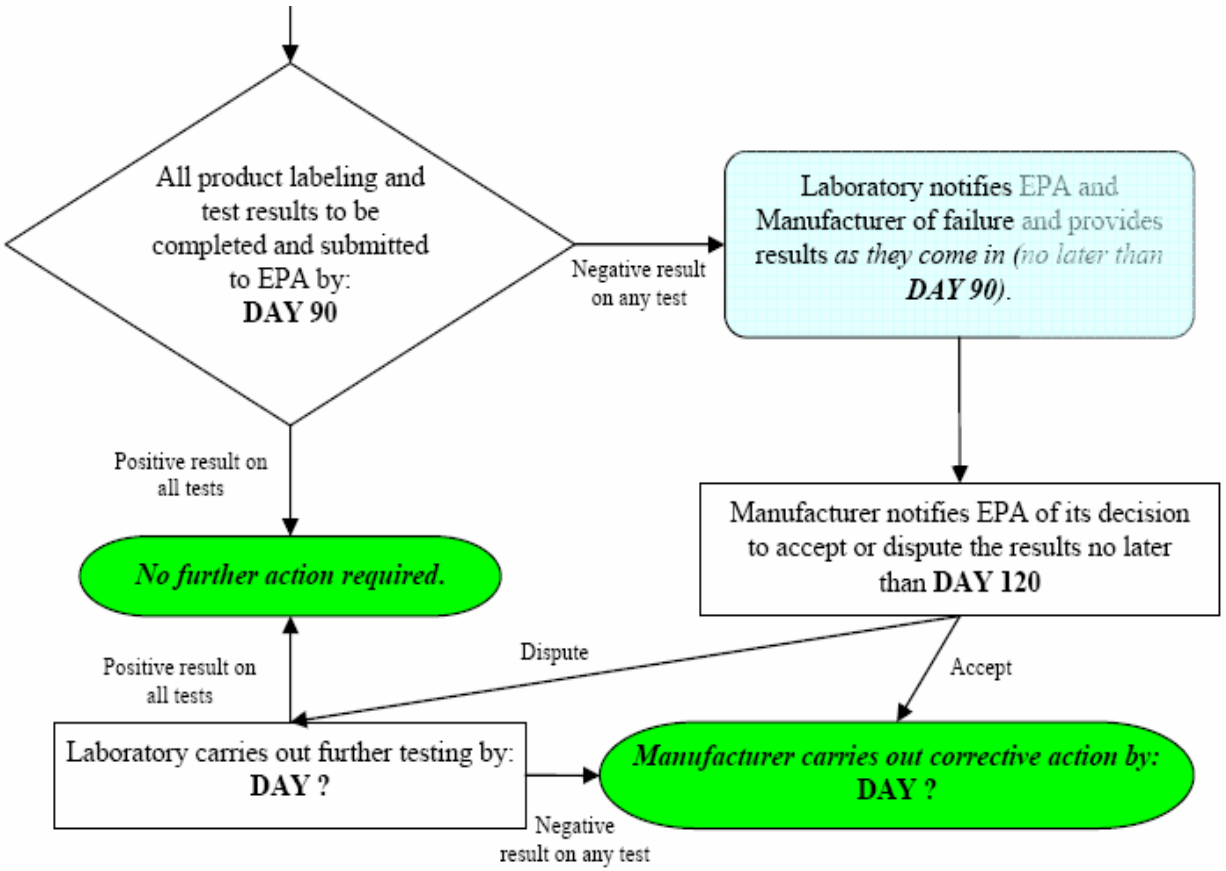
NEW MODEL NUMBER: The purpose of the new model number is to ensure that products that fail to meet performance requirements are distinguished from re-qualified models with modifications that allow them to meet the performance requirements.

Draft Timeline

II. Computer Verification Testing Milestones and Reporting Deadlines



Draft Timeline cont…



Next Steps

- Comments on draft verification guidelines and procedures manual due October 2nd
- Send comments to vokes.kathleen@epa.gov
- Next or final draft issued on October 23rd depending on nature of comments

Thin Clients

Jan Viegand

Technical Consultant to the European Commission

Thin Clients - Background

- Planned as a future product category in Version 4.0
- Factors contributing to addressing this product category in the ENERGY STAR Computer program:
  - IDC expects sales to double in the next 4 years
  - Thin Clients may spread into household sector
  - Request from stakeholders

Thin Clients - Approach

- Dedicated product category
- Thin Clients evaluated at the client level independent of back end resources
  - intended to encourage client-level energy savings and power management options
  - opportunities for server efficiency improvements through developing ENERGY STAR Server specification
- Harmonization where possible for power supplies and power management requirements
- Single category for products proposed with subcategories considered if supported by further data

Thin Clients - Data

- Two requests for stakeholder data
- Final dataset includes supplemental data from public sources (marketing information, manufacturer datasheets)
- Total: 103 products
  - Submitted data: 16 products
  - Public data: 87 products
- Dataset limitations
  - Uncertainty on measurement method
  - Full configuration data missing from public data

Thin Clients - Criteria

- Draft 2 Criteria
  - Idle: ≤ 11.5 W
  - Low power mode: ≤ 1 W
  - WOL:
    - Products with local storage (remote update capability): 0.7 W power allowance above low-power mode; shipment requirements aligned with other product categories
    - No WOL req. for TCs w/o remote update functionality
  - Power supply requirement aligned with other product categories

Stakeholder Presentation:
ITI Thin Client Proposal

Joe Hock

Hewlett Packard

Game Consoles

Thomas Bolioli

Terra Novum

Background

- Game Consoles were present as a subcategory of desktops in the V4.0 Specification; timing did not allow for specialized requirements to be included in V4.0
- In 2007, EPA initiated discussions with primary GC HW stakeholders in the industry: Microsoft, Nintendo, and Sony
- Discussions over the past year led to framework for ENERGY STAR requirements, V5.0 and beyond

Approach in Draft 2

- Operational Mode Power:
  - ≤ 1W (Off)
  - ≤ 5W (Sleep/Auto-Off Mode)
- Sleep or Auto-Off: system enters low power mode when game not loaded after period of inactivity
- TV/Display Sleep: consoles implement functions that allow displays to power down when system is inactive (dropped video out signal, etc.)
- Power Supply Efficiency: power supply efficiency requirements for external and internal power supplies

Future Requirements

- Sleep or Auto-Off: (revised) requirements to encourage further use of APD
- Power Scaling: supplementary functions (DVD/Movie playback, Wireless Access Point/Router, etc) use lower levels of power than full active game play operation. In essence, GCs use the level of energy, commensurate with task performed
- Efficient Networking: Systems will be able to maintain their network presence while remaining in a low power state

Related Initiatives

- EPA is in discussions with retailer stakeholders on approaching software manufacturers (Auto Power Down enabling)

Break

Multi-Product Requirements: Power Management and Power Supply Efficiency

Bruce Nordman

Lawrence Berkeley National Laboratory

Evan Haines

ICF International

Network Connectivity "Proxying"

- Draft 2 Definition (emphasis added)

  Full Network Connectivity: **The ability of the computer to maintain network presence while in sleep and intelligently wake when further processing is required.** Maintaining network presence may include obtaining and/or defending an assigned interface or network address, responding to requests from other nodes on the network, or sending periodic network presence messages to the network all while in the sleep state. In this fashion, presence of the computer, its network services and applications, is maintained even though the computer is in sleep.

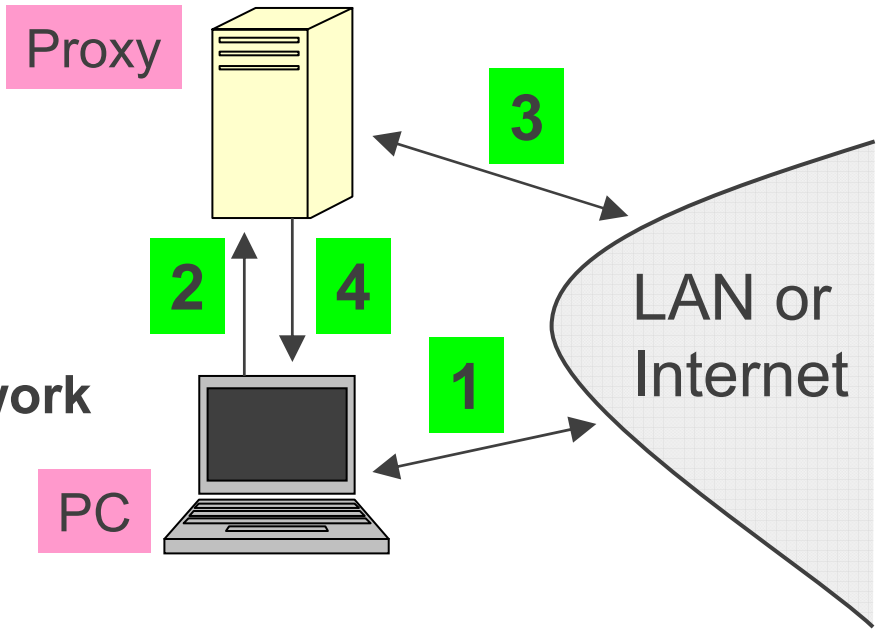
- Draft 2 Requirement: None

- Draft 2 Incentive
  - Reduced idle time in TEC calculation

Proxying — How does it work?

Proxy operation

1. PC awake; becomes idle
2. PC transfers network presence to proxy on going to sleep
3. Proxy responds to routine network traffic for sleeping PC
4. Proxy wakes up PC as needed



Proxy can be internal (NIC), immediately adjacent switch, or "third-party" device elsewhere on network

This spec about internal only

Proxy does: ARP, DHCP, TCP, ICMP, SNMP, SIP, ….

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Proxying — Goals

- Enable large majority of PC users to use sleep without breaking their own or IT admin applications
  - At least 80%. > 90% better. > 95% even better.
- Enable both current and emerging common applications
- Enable standard to be used directly in (or easily adapted to) printers, set-top boxes, game consoles, etc.
- Describe behavior of “green applications” that do not break proxying

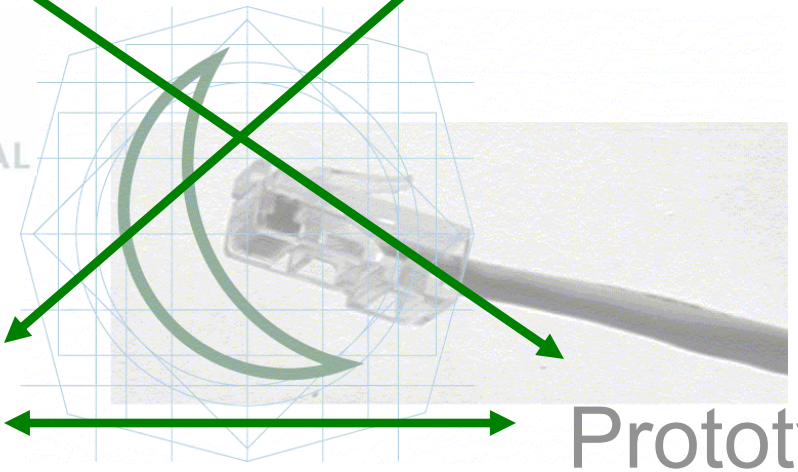
Proxying — How to get there

Standard

- Ecma TC32-TG21

Trace Analysis

- Intel Research Berkeley



Use Cases

- In development

Prototypes

- Microsoft Research "Somniloquy"
- ???

Proxying — Next Steps

- First, request Ecma TC32 - TG21 email updates:
  - www.ecma-international.org/mememto/TC32-TG21
- Ask your NIC vendor to support standard
- Ask your OS vendor to support standard
- Schedule
  - Standard: mid-late 2009 (*tentative*)

Proxying — Beyond

- Might be a software upgrade to some existing systems (NIC and OS)
- For legacy PCs, could implement functionality in adjacent network device (switch or wireless access point)
- Work into printers, game consoles, set-top boxes, etc.
- Remember, this **increases** product functionality

Energy Efficient Ethernet

- Originally “Adaptive Link Rate”
- Then “Rapid PHY Selection”
- Now “EEE” or formally IEEE P802.3az

- For further information:
  - grouper.ieee.org/groups/3/az
  - efficientnetworks.lbl.gov/enet-adaptive.html

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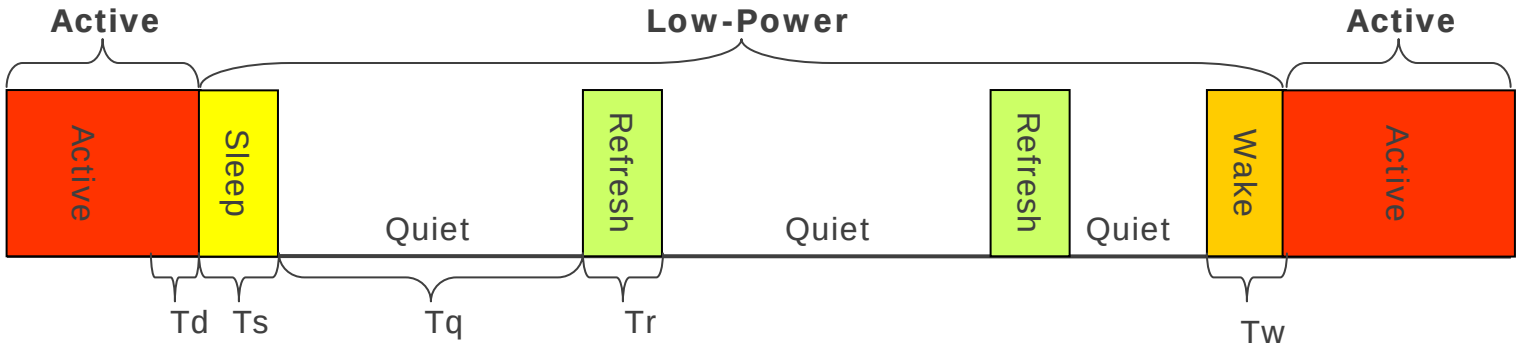
Energy Efficient Ethernet - Details

Energy Efficient Ethernet

- Why? Great majority of Ethernet links mostly idle great majority of time
- Today power is nearly independent of traffic levels
- EEE enables power to scale with traffic



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Energy Efficient Ethernet - status

- Version 0.9 of standard reviewed last week by EEE Task Force
- Applicable to (nearly) all types of Ethernet over copper (including 10 Gbps for data centers)
- Anticipated schedule: FINAL approval of standard in March 2010
- Available in products: ???

Energy Efficient Ethernet

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Power Supplies

- Levels maintained from Draft 1 Specification

- Draft 2 included clarification that the requirements for IPS and EPS apply to all products in the Specification

(A) Power Supply Efficiency Requirements - Requirements are applicable to all product categories covered by the ENERGY STAR Computer Specification:

Computers Using an Internal Power Supply: 85% minimum efficiency at 50% of rated output and 82% minimum efficiency at 20% and 100% of rated output, with Power Factor ≥ 0.9 at 100% of rated output.

Computers Using an External Power Supply: Must be ENERGY STAR qualified or meet the no-load and active mode efficiency levels provided in the ENERGY STAR Program Requirements for Single Voltage External Ac-Ac and Ac-Dc Power Supplies, Version 2.0. The ENERGY STAR

Power Supplies

- ENERGY STAR EPS V2.0
  - The ENERGY STAR EPS 2.0 Specification was finalized on April 23, 2008
  - Computers must meet V2.0 EPS requirements to qualify for Computers V5.0 (*Section 6A of the V2.0 EPS Specification*)
  - Manufacturers are encouraged to begin speaking with suppliers now regarding power supply availability

Internal Power Supplies - Testing

- Generalized Internal Power Supply Efficiency Test Protocol referenced by the ENERGY STAR Computer Specification is under revision
- In accordance with the 80Plus and CSCI programs, the test procedure no longer requires testing at 230V input power, a change from the live version 6.2 available at www.efficientpowersupplies.org
- EPA intends to maintain the 115V and 230V required testing condition for power supplies to meet IPS requirements in the specification
  - Consistency with V4.0 Internal Power Supply testing conditions
  - European market
- Stakeholder comment encouraged in advance of Draft 3

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Timeline and Action Items

Katharine Kaplan

US Environmental Protection Agency

Timeline

- September 29: Follow-up comments due to EPA
- October 2: Draft 3 distributed
- October 16: Comments due to EPA
- October 23: Draft final distributed
- October 30: Comments due to EPA
- October 31: Final distributed

- July 2009: Version 5.0 effective

Action Items

Thank you for your participation and continued support of the ENERGY STAR program.

Please address questions and comments to:
Katharine Kaplan, US EPA
kaplan.katharine@epa.gov • 202.343.9120
Evan Haines, ICF International
ehaines@icfi.com • 202.862.1158

Materials will be posted to the ENERGY STAR Computer Specification Revision page - http://energystar.gov/index.cfm?c=revisions.computer_spec

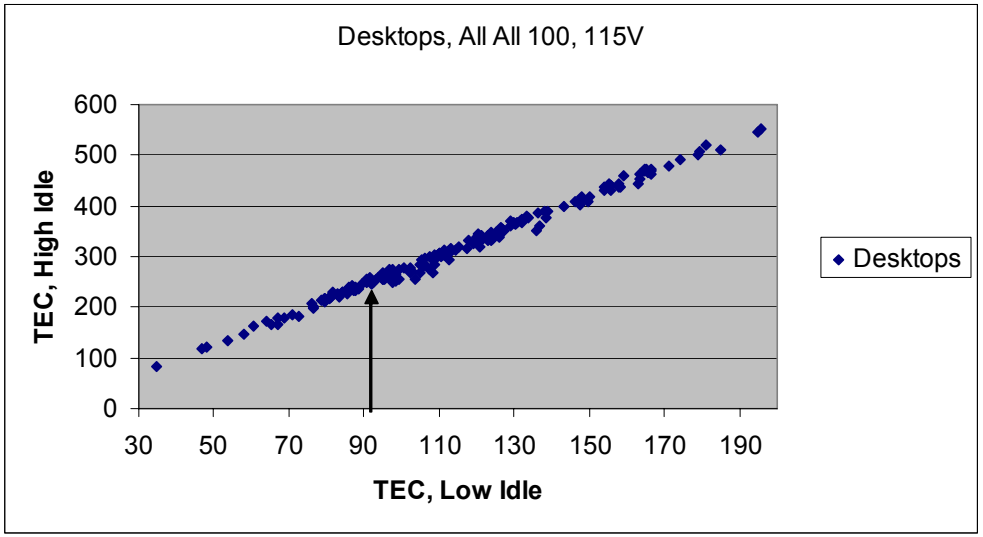
Backup Slides

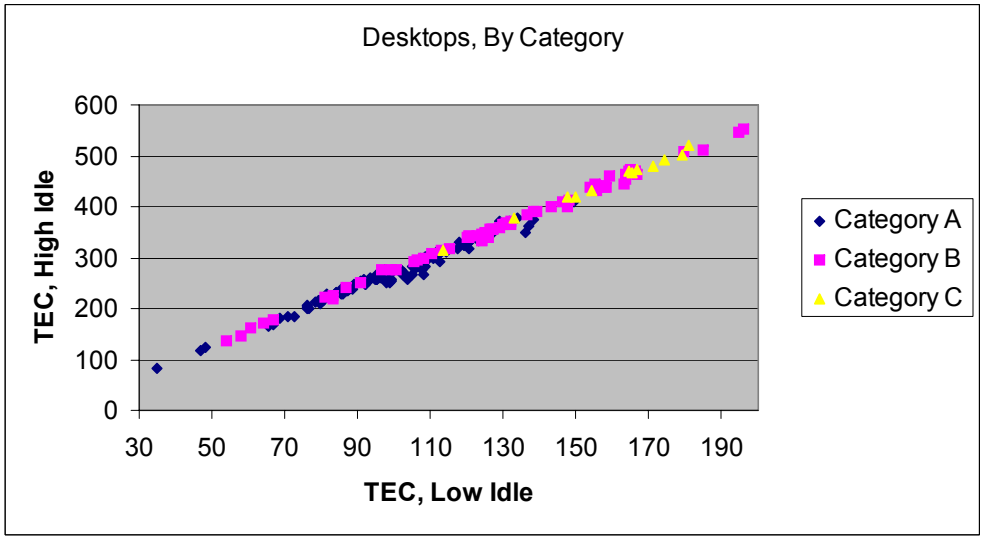
Idle in TEC Equation

- Evaluating impact of alternative TEC Weightings on relative system ranking

Desktops			
	Low Idle	**Draft 2**	**High Idle**
Toff	75%	55%	35%
Tsleep	5%	5%	5%
Tidle	20%	40%	60%
Notebooks			
	Low Idle	**Draft 2**	**High Idle**
Toff	75%	60%	40%
Tsleep	10%	10%	10%
Tidle	15%	30%	50%

Idle in TEC Equation - DT





Idle in TEC Equation - NB