ITI Promoting Innovation Worldwide

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ENERGY STAR®Program
U.S. Environmental Protection Agency
Via email: computers@enegystar.gov

Subject: ENERGY STAR® Program Requirements Product Specification for Computers
Eligibility Criteria Draft 2, Version 9.0

The Information Technology Industry Council (ITI) is providing comments on the Draft 2, Version 9.0 ENERGY STAR® Computer Specification issued on 05/06/2023 on behalf of the Information and Communication Technology (ICT) industry.

ITI is the premier global advocate for technology, representing the world's most innovative companies. Founded in 1916, ITI is an international trade association with a team of professionals on four continents. We promote public policies and industry standards that advance competition and innovation worldwide. Our diverse membership and expert staff provide policymakers with the broadest perspective and thought leadership from technology, hardware, software, services, and related industries.

ITI has a long history of collaborating with EPA on ENERGY STAR® programs for ICT products leading to huge improvements in energy efficiency and annualized energy savings. ENERGY STAR®Computers version 9.0 development has presented unique challenge and opportunities. ITI's key focus on Draft 1 was the integrity and completeness of datasets used for establishing the draft base TEC limits and adders. ITI appreciates collaboration with EPA to achieve that goal. With the dataset in place ITI focused its attention on the impact of removal of categorization in Draft 2. Such an analysis was not possible in Draft 1 response, as ITI and EPA were still working on the dataset. The comments below reflect some of the challenges industry is facing with removal of categorization.

<u>General comments on removal of categorization and Base TEC allowances (Table 6):</u>

US EPA adopted categorization approach for ENERGY STAR®Computers specification going back to version 4.0 or earlier. While the categorization criteria evolved from one version of ENERGY STAR®specification to another, the principle to compare like computers systems within their own respective category remained. So, while there were significant base TEC reductions along with adder adjustment with each specification revision, the limits were set based on the top 25-30% most efficient systems within each category, comparing like systems. Categorization allowed systems to be fairly compared with similar systems.

Once EPA determined that P-score was no longer a good criterion for categorization in ENERGY STAR® Version 9.0, EPA decided to eliminate P-score and the entire categorization approach that had been so successful. Upon further review of Draft 2 proposal, the industry now thinks the impact this change has created is more significant than originally envisioned. A single category approach for all desktops,

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notebooks, and integrated desktops respectively, will severely limit many high-end systems to get ENERGY STAR®certification, once possible with categorization approach. The tables below show % base TEC reduction from multiple category ENERGY STAR®version 8 to a single category approach being proposed under draft 2 of ENERGY STAR®version 9.

Industry is not advocating for revisiting the categorization approach, but requests that EPA make Computers version 9 as a transition version to allow gradual base TEC reduction, and limit base TEC reduction to no more than 30% from original version 8 categories (worst case). Industry is asking that this 30% reduction be calculated from the version 8 categories with a P-score >8 since almost all systems shipping today have a P-score >8. With the proposal below, it will require increasing base TEC for integrated desktops, with other minor tweaks to desktops base TEC due to new data on adders as provided in the tables below.

In summary, going from multiple categories to a single category system in version 9 is a huge change requiring gradual base TEC transition. The industry recommends setting base TEC limits based on ~30% (worst case) base TEC reduction from version 8 categories.

Desktops:

The ITI Recommendation for Desktop Base TEC is based on a decrease of memory and 3.5" HDD adder that is described later in this document.

Table 1:

ENERGY STAR® v8 Desktop - Category (P>8)	ENERGY STAR® v8 Base TEC limit (kWh)	30% base TEC reduction	ITI Recommended Base TEC (kWh)	ENERGY STAR® v9, Draft 2 (kWh)
I2	46	32.2	36	32

Integrated Desktops:

Version 9 Draft 2 proposes an Integrated Desktop Base TEC allowance of 6.8. That would be a 75% reduction in Base TEC alone, not including any of the TEC Adder reductions also being proposed. This drastic reduction gives industry very little time to modify system level designs. Following is an integrated desktop recommendation.

Table 2:

ENERGY STAR® v8 Integrated Desktop - Category (P>8)	ENERGY STAR® v8 Base TEC limit (kWh)	30% base TEC reduction	ITI Recommended Base TEC (kWh)	ENERGY STAR® v9, Draft 2 (kWh)
2	27	18.9	18.9	6.8

Notebooks: The Notebook Base TEC limit below in Table 3 was derived in two steps: first, the 30% reduction from version 8 TEC limits; the second step was to convert the Base TEC to the new version 9 notebook mode weightings. Using multiple notebooks as examples, the Measured TEC of a notebook is reduced ~20% with the new mode weightings.

This Base TEC value plus the reduction in Notebook adders provides an overall 38.3% reduction of the E_TEC MAX Limits () in the version 9 database. When the conversion to the version 9 mode weightings is also included, this industry proposal would reduce the $E_{\_TEC\ MAX}$ Limits by 50.5%. This is still a significant savings for the EPA towards its overall goal of reducing annualized energy consumption.

Table 3:

ENERGY STAR® v8 Notebooks - Category (P>8)	ENERGY STAR® v8 Base TEC limit (kWh)	30% base TEC reduction	ITI Recommended Base TEC (including conversion to new Mode Weighting) - kWh	ENERGY STAR® v9, Draft 2 (kWh)
2	14	9.8	7.8	6.3

ITI Comments on existing TEC Adder adjustments:

Desktop & Integrated Desktop TEC Adders

- **Memory Adder**
  - Reducing memory adder from 0.17 * GB to a new recommendation of 0.15*GB
  - After more data collection and review from more industry partners, the memory adder for Desktop and Integrated Desktops can be reduced a little more to better represent both low and max memory amounts.
- **Additional Storage Adder**
  - Reducing TEC Adder from 16.5 kWh to a new Recommendation of 12 kWh
  - This change is based on data industry collected on 3.5" 5400 RPM HDDs.

Notebook TEC Adders

- **Memory Adder**
  - Increasing memory adder from 0.08 * GB to a new recommendation of 0.12 * GB
  - This is to have a TEC Adder closer to Desktop memory since they are both using similar DDR technology. Notebooks do have a smaller multiplier which is based on the differences between the Desktop and Notebook TEC Mode Weightings.
- **Additional Storage Adder**
  - Industry is recommending including the additional storage adder for the small number of notebooks that provide this capability
    - SSD = 0.4
    - Any other storage = 0.8

ITI Comments on NEW proposed TEC Adders:

Integrated Display TEC Adders

- **Touch Technology**
  - Touch Technology is not power neutral. In Version 8.0, Base TEC was sufficient to account for implementations. ITI proposes EPA adopt this adder for computers with touch technologies (+ 0.17_{touch}) consistent with allowances provided in ENERGY STAR® Displays Version 8.0. Notebooks and integrated desktops with touch capability will get an allowance of 0.17, reflected in Table 7.
    - **Touch Technology**: Enables the user to interact with a product by touching areas on the Display screen (Displays 8.0)

- **DP/HDMI-in Technology**
  - ITI proposes EPA to adopt this adder for Integrated Desktops supporting DP/HDMI-in functionality (+ $0.13_{DP/HDMI\text{-}in}$). These systems require an additional scalar IC with varying power consumption impacting Short Idle mode, reflected in Table 7.
  - Data Justification: Below represents sample component analysis comparing Scalar IC and PCH (based on FHD panel).

Mode	Scalar IC	PCH	AIO Mode Weighting
Short Idle-W	2.50	0.32	30%
Long Idle-W	0.10	0.20	10%
Sleep-W	0.10	0.05	45%
Off-W	0.00	0.05	15%

Base TEC Adders/Allowance

- **External Power Supplies (EPS)**
  - For notebooks with higher output EPS, the efficiency at idle is very different than EPS with lower outputs. As an example, an EPS with a 65W nameplate output, the EPS efficiency at 4W DC load is ~80%. Higher output EPS at, or above 90W + the 4W DC load efficiency could be ~ 50-60%. This is extremely important for the ALPM and OFF power where the efficiency changes drastically at these light loads which have a higher mode weighting in version 9. The allowance also becomes necessary with the collapse of all notebooks into a single category in ENERGY STAR® version 9.
  - **External Power Supplies (EPS) Recommendation**: Allow EPS specific allowance of 0.1, when the rated output of EPS is ≥ 90 Watts and in the E_{TEC_MAX} formula for Notebooks:
  - **Data Justification**:

	Short Idle	Long Idle	Sleep	Off	Total TEC (kWh)
DC Power (W)	4	0.8	0.8	0.3	
65W EPS Efficiency	84%	77.4%	77.4%	74%	
AC Power (W)	4.762	1.034	1.034	0.405	15.04

230W EPS Efficiency	81.9%	63%	63%	40%	
AC Power (W)	4.884	1.269	1.269	0.75	17.00

New Formula including EPS allowance would be:

446 Equation 2: E_{TEC_MAX} Calculation for Desktop, Integrated Desktop, and Notebook Computers

447 $E_{TEC\_MAX} = (1+ALLOWANCE_{PSU}) \times (TEC_{BASE} + TEC_{MEMORY} + TEC_{GRAPHICS} + TEC_{STORAGE} + TEC_{INT\_DISPLAY} + TEC_{SWITCHABLE} + TEC_{MOBILEWORKSTATION} + TEC_{>1G\ to\ <\ 10GLAN} + TEC_{10GLAN})$

- *ALLOWANCE*$_{PSU}$ of 0.10 is provided to external power supplies for notebooks with 90 Watts or greater output (0.10). Notebooks with External Power Supplies output rating less than 90 watts receive an allowance of 0.

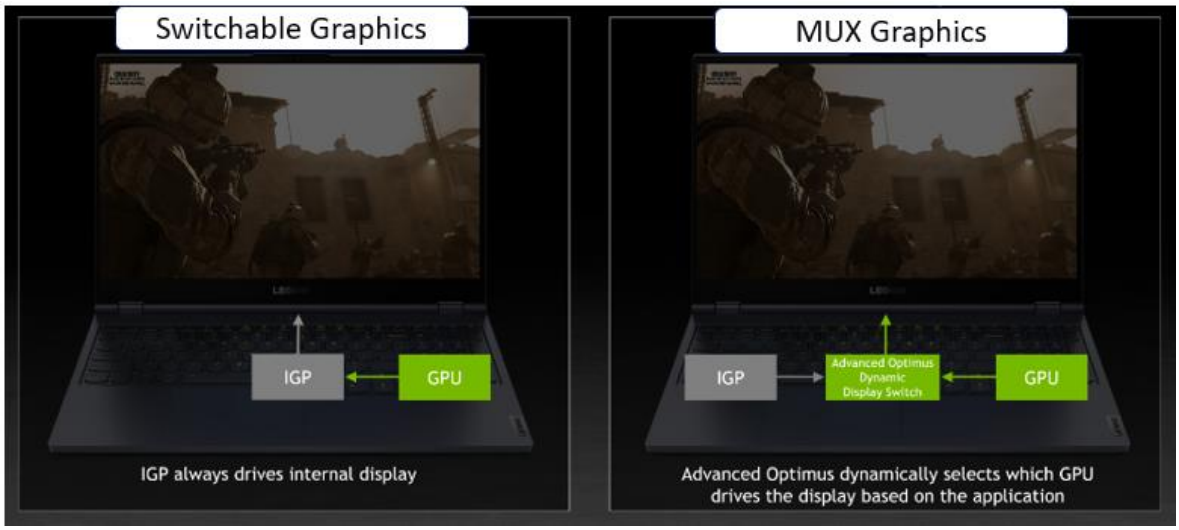
This *ALLOWANCE*$_{PSU}$ should be included in the ENERGY STAR® specification after Table 7, similar to how Enhanced Performance Display is treated as a separate Equation #3.

MUX Graphics

In the past 2 years the industry has introduced multiple ways for a system to work with both discrete graphics and integrated graphics. The traditional method is still used in many systems and is defined below as "Switchable Graphics". A new way to do this has been introduced by multiple vendors referred to as "MUX Graphics". Some examples are NVIDIA's Advanced Optimus or Microsoft Display Mux. Both methods use the same topology described at this NVIDIA website: https://www.nvidia.com/en-us/geforce/news/rtx-laptops-advanced-optimus/

Using MUX Graphics, a Notebook that traditionally just used discrete graphics can now save power by incorporating a MUX on the motherboard to drive the display. This MUX device would then switch between integrated graphics and discrete graphics. MUX Graphics does reduce power overall because in Idle modes the discrete GPU is powered off, but the MUX itself does consume some power when the system is in Short Idle, Long Idle, and Modern Standby modes. MUX Graphics is primarily used for higher performance graphics which need a dedicated port going directly to the display.
Traditional Switchable Graphics driven by integrated graphics still exists for a majority of today's systems but is a different topology than this new class of MUX Graphics.

Block diagram:



ITI is now requesting to have these two new definitions:

- Switchable Graphics: System has both integrated graphics and discrete graphics. The display is driven by integrated graphics.
- MUX Graphics: System has both integrated graphics and discrete graphics. The display is driven by a MUX device on the motherboard.

Based on these definitions, ITI is requesting the following TEC Adders (kWh):

- **Notebook**
  - Switchable = 0
  - MUX Graphics = 5.2
- **AIO/DT**
  - Switchable = 7
  - MUX Graphics = 12.2
  - Data Justification behind MUX Graphics TEC Adder:

Mode	DC Power of MUX device	AC Power (Includes VR Eff of 80% + PSU efficiency)	TEC Value NB	TEC Value DT
Short Idle	0.6 w	0.94 (PSU Eff = 80%)	1.64	2.46
ALPM	0.3 w	0.47 (PSU Eff = 65%)	3.54	2.78
Off	0.0w	0	0	0

		Total TEC	**5.18**	**5.24**

Ruggedized Notebook

With the overall reduction in TEC limits that version 9 would bring, a special segment of rugged notebooks would be especially challenged to meet these new TEC Limits. This segment of "Ruggedized Notebooks" is important to the US Government which requires ENERGY STAR® compliance for notebooks purchases. Industry is proposing to create a new definition of Ruggedized Notebooks and a corresponding special TEC Adder.

Ruggedized Notebooks include extra components required to meet military standards and increased system power. These components include differential GPS, RFID, additional LAN ports, specific keyboards, Serial ports, thermal cameras, barcode readers, DFPR, DVD drives, and SD card reader.

For the purpose of ENERGY STAR® specification, a Ruggedized Notebook is considered a Notebook which would need to meet the Notebook Base TEC, and all other appropriate Notebook adders, plus the specific Ruggedized Notebook TEC Adder.

- New Definition (Section 3.5, Table 7, Line 474)
  - Ruggedized Notebook: "A Notebook Computer that is tested to meet a rugged computer standard, e.g. MIL-STD 810H or IP66 (IEC 60529) that is expandable with multiple expansion slots for scalability."
- New Adder (Section 3.5, Table 7)
  - Notebook **TEC_{RUGGED}** adder = 5.6 kWh

Summary of all changes ITI is Recommending for Base TEC and TEC Adders

Section 3.5, Table 6.

Form Factor	Version 9 Draft 2 Base TEC limits (kWh)	ITI Proposed Base TEC limits (kWh)
Notebook	6.3	7.8
Integrated Desktops	6.8	18.9
Desktops	32	36

Section 3.5, Table 7.

Not listing any TEC Adders that are not recommended for a change. All values are in kWh. Any item with a "*" is a new adder.

	Desktop	Integrated Desktops	Notebooks
TEC Memory	0.15 * GB		0.12 * GB
TEC Storage: 3.5 HDD	12		No change

Other*	n/a		0.8
SSD	No change		0.4
Switchable Graphics	7 (no change)		0 (no change)
MUX Graphics*	12.2		5.2
Ruggedized Notebook*	0		5.6
$TEC_{INT\_DISPLAY:}$ A < 190	N/A	[(3.43 × r) + (0.148 × A) + 1.30] × (1 + EP + DP/HDMI-in + TOUCH)	8.76 × 0.20 × (1+EP + TOUCH) × (0.43×r + 0.0263×A)
190 ≤ A < 210		[(3.43× r) + (0.018 × A) + 26.1] × (1 + EP + DP/HDMI-in + TOUCH)	
210 ≤ A < 315		[(3.43 × r) + (0.078 × A) + 13.2] × (1 + EP + DP/HDMI-in + TOUCH)	
A ≥ 315		[(3.43 × r) + (0.156 × A) - 11.3] × (1 + EP + DP/HDMI-in + Touch)	

After Table 7 new Notes (Same spot as Enhanced Performance Display comment):

$ALLOWANCE_{PSU\_}$ = 0.10, for any Notebook that has an external power supply greater than or equal to 90 watts.

TOUCH = 0.17, if a computer has Touch display on the integrated display

DP/HDMI-in = 0.13, if an integrated desktop has an DP/HDMI input.

Comments on specific sections.

Section 1.D.4. Line 202. Change all instances of the word "inactivity" to "inactivity or lack of human presence," and port over language on occupancy sensors from ENERGY STAR® for Displays Version 8.0:

ENERGY STAR®Displays Version 8.0 Eligibility Criteria Section 1.E.4 "Additional Functions and Features":

Occupancy Sensor: A device used to detect human presence in front of or in the area surrounding a Display and/or Computer.

Note: An Occupancy Sensor is typically used to switch a Display between On Mode and Sleep Mode by detecting human presence or a combination of human presence and a signaling device such as Bluetooth device.

ENERGY STAR® Displays Version 8.0 Test Method Section 5.2.C.3 "UUT Configuration and Control":

Occupancy Sensor: If the UUT has an occupancy sensor, the UUT shall be tested with the occupancy sensor settings in the as-shipped condition. For UUT's with an occupancy sensor enabled as-shipped:

a) A person shall be within close proximity of the occupancy sensor for the entire warm up, stabilization, luminance testing and On Mode to prevent the UUT from entering a lower power state (e.g. Sleep Mode or Off Mode). The UUT shall remain in On Mode for the duration of the warmup period, stabilization period, luminance test and On Mode test.

b) No person shall be within close proximity of the occupancy sensor for the duration of the Sleep Mode and Off Mode tests to prevent the UUT from entering a higher power state (e.g. On Mode). The UUT shall remain in Sleep Mode or Off Mode for the duration of the Sleep Mode or Off Mode tests, respectively.

Section 1.3. Lines 223- 243. ITI proposes that US EPA remove the section on Full Network Connectivity and sections pertaining to Network Proxy capabilities. Since all the mode weightings are now based on conventional exclusively there is no need to include the above section in the ENERGY STAR® Specification.

Section 3.2.2. Table 1. Lines 332. Regarding power supply efficiencies, ITI appreciates that the EPA has reverted the IPS requirements below 500 watts to 80Plus bronze equivalent while retaining the existing additional 10% load point requirement based on data.

Section 3.5.1. Lines 396-402. ITI appreciates the EPA has clarified that resume time requirements do not apply to mobile workstations, workstations or thin clients. This change was necessary to remove any uncertainties

Section 3.5.2: ITI recommends removing Footnote ii below 3.5.2. since it made reference to the old option b pertaining to Full Capability Mode Weightings

Section 3.5.2.iv. Lines 425. ITI observed a typo that shall be changed from "7 watts" to "7 kilowatt hours."

Section 3.5.2. Table 4 and 5 Lines 460- 475. ITI recommends that the first column heading to state "Mode" and the second column heading to state "Mode Weighting". This comment applies to both Table 4 and Table 5. Since there is no proxy mode weighting, the word "Conventional" is no longer needed.

Table 4: Mode Weightings for Desktops and Integrated Desktop Computers

Mode Weighting	Conventional

Testing using external power supplies (EPS): ITI acknowledges EPA's concerns that laptops' safety or performance might be affected if used with certain external power supplies other than those they are

packaged with. However, it also believes that these risks are less prevalent for Slates/Tablets. Therefore, to enable manufacturers to consolidate designs and operations considering emerging common charger requirements and avoid carbon emissions from manufacturing, transporting, and disposing of unnecessary hardware and packaging, ITI requests that Version 9.0 make the following revisions to the first paragraph of Section 5.1.C of the ENERGY STAR®Test Method for Computers, Rev. May 2022:

Current Text: *Notebooks and Slates/Tablets shall be tested using the external power supply (EPS) shipped with the product. If the UUT is designed with the intention of utilizing an EPS that is 30W or less, but does not include a pre-packaged EPS, then test the UUT as follows:*

Recommended text: *Notebooks and Slates/Tablets shall be tested using the external power supply (EPS) shipped with the product. If the UUT* ***is a Slate/Tablet and*** *is designed with the intention of utilizing an EPS that is* ***60W*** *or less, but does not include a pre-packaged EPS, then test the UUT as follows:*

ITI recommends 60W because it corresponds to the maximum power level permissible before USB-C cables must be rated for 5A current, and because Slates/Tablets are typically not designed to operate at above 60W. ITI also wishes to meet with EPA in one year, as the market matures and more manufacturers adopt USB-C, to reconsider unbundling external power supplies from Notebooks in future revisions of ENERGY STAR®.

Future Testing: AI, along with other user driven tasks can impact Short Idle and Long Idle measurements. AI operations can occur from very low power levels to high power states which will be inconsistent and skew results. Stopping AI activity is prudent where not needed. OS tasks can also skew results. Some OS tasks can be postponed, this is helpful to block during tests.

Industry is asking that an OS provided “Focus Mode” be allowed during testing to provide postponing of these random background tasks and provided consistent testing and reduces the number of runs needed for standard deviation (saves time and money).

Thank you for this opportunity to provide comments. Please contact me if the EPA wishes to meet with members to discuss our recommendations in further detail.

Best regards,

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