AMD
together we advance_

January 11, 2024

Ryan Fogle

ENERGY STAR® Program
US Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

Dear Mr. Fogle,

Advanced Micro Devices (AMD) appreciates the opportunity to provide stakeholder feedback following the November 20, 2023 publication of the Draft 1 specification for ENERGY STAR® for Computers version 9.0. We support specification changes that would enhance the scalability, fairness and clarity of the criteria, and after review of this Draft 1 specification, the team at AMD suggests the following edits:

A. Changes requested for technical improvements to the specification:

1. **Lines 374-376, EEE: change line 374 to read "3.2.4 IEEE 802.3az Energy Efficient Ethernet (EEE) Requirements: All products which contain one or more Ethernet…"**

   a. The addition of an Energy Efficient Ethernet (EEE) requirement seems to be reasonable, given the high adoption rate of EEE in 1Gbit or higher ethernet ports.

   b. Since "Energy Efficient Ethernet" is an undefined term that should be associated with an IEEE and international standard, it makes sense to add a definition embedded in this paragraph, e.g. IEEE 802.3az Energy Efficient Ethernet (EEE).

2. **Table 6, Line 505: Change TEC_{BASE} for Notebooks to 3.5 kWh (or 4.5 kWh) if no adders change**

   a. Based on the database provided by the EPA and using the Draft 1 proposed adders, the top quartile (25%) of Notebooks in the EPA-published spreadsheet calculates a TEC_{BASE} of 3.5 kWh, if no other adders are granted (see below for suggested changes to adders). For a passing percentile of the top 30% of Notebooks, TEC_{BASE} would need to change to 4.5 kWh.

   b. Without this change, the Draft 1 criteria yields a passing rate of <20% for Notebooks.

3. **Table 7, Line 523: Change Notebook TEC_{MEMORY} from "N/A" to the Desktop TEC_{MEMORY} formula, i.e. "0.5 × [1.7 + (0.24 × GB)]" and, if changed, Notebook TEC_{BASE} can be reduced to 0.5 kWh.**

   a. **Performant iGfx:** Integrated-graphics-only (iGfX) Notebooks and other PCs exist that have graphics performance equivalent to dGfx, AND these Notebooks will necessarily have much more (e.g. 2X) shared system memory than Notebooks with either dGfx or only lower-performance iGfx. Assuming iGfx-only Notebooks are unable to claim the $TEC_{GRAPHICS}$ adder, due to the formula and footnoted restrictions on that adder, the extra memory to support performant iGfx graphics requires an adder for TEC_{MEMORY}. Solutions with performant iGfx graphics should not be put at an ENERGY STAR criteria

disadvantage, when they would yield annual energy reductions relative to dGfx competitors.

b. **Consistency:** Desktop and Notebook PCs support similar types of DRAM, so power scales similarly with installed capacity. It makes no logical sense to treat Notebook memory scalability differently, and a scalable TEC_{MEMORY} adder should be used for all categories.

c. Top Quartile selection error in Draft 1: Adding a TEC_{MEMORY} adder formula for Notebooks would correct an error in Draft 1 criteria, where the Draft 1 criteria caused passing scores for less than 20% of Notebooks in the spreadsheet.

d. Scalability: The Draft 1 combination of too-small TEC_{BASE} in Table 6 and lack of a formula for TEC_{MEMORY} in Table 7 creates memory scalability issues for ENERGY STAR compliance, especially in the largest memory configurations that are possible now and in the future.

e. **Future-proofing:** CPU Core counts are increasing in SoCs, along with additions of more-performant GPU and AI processor Cores that are also being added to SoCs, and all three of these trends increase the amount of base memory that needs to be installed. Even with aggressive power management, quiescent energy consumption during idle, sleep and off states will scale up with memory capacity. DRAM refresh must continue and energy for refreshing DRAM scales up with memory capacity increases.

f. **Empirical Measurements:** From measurements on AMD-based Notebooks, E_{TEC} scales with memory size. Supporting scalability can be done while also changing the Notebook TEC_{BASE} value to improve selection of the top quartile of energy-efficient computers.

4. Table 7, Line 523: Change $TEC_{SWITCHABLE}$ for Notebooks from N/A to 1.0 kWh

a. Also on Line 490, add Notebooks to the list of systems that are allowed to claim the $TEC_{SWITCHABLE}$ adder.

b. According to ***footnote v and Line 451***, $TEC_{GRAPHICS}$ is not applicable when Switchable Graphics is enabled in AC power mode, so for Notebooks the *Switchable Graphics* feature needs an adder to support and encourage this energy-saving feature.

c. Adding a $TEC_{SWITCHABLE}$ adder for Notebooks would also be one aspect of fixing the top quartile under-selection problem for Notebooks.

5. **Table 7, Line 523: Change the Notebook $TEC_{STORAGE}$ adder from N/A to be the same as for desktops.**

a. The number and types of storage devices in notebooks are self-limiting by the constrained size of those computers, but the storage power adders should be scalable in Notebooks for those Notebooks that do support larger numbers of storage devices.

6. **Lines 553-555:** We recommend having the same workstation criteria in version 9.0 as existed in version 8.0, and we recommend working with the Standard Performance Evaluation Corporation (SPEC) benchmark development nonprofit consortium to create an active-energy workstation efficiency benchmark to use as the basis for criteria on subsequent versions of ENERGY STAR for Computers.

7. **Lines 574 and 576:** there is no section in this document defining the workstation test procedure for establishing P_{MAX} for use in **Equation 5**, so please copy and paste the entire **Section 7 "Test Procedures for Workstations" from the v8.0 ENERGY STAR for Computers** specification to become the section following Section 4 of this specification.
    a. Perhaps an enhancement could be allowed, to also simultaneously activate and run workloads on additional application-specific processing cores that may be on SoCs.

8. **Line 622:** The **Table 12** test method reference is incorrect. It should be "ENERGY STAR Final Test Method for Computers, Rev. May 2022" and include a footnote to that document URL: https://www.energystar.gov/sites/default/files/asset/document/ENERGY%20STAR%20Draft%20Test%20Method%20for%20Computers.pdf

9. **Lines 687 and 291, Effective Date**: Regardless of the release date for the final completed ENERGY STAR for Computers version 9.0 specification, the Effective Date should not be less than 9 months later, and for practical reasons may be best if chosen to be no sooner than 2Q 2025.
    a. V9.0 criteria should be allowed for use in compliance testing as soon as v9.0 is released.
    b. Line 692 states the Effective Date will be at least nine months following final release of v9.0, and that would likely push the Effective Date into 2Q 2025.
    c. Most new computer product launches occur in the first quarter of each year, for both commercial and consumer OEM PC products, with full production in 2Q.
    d. We support the decision to have both a Draft 2 and Final Draft in your release timeline, so that changes can be made to errata in Draft 2, prior to the Final Draft.

10. **Lines 699-701:** We recommend that ENERGY STAR collaborate with SPEC on any active energy efficiency benchmarks that may be considered in the future for workstations or PCs.

B. Changes required for improving clarity, punctuation and consistency in the specification, including a few minor updates to editorial corrections previously shared in an email to the EPA:

1. **Lines 30 and 31:** please remove the comma between "non-detachable" and "mechanical" so that those words are directly associated and don't have the appearance of being separate items in the list. Add the word "a" before "pointing device" at the end of the sentence. The modifications improve that sentence to read "Notebook Computers include an Integrated Display, a non-detachable mechanical keyboard (using physical, moveable keys), and a pointing device."

2. **Lines 127 and 235:** the phrase "as shipped" should by hyphenated "as-shipped" to be consistent with the other correct uses of that term in the specification.

3. **Line 149:** The word "cores" refers to the plural of the defined term Core, so it should be capitalized as "Cores" in this instance. Also, move the Core definition before the CPU definition.

4. **Lines 150-151:** The definition of Core is appropriate to the narrow use of that term in this specification, but as a definition with potential for use in future ENERGY STAR specifications, perhaps it would be better to genericize the term *Core*, thus allowing (e.g.) its eventual use in describing multiple GPU Cores or other special-purpose computing accelerator Cores on an SoC.

a. If the paragraph on lines 150-151 was changed to "Core: A single functional unit of a CPU, GPU or other application-specific computation functional accelerator" then the modification to Line 149 above would need to change "cores" to "CPU Cores."

b. Add a period at the end of the sentence ending on Line 151.

5. **Line 157:** The word "cores" should be capitalized as "Cores" since this is a defined term.

6. **Line 427:** for clarity, we suggest adding the word "annual" (not capitalized) to change the sentence to: "Calculated annual Typical Energy Consumption (E_{TEC})…"

7. **Lines 430 and 431 (and in many note boxes):** The defined term "Notebook" needs to be capitalized. Same change for multiple instances of Desktop and Integrated Desktop.

8. **Lines 427 to 474:** These were mis-formatted and had jumbled paragraphs.

   a. The Note starting in Line 429 an ending on Line 434 should be cut and pasted into a separate Note box.

   b. The first sentence of section 2.5.2 that starts on lines 427-429, and ends with "…(E_{TEC_MAX}) per" is supposed to be continued by the text that starts on Line 435 "Equation 2, subject to…"

   c. On **line 435**, the section numbering for section **3.5.3** should not exist, since that text should be part of section **3.5.2**.

   d. On **Lines 451 and 452**, the beginning of that sentence is interrupted by the text that should be in another Note box. "Notebooks, Desktops, and Integrated Desktops with switchable graphics may not apply the Discrete Graphics allowance, $TEC_{GRAPHICS}$, from Table 7 in" should be moved to begin **sub-section iv**, in front of the current text in **sub-section iv**.

9. In ***footnote i*** at the bottom of page 12, the term "UUT" is undefined, so please change "UUT" to either "Unit Under Test (UUT)" or "unit under test (UUT)."

10. ***Footnote iii*** at the bottom of page 12 and ***footnotes iv-xii*** should all be in superscript font, to be consistent with ***footnotes i and ii***, OR change **footnotes i and ii** to conform to the others' non-superscript formatting.

11. **Lines 451 and 491: Change "switchable graphics" to the defined term "Switchable Graphics"**

Sincerely,

Roger Tipley
Of behalf of the AMD ENERGY STAR Review Team

7171 Southwest Pkwy, Austin, TX 78735