ENERGY STAR Computers
Discussion Guide
December 2018

Overview

The U.S. Environmental Protection Agency (EPA) is sharing this ENERGY STAR Computer Program Discussion Guide: Version 8.0 to invite early stakeholder input on aspects under consideration for the revision of this specification. The topics that EPA feels are of particular importance for discussion prior to a Draft 1, Version 8.0 release are:

- Categorization system used to set leadership levels.
- Duty cycle and mode weightings, including incentives for features promoting more functional power management
- Internal Power Supplies
- Resume time from sleep
- Scope
- Treatment of non-traditional SSD options

EPA will host a webinar on Monday, January 14, 2019 from 1-3 PM Eastern Time to engage with stakeholders on the content included in this discussion guide. Stakeholders are asked to share written feedback with EPA by January 25, 2019. As always, stakeholder engagement is a vital ingredient in the success of the ENERGY STAR program and EPA looks forward to working with all parties to develop the ENERGY STAR Version 8.0 Computers specification.

Categorization System

In March 2018, EPA held a stakeholder meeting to discuss categorization of desktop computers for Version 8.0. EPA and stakeholders presented three different categorization systems that the Agency was considering for Version 8.0 desktop categorization: p-score, currently used by EPA for the ENERGY STAR program, expandability score, which is used by the California Energy Commission (CEC), and simplified expandability score, which had been proposed by the California Investor Owned Utilities. In addition, EPA held one-on-one conversations with each of the major desktop manufacturers to get more detailed thoughts on each of the categorization systems. The general conclusion from this set of meetings was that while there is a strong preference from industry to not introduce an additional categorization system, there is not a strong preference between p-score and the expandability score.

In order to more fully vet expandability score and its applicability to the ENERGY STAR program, EPA collected data as part of the Version 7.0/7.1 recertification of desktops and gave manufacturers time to submit data on non-certified products. This data, which includes data from the ENERGY STAR certified product list and data submitted by ITI on non-certified systems, is presented here and provides a comparison of how p-score and expandability score sort products and to what extent one or both metrics are appropriate for identifying leadership levels for desktop computers.

In **Figure 1** below, 834 desktop configurations were separated out based on their expandability bins[1], with the "max" bin equating to products which fall under max expandability exempt (e.g. workstation) requirements for CEC, although they are defined and treated as desktops for ENERGY STAR purposes. While there is a general trend upward in energy usage as the CEC categories increase, there is significant overlap and reduced differentiation between the medium and high expandability categories, which is where the majority (74%) of the configurations sit. Additionally, there is a notable group of high expandability bin products with TEC lower than the 25th percentile of medium bin products, which are predominately desktops with integrated graphics, which shows that the expandability score does not serve as a differentiator for energy use.

Figure 1: CEC Expandability Score Categorization Performance

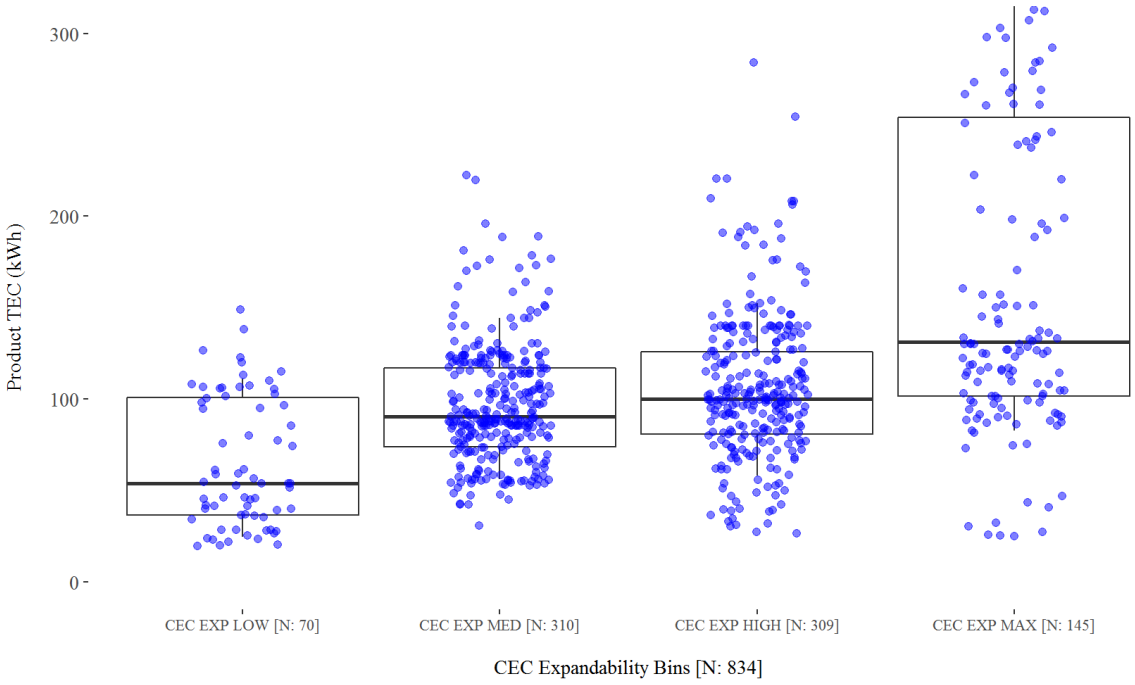
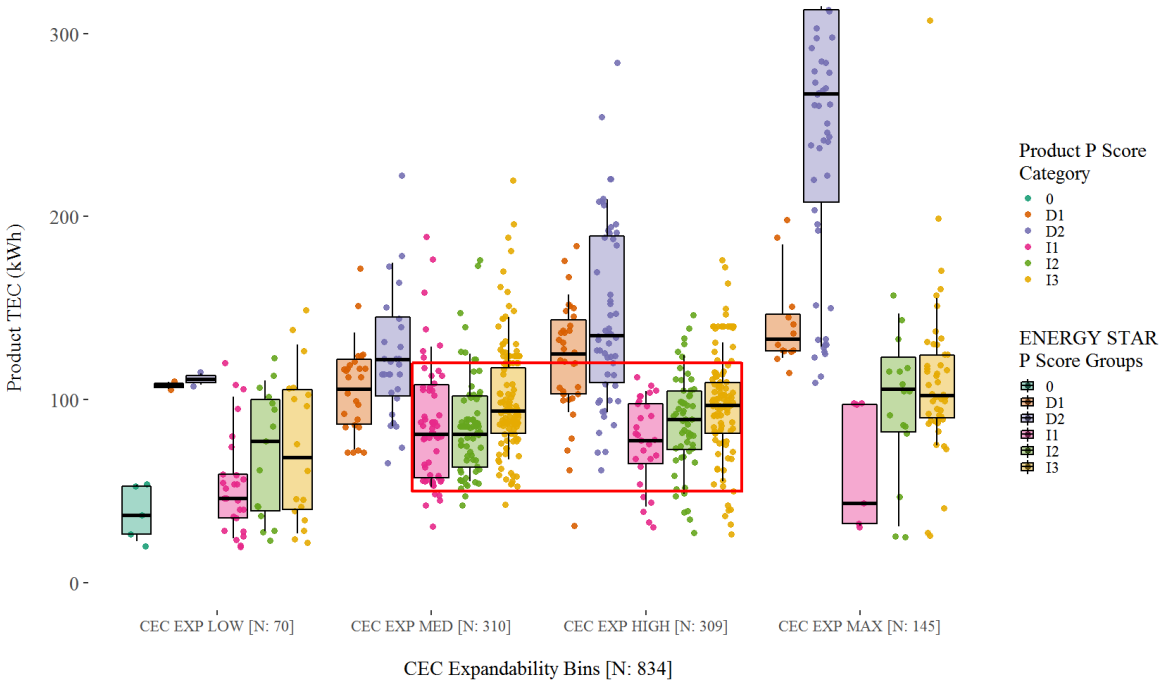


Figure 2 shows the same data but is further broken out by current p-score category. The red box highlights the lack of differentiation particularly between integrated graphics desktop products in the medium and high categories. This pattern holds true for most integrated graphics products found in the maximum category and to a lesser degree the discrete graphics products whose median power usage levels are similar across the entire expandability score category spectrum.

EPA acknowledges that p-score needs some updating particularly to address the I3 category, but the data indicates that p-score better addresses the TEC differences between integrated and discrete graphics. Median marks (Boxplot center lines) in **Figure 2** highlight power usage profile differences between integrated and discrete graphics in each expandability score category. Also notable are integrated systems found in the CEC max expandability bin (exempt), which are comparable to systems within lower expandability bins which are non-exempt products.

[1] The CEC broke out the expandability score into the following bins: Low: EXP ≤ 250, Med: 250 < EXP ≤ 425, High: 425 < EXP ≤ 690, Max: 690 < EXP.

Figure 2: CEC Expandability Score Categorization Performance



Based on these findings, and lack of stakeholder feedback advocating for a change, EPA currently believes that maintaining the p-score category system in Version 8.0, with upcoming modifications to p-score boundaries and performance categories as needed to best fit the latest data set, is the best path forward for Version 8.0. Categorizing our data set using the expandability approach alone does not appear to create meaningful differentiation across the bulk of products in the medium and high categories and does not differentiate sufficiently well between the power profiles of integrated and discrete graphics products. EPA thanks stakeholders for the data that has been provided to date and welcomes comment on the data presented in this guide and will continue to monitor the development of the expandability score in future specification revisions, as appropriate.

1. Are there other considerations that EPA should evaluate before deciding on use of an updated p-score desktop categorization approach in Version 8.0?
2. Are there additional data points that stakeholders would like to share on non-certified products to support this decision making regarding categorization?

Mode Weightings

EPA has received partial mode weighting data from partners which may provide a foundation for revised mode weightings in Version 8.0. This data was provided in aggregate form from over 1.8 million desktop systems and 3.5 million notebook systems over a period of nearly two years (ending in 2017). The data includes products used in both residential and commercial settings and provides much better clarity on time products spend in off mode vs. on mode (sleep + long idle + short idle). Unfortunately, the current data do not distinguish clearly between the various on modes, although EPA is looking forward to receiving additional data in advance of Draft 1 that will do so.

The initial data received suggest that the mode weightings the ENERGY STAR computer specification references presently do not accurately reflect the way computers are currently used today. Figure 3 shows the proposed breakdown of sleep and off mode based on data received to date.

Power State	Desktops (Current)	Desktops (Proposed)	Notebooks (Current)	Notebooks (Proposed)
T_{Off}	45%	30%	25%	25%
T_{Sleep}	5%	30%	35%	45%
T_{long_Idle}	15%	40%	10%	30%
T_{short_Idle}	35%		30%	

In particular, the initial data results indicate that desktop computers spend about a third of their time in sleep and a third of their time in off mode. Notebook computers were found to spend roughly half of their time in sleep and about a third of their time in off mode. EPA would like to consider changes to the mode weightings as part of the Version 8.0 process and encourages any other stakeholders with data that supports or refutes these initial findings to provide it.

A priority of the ENERGY STAR Version 7.0/7.1 notebook requirements was increasing the adoption of highly functional power management settings, with the stated aim to improve the amount of people who maintained the power management settings. A key component of this strategy was allowing alternative low power modes, such as connected modern standby and comparable functions to obtain more beneficial mode weightings. Since the implementation of that strategy, EPA has learned new details about the use of power management by end-users and the ability of manufacturers to successfully implement connected modern standby and comparable functions. In particular, EPA has found that people are already increasing the amount of time the product remains in sleep or off mode, as indicated by the mode weighting discussion above. In addition, the Agency has seen data, which indicates that traditional power management is maintained at a much greater rate than previously believed. EPA is now assessing additional opportunities to increase or improve the service offered in low power mode through this specification revision.

1. Do additional stakeholders have large scale mode weighting data to help inform potential modified mode weightings for use in Version 8.0? If so, when can they be shared?
2. The existing mode weightings are based solely on enterprise systems, as this was the information available at the time, while the proposed weightings include residential usage as well. Is this an appropriate focus for ENERGY STAR, or should enterprise systems continue to be the focus?

3. During the development of Version 7.0, EPA received information that manufacturers were targeting connected Modern Standby as the key feature to reach the CEC standard levels for 2021. Is this no longer the case or what other options are being considered to reach these levels?
4. Data shared with EPA appears to indicate that power management is not turned off in the vast majority of systems, which is also supported with the mode weighting data shared above. Is there additional data that stakeholders have which would support or refute this conclusion?
    a. Additionally, the original data that EPA received, which indicated that power management was being turned off, focused on enterprise systems, while the current dataset is a mix of both. Is there any nuance that EPA should be aware of related to enterprise computers that would lead to a different conclusion in the adoption of power management?
5. Given the mode weighting data and the potential dramatic increase in power management adoption, is there a reason for EPA to consider continuing to incentivize features such as EMCA-393 full capability, connected Modern Standby, and other solutions with comparable functions? Or does a need remain to incentivize these features due to the increased functionality to ensure that there is no risk to power management being turned off in the future?

During the meeting with stakeholders in March, the National Resources Defense Council presented its work on developing a test method for active mode testing. EPA continues to monitor the progress of this initiative and welcomes any update on this process from stakeholders.

Internal Power Supplies

In January 2018, EPA held a stakeholder meeting to discuss interest in developing alternative requirements for internal power supplies, focusing on low-load power. EPA has maintained communication with the 80Plus program and has found that overall, power supply efficiency at lower load levels is consistently efficient. More specifically, the 80Plus program found that it is able to accurately measure data as low as the 5% loading point via its testing protocol. In addition, the analysis of the dataset, which includes testing on over 100 products, shows that there is good correlation between the 50% load efficiency and the 5% load efficiency. There was also a likely correlation between the 100% load correlation and the 5% load efficiency. For this reason, the Agency is not considering setting levels for the 5% load at this time. However, the Agency is interested in further data collected by the 80Plus program at the 5% load as part of its program.

As part of V7.1, EPA amended the internal power supply requirements for products at 500W or higher. For V8.0, EPA will take a second look at the requirements for power supplies less than 500W to consider the need to raise those requirements.

1. Do stakeholders agree with the assessment, based on 80Plus data, that the efficiency of the power supplies at 5% load is at an adequate level to not require specific criteria?
2. Is there any additional data that EPA should consider when determining if power supply efficiency has improved to the point that greater savings are possible for those products under 500W?
3. Is there any further data or comment on increasing the internal power supply requirements for products operating at less than 500W to 80Plus gold or equivalent to match the requirements at greater than 500W?

Resume Time from Sleep

As part of the Version 7.1 specification development effort, EPA was approached by stakeholders to reconsider the sleep definition, particularly the inclusion of a five second resume time. Stakeholders shared concerns that there was no test method element to accurately test this and therefore the definition

requirement was inconsistently applied. The U.S. Department of Energy has worked with stakeholders to develop a test method, which will be included in Draft 1. EPA has received data, which indicates that while five seconds is reasonable for notebooks, further consideration should be given to desktops and workstations, which may take additional time to resume.

1. Are there any additional data points that stakeholders would like to share to help inform EPA's assessment of resume time?

Scope

Since the release of the Version 7.1 specification, EPA has been made aware of new technologies that are being developed for the market, which require clarification of if and how these products fit within the ENERGY STAR program structure. These products include:

- Multi-Screen Notebooks
- Mobile Phone, which can convert to a Tablet

EPA proposes a new definition for Multi-Screen Notebooks, which will be used to bring these products under scope. The definition EPA proposes for these products, as a sub are:

- A computer that resembles a traditional notebook computer with a clam shell form factor, but has a second display that can be used a touch screen keyboard in place of a traditional mechanical keyboard. Multi-screen notebooks are considered notebooks in the remainder of this specification and are therefore not referenced explicitly.

EPA plans to exclude products, such as this, which are a mobile phone device, which can be converted into a tablet. As their primary function is a mobile phone device, the Agency does not believe that it is appropriate to consider these under the computers specification. EPA is interested in stakeholder feedback on how to define these products so the Agency can make clear the scope of this specification.

1. Are there any other products that manufacturers will be releasing that EPA should consider for inclusion under the Version 8.0 specification?
2. Does the definition for multi-screen notebooks capture the various iterations of these products that are expected to be released over the life of the Version 8.0 specification?

Treatment of Non-Traditional SSD Options

EPA is aware of an increasing number of non-traditional SSD storage device options that are being shipped in M.2 slot form factors. Currently, these products are not eligible for storage device adders in the computer specification. EPA welcomes energy and performance data on these devices so that we may consider whether it is appropriate to apply the current storage device adders to them, or whether a modified adder for them makes sense.

1. Are there any other forms of non-traditional based storage device that EPA should consider in Version 8.0? If so, is there data available to address them if appropriate?
2. Are there other M.2 devices that provide functionality different than a storage device that EPA should account for in Version 8.0? If so, what are they and is there data available to address them if appropriate?

Version 8.0 Revision Schedule

EPA sees value in giving stakeholders insight into the anticipated timeline for the Version 8.0 specification development early in our process. Following this discussion guide, EPA expects to release a draft 1 and 2 by the end of June 2019 with publication of a final specification in September 2019 that takes effect in July 2020.

1. Are there market issues that impact the anticipated timing of this development that warrant consideration, such as retail and corporate/government purchaser cycles?