

ENERGY STAR Computers Version 7 Discussion Document Comments				
Ref. #	Topic	Subtopic	Comment Summary	ENERGY STAR Response
1	Dataset		One stakeholder recommended that EPA obtain the most current data possible for computers products and conduct analysis that uses historical data to anticipate future energy use.	EPA is using all applicable data available from the certified product list for products certified from CY 2015 through present to inform level setting in the Version 7.0 specification. Given the very high market penetration rates of the products being addressed in Version 7.0, EPA feels this data is representative of the market as a whole.
2	Definition	Sleep Mode	One stakeholder recommended that EPA modify the existing definition of Sleep Mode to include alternatives to ACPI S3 sleep modes, which would then align with the California Energy Commission (CEC).	EPA believes the current sleep mode definition already allows for alternative sleep modes as written. ACPI S3 is referenced as the most common example of sleep mode, not the only allowable option to meet the sleep mode definition.
3	Duty Cycle and Mode Weightings		<p>Three stakeholders commented on the Duty Cycle and Mode Weightings in the current specification. One stakeholder noted the history of the current values and the availability of 2 new sources of information:</p> <ol style="list-style-type: none"> <li>1. The duty cycle meta study submitted by the California IOUs during the Version 6.0 specification development process.</li> <li>2. The 2014 UC Irvine study which found that office desktop computers are turned on as much as 77 percent of the time each day; and they are inactive 61 percent of that time.</li> </ol> <p>Another stakeholder recommended that current sources of information were not sufficient and that EPA should commission a study on modern duty cycles and mode weightings, but this would conflict with the current specification timeline. This stakeholder also suggested that IEC 62623 would potentially be useful for this development. Lastly, this stakeholder noted that a significant percentage of products are shipped with remote wake capability, and recommended EPA reduce the number of network mode weightings from 4 to 2 to harmonize with the CEC.</p> <p>The final stakeholder recommended that mode weightings can allow for some unintended behavior, such as a low TEC increase for computers that may use significant amounts of power in sleep mode when measured in a real world setting. They recommended that ENERGY STAR set a low power sleep mode requirement to avoid this potential issue. This stakeholder also recommended that although a computer may ship with a beneficial mode weighting, there is often no guarantee that it will be operated with this functionality in practice, thus ENERGY STAR should also require that this computer pass minimum levels in the conventional use profile.</p>	<p>Studies that have been presented to EPA thus far have been limited in scale and are therefore insufficient to warrant adjusting the mode weightings at this time. However, EPA remains interested in further studies as additional data points become available. EPA has solicited the help of multiple interested stakeholders and is hopeful that they will be able to lead an effort to determine if the current mode weightings are indeed in need of being updated, and if so what those new values should be. EPA is hopeful that progress on this effort can be made in the near term such that appropriate mode weightings can be applied to V8.</p>
4	Energy Reduction Strategy		Two stakeholders included analysis suggestions in their comments. One recommended that EPA should fine tune the boundaries of the p-score categories, revising base levels for these new groups. The other stakeholder recommended that additional consideration should be given for reducing the allowances for idle and light active modes, which would encourage low power active states and modern standby in future products	<p>EPA has revised the existing p-score categorization, adjusting the performance boundaries slightly and greatly simplifying the number of categories for notebooks. EPA noted that there was reduced separation in measuring energy between lower performance and higher performance products, which warranted the consolidation.</p> <p>EPA has also modified the Full Network Proxy definition and corresponding mode weighting in order to allow newer very low power network capable modes from taking advantage of the Full Capability Network Proxy mode weighting.</p>
5	Graphics Adders		One stakeholder commented on the graphics adders in the specification, recommending that EPA should ensure that the graphics categories are sufficient to cover the products in the market. Additionally, there may be a need for an alternate sleep state for discrete graphics, as the discrete GPU's memory needs should be accounted for.	EPA has maintained the existing adder format for discrete graphics adders for various graphics performance categories between G1 and G7, and has aligned the discrete graphics values in Table 8 to align with recently adopted CEC discrete graphics adders for notebooks.

Computers Version 7 Discussion Document Comment Summary

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6	Metrics	Best Approach, Harmonization	<p>Three stakeholders commented on the harmonization and best approaches for metrics in the Computers Version 7.0 specification. All three stakeholders recommended that using the p-score approach would result in less harmonization than using an expandability score based approach, due to the CEC regulations. One of the stakeholders recommended that EPA revise the performance metric in this specification instead of waiting for future revisions.</p> <p>Regarding best approaches, one stakeholder recommended that EPA consider existing and new regulatory measures in computers to ensure that the specification is sufficiently ambitious. The other stakeholder recommended that EPA should consider expandability based approaches along with other valid metrics options when drafting the specification.</p>	<p>EPA thanks stakeholders for their comments regarding p-score and expandability score. EPA intends to amend the criteria for desktops and integrated desktops as part of the Version 8.0 specification revision process. EPA may solicit feedback on certain elements of the Version 8.0 specification in subsequent drafts of the Version 7.0 revision to allow stakeholders additional comment. As part of those discussions, EPA will review the categorization system and engage on the most appropriate categorization system for these products.</p> <p>Version 7.0, as currently proposed, does not address desktop or integrated desktop computers. Therefore the CEC's expandability score categorization approach is not applicable to Version 7.0 as expandability is not meaningful in the differentiation of notebooks.</p>
7	Metrics, CEC Exp	Additional Adders	One stakeholder commented that the CEC Expandability score incorporated additional adders, and recommended that EPA add these adders to the Version 7.0 Specification if considering the expandability approach.	See comment #6 above.
8	Metrics, CEC Exp	Differentiation within a product group	Two stakeholders commented on the CEC Expandability Score regarding differentiation within a product group. Both stakeholders commented that they expected the CEC Expandability Metric to differentiate products to provide equivalent or superior results than the p-score approach.	See comment #6 above.
9	Metrics, CEC Exp	Implementability and Data	<p>Three stakeholders commented on the data availability for the CEC expandability score. One noted that aside from the current data, it would be unlikely that additional data would be able to be provided to EPA in the current specification revision timeframe. This stakeholder also commented that if EPA did adopt a p-score approach for the Version 7.0 specification, there would be a need to map ENERGY STAR categories to expandability categories for harmonized product certification for the two programs. This stakeholder also recommended that validation of the CEC Expandability approach occur as the regulation is final and active in the market.</p> <p>Another stakeholder commented that the expandability approach may have a higher level of accuracy long term, it requires a great deal more data, much of which is not available from the QPL during this specification revision.</p> <p>The final stakeholder commented that the QPL does not have the necessary data available for the current specification revision for an expandability approach, and this could lead to EPA setting levels that were inconsistent with the market based on the limited available dataset.</p>	See comment #6 above.
10	Metrics, CEC Exp	Scope	One stakeholder commented that the current CEC Expandability approach is tested and validated for desktops and all-in-one Computers, but the notebooks product segment was not examined in the same detail, due to lower anticipated energy savings. This stakeholder recommends that high-end notebooks could behave similarly to desktops, but the remaining notebooks would require more investigation to determine recommended levels.	Due to its continued relevancy in the notebook space, and a lack of alternative options, EPA has determined to maintain p-score for those products in Version 7.0. EPA has amended the base allowances and the adders, harmonizing where appropriate with the CEC adders, as part of the Version 7.0 revision.

Computers Version 7 Discussion Document Comment Summary

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11	Metrics, CEC Exp	Power Supply	<p>Four stakeholders commented on the power supply aspect of the CEC Expandability Metric. One stakeholder noted that the high expandability categories would be unlikely to be gamed as there are several requirements and a significant incremental cost to reach the higher expandability levels.</p> <p>The next stakeholder commented that the higher the expandability of the computer, the larger the power supply would have to be in order to meet the maximum power needs of this computer. This has the side effect of placing the idle and active states of this computer at lower load points on the power supply.</p> <p>An additional stakeholder commented that they did not believe that the PSU allowances in the CEC Expandability metric were accurate, resulting in inappropriate allowances assigned to products.</p> <p>The final stakeholder commented on the potential for a manufacturer to choose an oversized power supply in order to reach a higher expandability score. This stakeholder proposed using a new expandability score approach which mitigates this issue, referred to as the Simplified Expandability Score.</p>	See comment #6 above.
12	Metrics, CEC Exp	Additional Considerations	<p>Multiple stakeholders submitted additional comments on the CEC Expandability Approach:</p> <p>One stakeholder noted that the expandability score captures the idle power draw requirements of a computer well, since it focuses on the power supply and motherboard expansion interfaces. This stakeholder also noted that the motherboard expansion interfaces will still draw some level of standby power, even when power managed.</p> <p>Another stakeholder commented that the CEC Expandability metric was designed to incorporate the power needs of specific ports, by associating each port type with a given expandability score.</p> <p>The final stakeholder expressed some concerns with ambiguity in the CEC Expandability score approach, in terms of which scores may be applied to products. This stakeholder recommended that regardless of which metric approach is chosen in the Version 7.0 specification, EPA should add reporting requirements for product ports, to allow a later conversion to expandability based approaches if appropriate. This stakeholder also noted that a software based approach may be useful for working with the large amount of product technical data needed for a complex expandability based metric.</p>	See comment #6 above.
13	Metrics, P-Score	Additional Considerations	<p>One stakeholder provided detailed considerations on the use of the p-score, including the following:</p> <p>The p-score is sensitive to chipset architecture, for example mobility versus desktop may have different power profiles throughout the range of p-scores. CEC calculations did not verify the differentiation within product groups provided by p-score on 2015 QPL data. Form factor considerations may be significant, such as large core vs small core, products with a mix of core sizes; the p-score may favor one configuration over the others.</p>	EPA agrees with this assessment and uses product types to differentiate along form factors as well as other functionalities to ensure that p-score does not create unfair comparison.
14	Metrics, P-Score	Longevity for Efficiency Requirements	Two stakeholders commented on the lifetime of requirements based on p-score. One stakeholder noted that products and corresponding p-score evolve rapidly, leading to later generation products in a specification moving toward the higher p-score requirement categories. The other stakeholder noted that p-score continues to be less correlated with computer energy performance, and this trend is increasing.	After investigating the current data set, EPA has found sufficient differentiation still exists in the notebooks category to continue using an updated version of the p-score categorization for Version 7.0.

Computers Version 7 Discussion Document Comment Summary

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15	Metrics, P-Score	Performance vs Energy Use	<p>Three stakeholders commented on p-score in regard to the energy performance of a computer versus the p-score of that computer. All three stakeholders noted that the correlation between energy use and p-score is becoming less relevant in modern processor technology, which can power scale effectively. Two of these stakeholders noted that p-score is especially less relevant in idle mode power requirements, which is often driven by expandability, power supply size, and motherboard expandability.</p>	See comment #14 above.
16	Metrics, Simplified Expandability Score		<p>One stakeholder described a modified metric based on the original CEC Expandability Score:</p> <p>Simplified expandability score (SES) = (nPCIe lanes) + 2 x (nHigh-speed data ports).</p> <p>This stakeholder noted that this version of the expandability score avoids the potential issue of a manufacturer choosing an oversized power supply to gain additional TEC allowance. This stakeholder also noted that among the potential items to choose for this expandability score, it was determined that the number of PCIe lanes and high speed data ports were the most closely correlated with power requirements.</p>	See comment #6 above.
17	Power Management		<p>Three stakeholders commented on Power Management:</p> <p>One stakeholder commented that their member companies ship computers with power management enabled by default, and there is no strong evidence that overall, power management is disabled by end users. This stakeholder noted that in the enterprise context, power management is often driven by IT requirements and policy, however, these IT policies do not necessarily reduce power management settings, and in some circumstances, set even more stringent power requirements.</p> <p>The next stakeholder noted that the effective use of power management uses approximately 1/3 of the energy of a computer with power management disabled. They recommended that EPA refine approaches in the specification to ensure that power management remains enabled at end user sites. This stakeholder noted that there are several reasons why power management would be disabled, including IT policy and user preferences, poor interaction between power management and applications, long wake times, issues waking from sleep states, programs that disable power management without properly re-activating it once closed, and operating system issues that prevent computers from entering sleep states even when power management is enabled. Due to the number and variety of these issues, this stakeholder recommended that EPA facilitate a research project with industry and stakeholders to determine root causes and potential solutions.</p> <p>The final stakeholder noted that it has been brought to their attention that end users are disabling power management strategies on their computers, so this stakeholder recommended that EPA implement requirements on ensuring the continued effectiveness of power management on certified computers. One potential suggestion was to include a power management issue reporting requirement, where manufacturers would provide a list of software vendors whose products do not operate well with power management, which is then published by ENERGY STAR. This would provide an incentive for these software vendors to improve their power management compatibility.</p>	<p>EPA is still considering ways to improve desired end-user behavior towards power management, and welcomes stakeholder feedback on the most effective methods of outreach that may lead to better use of power management, particularly in enterprise settings.</p> <p>In Draft 1, EPA is encouraging the adoption of new low power network capable modes that may effectively take the place of not only long idle, but also traditional sleep. These modes are intended to use less energy while delivering an end-user experience similar to what they currently experience in long idle which consumes considerably more energy.</p>

Computers Version 7 Discussion Document Comment Summary

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18	Power Supply	Efficiency at Low Load Points	<p>Three stakeholders commented that EPA should include Power Supply efficiency requirements at low load points, since this area is not covered by current standards such as 80 Plus, and computers spend a majority of their time in at these loads.</p> <p>One stakeholder referenced EPRI research, and noted that up to 50% of power can be lost at these load points in the PSU. This stakeholder noted that efficiency improvements in current technology could be implemented in products with an incremental cost of less than 1 dollar, and can improve efficiency to 64%. This stakeholder also suggested that there would be a great benefit to identifying the load point typical products maintain in idle, and setting requirements to this load region; reporting requirements at this load point would also be helpful for future specification revisions.</p> <p>Another stakeholder noted that the range of efficiencies of products at these low load points can vary widely, indicating a strong need to set requirements for these areas to improve product performance. This stakeholder also recommended that the previously offered incentive for 80Plus Gold/Silver with 10% load efficiency should be made mandatory. This stakeholder also suggested that EPA should work with the 80PLUS program and stakeholders to define new low load point requirements.</p> <p>A final stakeholder recommended that EPA create stricter requirements for Internal Power Supplies (IPS), especially at low load points.</p>	<p>EPA has engaged in discussions with 80Plus regarding the behavior of power supplies at very low load levels, the potential lost energy when operating at these low load levels compared to a products overall energy usage, and what information 80Plus currently collects regarding these very low load levels. During these discussions, concerns also came to light regarding the challenge of testing these very low load levels as errors in measurement equipment can start to become problematic at these load levels.</p> <p>In Draft 1, Version 7.0, there are no requirements for testing at low load levels. Should 80Plus along with other stakeholders confirm the benefit of requirements at low load points and resolve testing challenges, EPA is open to add low load requirements in a future draft.</p>
19	Scope	High End Desktops	One stakeholder commented on high end desktops, recommending that this category should be defined based on high expandability, and be kept out of scope for Version 7.0	See comment #6 above.
20	Scope	Interactive Displays	One stakeholder commented on interactive displays, recommending that these products be kept out of scope due to their low sales volume, few number of products on the current market, and low overall energy footprint. This stakeholder listed the Interactive Displays currently on the market, and described the wide variation in capabilities and design. This stakeholder also noted that the early nature of the category could have innovation reduced if an ENERGY STAR specification was applied to this category at this point in time.	Interactive displays are in scope of the current ENERGY STAR displays specification and will continue to be addressed in that specification.
21	Scope	Small Scale Servers	Two stakeholders commented on small scale servers, both recommending the removal of this category from scope, due to the loss of sales and relevance to the category in the current computer market.	EPA has removed small scale servers from scope in the Draft 1 specification.
22	Scope	Tablets and Slate	One stakeholder commented on slates/tablets, recommending that they should be removed from scope. This stakeholder noted that slates/tablets are already very efficient devices, since their design is driven by battery life and typically only connected to AC power for battery charging. This stakeholder recommended that this product category could be addressed by separate requirements and regulations governing external power supplies and battery charger systems.	EPA intends to continue to include slates/tablets in the scope of Version 7.0, due to the large demand for their purchase in federal procurement.
23	Scope	Workstations	Two stakeholders commented on Workstations. One stakeholder recommended that EPA align with the new CEC Workstation definition. The other stakeholder recommended that EPA should not align with the CEC Workstation definition, and should maintain the existing Version 6.1 Workstation definition.	After reviewing the latest CEC workstation definition, EPA does not feel this definition adequately separates high end desktops from workstations for ENERGY STAR purposes. Therefore, EPA is proposing to maintain the existing workstation definition, but welcomes stakeholder feedback on any specific tweaks that may be necessary to address newer products and technologies on the market since the completion of Version 6.0.
24	Scope	Zero Clients and Ultra-thin Clients	One stakeholder commented that Zero Clients and Ultrathin Clients should be treated as 1 product type, and should remain out of scope for Version 7.0	EPA is proposing to continue excluding ultra-thin clients/zero clients from scope in Version 7.0.

Computers Version 7 Discussion Document Comment Summary

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25	Test Procedure, Display	Display Brightness	<p>Three stakeholders commented on the Computers Test Procedure regarding Display Brightness. One stakeholder commented that the ENERGY STAR test method, which tests at calibrated brightness settings, can have considerable difference than the brightness of integrated displays at shipping and in use. This stakeholder recommended that the test procedure should test these displays at manufacturer recommend brightness, and should be greater than or equal to 65% of max brightness of the display. This stakeholder also recommended requiring a warning to be shown to end users, that increasing display brightness leads to higher energy consumption.</p> <p>The next stakeholder commented that the current test method does not encourage manufacturers to optimize their display brightness on shipment. This stakeholder recommended that if a display is at least 90 cd/m2 for notebooks or 150 cd/m2 for integrated desktops, test as shipped, otherwise increase the display brightness to 90 cd/m2 for notebooks or 150 cd/m2 and test at that setting. If the product can not reach that brightness level, test at max brightness.</p> <p>The final stakeholder recommended that the test procedure should be modified to test as shipped, with a minimum level defined to prevent manufacturers from shipping with low brightness as an test method energy incentive. This stakeholder noted in recent internal testing that all-in-one display brightness was found to be responsible for 40-50% of system idle demand in the products tested.</p>	<p>The current ENERGY STAR test method display brightness values have been adopted from IEC 62623. DOE believes that while the display settings may be relatively dim, there is not enough readily available data to support changing the display brightness settings to an alternative value. Additionally, because of the ease of access of the brightness setting on a computer, focusing on how the computer is shipped may not be representative of usage in the field. Therefore, the display settings have been maintained in Draft 1, Version 7.0.</p>
26	Test Procedure, Display	Testing with ABC	<p>Two Stakeholders commented on the Display Test Method regarding Automatic Brightness Control (ABC). One recommended that all tests should be conducted with ABC disabled unless significant data is found that documents the real world energy savings of this feature. The other stakeholder recommended that the test procedure should redesigned to account for ABC, since calibrating the display at a standardized brightness misses the energy savings of a computer which ships with ABC enabled, and also fails to penalize a display that is shipped at max brightness. This stakeholder recommended that the test should be performed with ABC enabled and realistic (specified) interior lighting conditions.</p>	<p>DOE may consider changes to the ABC setting during V8.0 development, but does not currently have enough data to determine whether having ABC settings enabled during test is appropriate to ensure comparable and repeatable results.</p>
27	Test Procedure, Power	Hard Drives	<p>One stakeholder suggested that EPA and DOE modify the computers test method to add the requirement that "settings regarding hard-disk spinning shall not be altered from the default as-shipped settings", which would provide an incentive for manufacturers to apply more responsive power management strategies to hard disks.</p>	<p>The current language in the test method was crafted in order to provide repeatable and representative results. Because many of these features could be disabled by the user, overly aggressive settings for "shipped" settings may encourage the user to disable it together. For example, short idle is designed to capture cases where the user is taking short breaks while reading emails or web pages. However, if the primary HDD were to spin down in short idle, it could significantly affect the responsiveness of the computer when the user resumes tasks, and the user would disable spinning down the HDD in actual use.</p>
28	Test Procedure, Power	Heavy Active Proposed Definition	<p>One stakeholder recommended that EPA add the following power state to the specification, Heavy Active, which would be defined as: "Gaming, digital content editing, and other computing activities that consume a significant share of the computer's processing resources.</p>	<p>DOE thanks the stakeholder for this comment, but has not seen enough data to determine what percentage of the mode weighting would be appropriate. In addition, DOE is not aware of what combination of tasks would make up heavy active and if these tasks would provide additional value above what is currently collected.</p>
29	Test Procedure, Power	Modern Standby	<p>Three stakeholders recommended that EPA include Modern Standby in the Computers Version 7.0 Specification. One stakeholder noted that modern standby in the current market has varying implementations and may suffer from differences in wake times and reliability, so should be examined carefully while incorporating into the specification. Another stakeholder commented that modern standby, including the "sleeping between keystrokes" version of low power light active can present issues to test, as these states may test at extremely low power, creating unrepresentative TEC estimates.</p>	<p>DOE and EPA are aware of the testing challenges of features such as Microsoft's Modern Standby and Apple's Power Nap and has begun engaging with stakeholders on the potential to test for these features. The ENERGY STAR program does not currently require testing of these modes as part of Version 7.0, but looks forward to discussing potential testing options to ensure that these features are engaging as intended and saving energy.</p>

Computers Version 7 Discussion Document Comment Summary

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30	Test Procedure, Power		<p>One stakeholder provided detailed information on defining and testing Real World Idle and Light Active states in computers:</p> <p>Definitions: Light Active: users are actively interacting with their computer, performing tasks which require little additional processing beyond real-world idle, such as reading information, navigating web pages, writing content, and even streaming media content. Real-world Idle: The user is not actively interacting with the computer (e.g. away from desk). Typically, the computer will have multiple applications loaded and windows open, e.g. multiple browser tabs, email, office productivity software, which interact with the network and hard disk without direct user input.</p> <p>This stakeholder noted that in their own testing experience current ENERGY STAR power modes Long and Short Idle are not representative of typical computer use, and when measured experimentally on computers, power states were seen with 2.5 times the short idle power. This stakeholder recommended that Real World Idle and Light Active modes could be tested via a web browser with set content lists, ensuring repeatability and platform independence.</p> <p>Three stakeholders recommended that EPA include reporting requirements for Real World Idle and Light Active states, to inform future energy requirements (TEC levels) in a later specification revision. One stakeholder noted that these states could provide useful information on efficiency levels at low load points, since real world idle would fall in this range. Another stakeholder recommended that a Light Active mode is an important source of energy consumption in computers, thus needs to be quantified and incorporated into power requirements when appropriate. This stakeholder also notes that there are test procedures in development that would address this power state, but they would be completed near the finalization date of Computers Version 7.0.</p>	<p>DOE and EPA thank the stakeholder for the definitions of these terms. DOE and EPA are aware of the effort to develop a test method for real world idle and light active and looks forward to learning more about this effort as it further develops. At this time, DOE has maintained the settings that are in the current ENERGY STAR test method.</p> <p>DOE and EPA would like to see additional information on the test method and its impact on energy consumption in computers before determining the value of collecting this information via the ENERGY STAR stakeholder process. As noted previously, EPA is sensitive to the amount of information that is currently collected via the QPX form.</p>
31	Timeline		<p>One stakeholder commented on the Computers Version 7.0 timeline, expressing concerns that the Q3 2017 goal is too aggressive, and would prevent typical specification revision activities such as collecting relevant data from stakeholders regarding proposed changes. This stakeholder also noted that this timeline would result in implementation ahead of CEC regulations, which could negatively impact the performance of expandability based approaches.</p>	<p>EPA intends to maintain the current timeline for Version 7.0 development as it is targeted primarily at notebooks which have a market penetration greater than 95%. Version 8.0, targeted to begin development in 2018, will address the more complex topic of desktop and integrated desktop levels, including the potential for a new categorization system for those products.</p>