NRDC

NATURAL RESOURCES DEFENSE COUNCIL

August 4, 2017

Mr. Ryan Fogle
United States Environmental Protection Agency
ENERGY STAR Program
1200 Pennsylvania Ave NW
Washington, DC 20460

Subject: NRDC Comments on ENERGY STAR Computers Version 7.0 Draft 1 Specification

Dear Mr. Fogle,

On behalf of the Natural Resources Defense Council (NRDC), and our more than 1.3 million members and online activists, we respectfully submit the following comments in regards to the ENERGY STAR Computer Program Discussion Guide Version 7.0, January 27, 2017.

NRDC has been an active participant in the development of ENERGY STAR specifications for computers for over a decade. Computers are the second largest electricity end-use among electronic devices after televisions, putting them roughly on par with the energy use of all data centers in the United States. Large and cost-effective energy saving opportunities remain, particularly in desktops but also in notebooks as demonstrated in NRDC's 2016 study "Slashing Energy Use in Computers and Monitors While Protecting Our Wallets, Health, and Planet".[1] As such, energy efficiency in computers is an important opportunity to save American consumers and businesses money on their utility bills, make America's economy more competitive, support job growth, all while reducing greenhouse gas emissions.

NRDC strongly supports EPA's initiative to revise the ENERGY STAR specification for computers -- Computer technology has evolved considerably since the version 6 specification was finalized in 2013 based on a data set covering products launched between 2010 and 2012, leading to a large share of the market achieving ENERGY STAR levels in 2017: 95 percent market penetration for notebooks, and 40 percent market penetration for desktops per EPA. In addition, the California Energy Commission's (CEC) recently adopting mandatory efficiency standards are more stringent than ENERGY STAR version 6.1, which will make the specification obsolete by the time California's standards go into effect on January 1, 2019.

[1] Delforge P., July 2016, https://www.nrdc.org/resources/slashing-energy-use-computers-and-monitors-while-protecting-our-wallets-health-and-planet

We appreciate the opportunity to provide input into the ENERGY STAR process and offer the following comments:

Summary

1. Scope - NRDC supports EPA's approach to split updates to the specification across two versions, and we urge EPA to start development work on version 8 right away and in parallel with version 7, and aim to release version 8 including a revised specification for desktops as soon as possible after version 7.

2. Notebooks – We generally support ENERGY STAR's approach on notebooks, but urge EPA to set levels at 10 to 15% pass-rate against the dataset in order to achieve 25% pass-rate at effective date. We are also concerned that the proposed memory adder structure and levels, combined with the requirement to report only the highest energy configuration per representative model for product families, does not provide a representative picture of the energy use and compliance margin of typical products. We propose different memory adders and reporting requirements to address this issue.

3. Desktop Internal Power Supplies – We strongly support EPA's proposal to revised the internal power supply efficiency requirement and incentive, and encourage EPA to add a low-load test point for mandatory reporting in version 7, as well as power factor requirements at all load points.

4. Display brightness – We urge EPA to update the test procedure to test notebooks and all-in-one desktop computers with brightness settings as shipped, with a minimum brightness level to avoid an incentive to ship with very low brightness just to qualify for ENERGY STAR.

Detailed Comments

1. Scope - NRDC supports EPA's approach to revise requirements for notebooks, slates and tablets, thin clients, and internal power supplies, and to encourage adoption of very low power network capable modes as quickly as possible in version 7, and to move the revision of the desktop specification into version 8. However, we urge EPA to start development work on version 8 right away and in parallel with version 7, and aim to release version 8 including a revised specification for desktops as soon as possible after version 7.

Desktops are still responsible for the majority of computer energy use. While we support collecting the data and performing the analysis necessary to revise the categorization and adder framework for desktops and to update the test method to better represent real-world energy use, the desktop specification is going to become rapidly obsolete when the California tier 1 standards go into effect on January 1, 2019. It is therefore important to update the specification for desktops as soon as possible for ENERGY STAR to remain meaningful for desktop purchasers and to continue to provide an incentive for manufacturers to invest in energy efficiency innovation and to market more energy efficient desktop products.

The market penetration of ENERGY STAR desktop computers may be much higher than 40 percent, increasing the urgency of revising the desktop specification – ENERGY STAR's 2015 Unit Shipment Data report estimates market penetration of ENERGY STAR desktops at 39 percent.[2] We believe this is not representative of the energy efficiency capabilities of 2017 desktops for two main reasons: 1) This data is nearly 2 years old, and computer technology evolves very rapidly, with new generations of processors, memory, graphics and other technologies being released every year; 2) A major reason for this relatively low rate is that in order to minimize costs, manufacturers equip many products with non-qualifying internal power supplies, particularly those marketed to market segments that are less sensitive to ENERGY STAR labeling. This hides the reality that many of these computers would easily achieve the ENERGY STAR energy requirements if they used a complying power supply. While no comprehensive data is available on the penetration rate relative specifically to typical energy consumption (TEC) criteria, anecdotal evidence suggests that the vast majority of the desktop market already achieves ENERGY STAR v6.1 levels.

NRDC and its consultant Xergy Consulting are working on a desktop expandability dataset which we look forward to sharing with the ENERGY STAR team and other stakeholders in the coming weeks – This dataset is intended to support energy efficiency activities around desktop computers, and could support the start of the specification development process for desktops as soon as available. While the scope of this dataset is limited due to budget constraints, it already covers product families representing a quarter of recent (since 2015) systems in the qualified product list (QPL), and can easily be expanded using the same methodology to increase coverage or include additional product attributes. We encourage EPA to consider this dataset in its planning for desktops.

Version 8 should also address the major and growing issue of the representativeness of the test method - The test method needs to be revised to better represent real-world energy use and incentivize energy efficiency improvements that yield the most energy savings for computer users. Per NRDC's February 24, 2017 comments on the version 7 discussion guide, the v6 test method is becoming increasingly non-representative of real-world energy use. This is because the short and long idle states as defined by ENERGY STAR are no longer adequate proxies for real-world idle and active state energy use of modern computers. This gap will likely worsen dramatically as computers adopt modern standby capabilities, since ENERGY STAR idle testing may report sub-2 watts modern standby power levels instead of levels closer to typical active levels such as 15 to 30 watts or higher.

NRDC is collaborating with the Canadian Standards Association (CSA) and other partners to develop a new real-world idle and low-intensity active energy use benchmark to add to the current test method. We urge EPA to include this effort in its development process, with the goal of adopting this new active mode for testing and reporting-only purposes in version 8, thereby allowing for data collection while v8 is in effect, and potential level setting in version 9. Given that the objective of this new mode is testing and reporting only, not to set limits in version 8, it does not need to be fully developed by the beginning of the version 8 process, but

[2] ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2015 Summary , https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2015_USD_Summary_Report.pdf?db47-84aa

the v8 process is an important opportunity to gather stakeholder input and feedback, in complement to the CSA process.

2. Notebooks – We generally support ENERGY STAR's approach on notebooks, but urge EPA to set levels to achieve 25% pass-rate at effective date. We are also concerned that the proposed memory adder structure and levels, combined with the requirement to report only the highest energy configuration per representative model for product families, does not provide a representative picture of the energy use and compliance margin of typical products. We propose different memory adders and reporting requirements to address this issue.

We support ENERGY STAR's proposal to condense and simplify notebook categories into 3 categories, align graphics and display adders with CEC's, and revise base allowances to achieve 25 percent market penetration at effective date.

However, we've seen in version 6 and earlier versions of the specification that products, especially, notebooks, have been able to rapidly adjust to meet the requirements and have achieved penetration rates in the high nineties. Technology improvements are not slowing down (for example with the implementation of modern standby), it is therefore reasonable to expect that this trend will continue and that the actual penetration rate will be much higher than that calculated against the dataset when version 7 goes into effect late 2018. As such, we urge EPA to design the specification such that 10 to 15% of the current QPL could meet it at time of specification publication, with anticipation that the product list would grow to ~25% by the effective date. This will provide better assurance to purchasers at effective date and over the life of the specification that ENERGY STAR-labelled products are among the most efficient on the market.

Memory adder structure and levels: We are also concerned about the structure and levels of memory adders: V7 draft 1 proposes 0.4 kWh/GB. The problem is that the power draw of computer memory is more highly correlated with the number of modules (DIMMs for desktops and SODIMMs for notebooks) than with memory capacity. The California IOUs submitted test data and comments on this issue, proposing the following memory adder structure and allowances for desktops:[3]

[3] California Investor Owned Utilities Comments: Computers - Response to Final Staff Report, May 23, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/14-AAER-02/TN211614_20160523T163525_California_Investor_Owned_Utilities_Comments_California_Investo.pdf

Table 7: Graduated Memory Adder Approach

Number of installed DIMMs	Desktop Adder (kWh/yr)
First and second installed DIMMs	2.5 kWh/yr per DIMM
Third and fourth installed DIMMs	1.25 kWh/yr per DIMM
Beyond fourth DIMM	No additional allowance

The difference isn't major for small amounts of memory such as up to 8 GB, but it becomes significant for 16 GB and 32 GB because EPA's proposed adder scales linearly.

This issue is compounded by the fact that ENERGY STAR requires testing and reporting only the product configuration that represents the worst-case power consumption for each product family. This is likely to be products with the maximum amount of memory, which are getting outsized memory adders.

In fact, an analysis of major online retailers by Xergy Consulting clearly shows the discrepancy between the QPL and the market: more than three quarters of configurations offered for sale in July 2017 have 8GB memory or less (Figure 1), whereas these only represent one third of 2016-2017 configurations in the QPL (Figure 2).

Figure 1 – Distribution of memory configurations of products offered for sale, July 2017

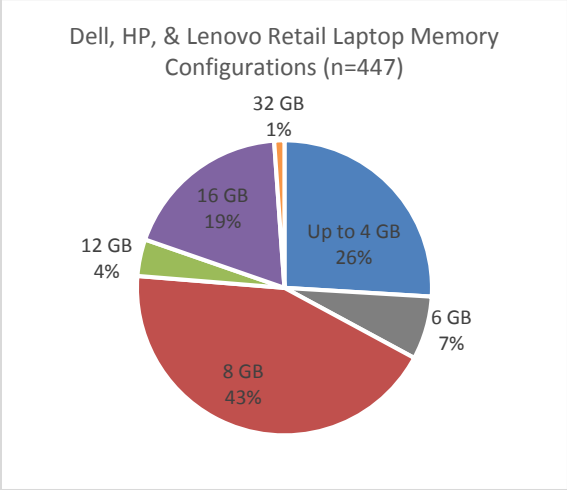
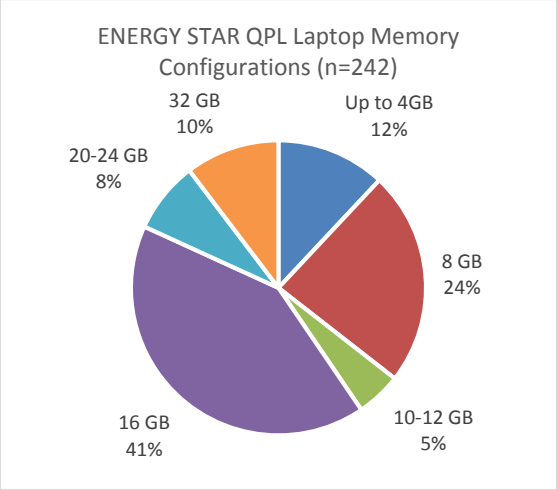


Figure 2 – Distribution of memory configurations in ENERGY STAR QPL (2016-2017)



While this may not be a certification issue because EPA makes it clear that "manufacturers continue to be held accountable for any efficiency claims made about their products, including those not tested or for which data were not reported", the QPL provides a skewed picture of the energy use and compliance margin of typical products, which does not facilitate a data-driven approach to setting base allowances and adders.

We suggest a 2-prong solution to this issue:

1) Revise the memory adder structure and levels to better represent actual energy use by higher memory configuration, either by setting levels by DIMM as proposed by the CA IOUs, or if sticking to a capacity-driven adder, using **0.4 kWh/GB up to 8GB, and 0.15 kWh/GB above 8GB** in line with CEC's adder; And

2) **Adopt a 2-configuration testing and reporting requirement**, like the 4-configuration requirement for servers: for computers, this could be most typical model and worst-case power model. This should apply to both desktops and laptops and would improve the quality of the dataset for market analysis and future spec revisions, and would also provide greater transparency by ensuring that the most commonly-sold models are represented in the QPL.

QPL (or QPX) structure: To avoid the issue with the servers QPX where the 5 product families are implemented by duplicating a large number of columns, making the QPL unwieldy and difficult to analyze, we further recommend that the 2-configuration approach for computers be implemented by simply adding a single column that specifies if the entry is a Typical or Worst-Case model. This will allow easy analysis through filters and pivot tables.

3. Desktop Internal Power Supplies – We strongly support EPA's proposal to revised the internal power supply efficiency requirement and incentive, and encourage EPA to add a low-load test point for mandatory reporting in version 7, as well as power factor requirements at all load points.

Computer internal power supplies (IPS) are not regulated like external power supplies, and generally lag in efficiency relative to server power supplies. However, they remain one of the components that uses the most energy in a desktop computer, sometimes more than half of the entire computer's energy use, as non-80 PLUS IPS can have efficiencies lower than 50% in short-idle mode, meaning more than half of the computer's energy use comes from the IPS. 80-PLUS and EPA's inclusion of IPS efficiency requirements in ENERGY STAR are critical drivers of efficiency improvements in IPS.

We strongly support EPA's proposal to require 80-PLUS Gold efficiency level in ENERGY STAR v7, and to provide an incentive at Platinum and Titanium efficiency levels to encourage efficiency leadership. 80-PLUS data shows that there is now a large number of Gold and higher efficiency IPS available in the market.

However, 80-PLUS Gold only sets requirements at 20%, 50% and 100% load. This is useful but does not represent the most typical operating load point of computers when idle or performing low-intensity work such as office productivity, web browsing, social media, video and audio streaming, which are the vast majority of computer usage. Modern desktop computers typically operate between 1 percent and 5 percent IPS load for these tasks, far below the 20 percent 80-PLUS test point. And computer technology is evolving toward greater power scalability, meaning that computers are increasingly operating, and using the most energy, at lower load points. It is therefore important to align IPS efficiency requirements with real-world loads to ensure manufacturer investments in IPS efficiency yield the most energy savings.

We encourage EPA to take the following steps to address this issue:

1. Seek input from stakeholders to determine the most applicable low-load test point (e.g. a certain percentage such as 5%, or a fixed load point of say 15 watts…), based on the test data that the 80-PLUS team already collected for the CEC computer rulemaking in 2016, and is currently further developing.

2. Include a "test and list" requirement for this low-load test point in version 7

3. Consider adding an efficiency requirement for this low-load test point in a future specification.

Power factor: In addition, we urge EPA to extend power factor requirements to the 20% and 50% load points, to prevent manufacturers from disabling power factor below 100% load in order as an easy strategy to achieve efficiency levels. Most computers rarely if even operate at 100% load, so this test point is not reflective of real-world energy use. It is important that power factor correction is enabled at real-world load points. It may not need to be 0.9: 0.8 would be sufficient, the key is to avoid power factors of 0.5 or lower, which are commonly found in IPS today. While the impact of low power factor is less at lower load points, distortion power factor issues from switch mode power supplies are additive, and the aggregate impact of poor power factor across all electronic loads in a building adds up to significant total impact on individual buildings and on the grid. As electronic devices including LED light bulbs and IoT devices proliferate, ENERGY STAR has a key role to play in extending power factor requirements to lower load points to address this growing issue.

4. Display brightness – We urge EPA to update the test procedure to test notebooks and all-in-one desktop computers with brightness settings as shipped, with a minimum brightness level to avoid an incentive to ship with very low brightness just to qualify for ENERGY STAR.

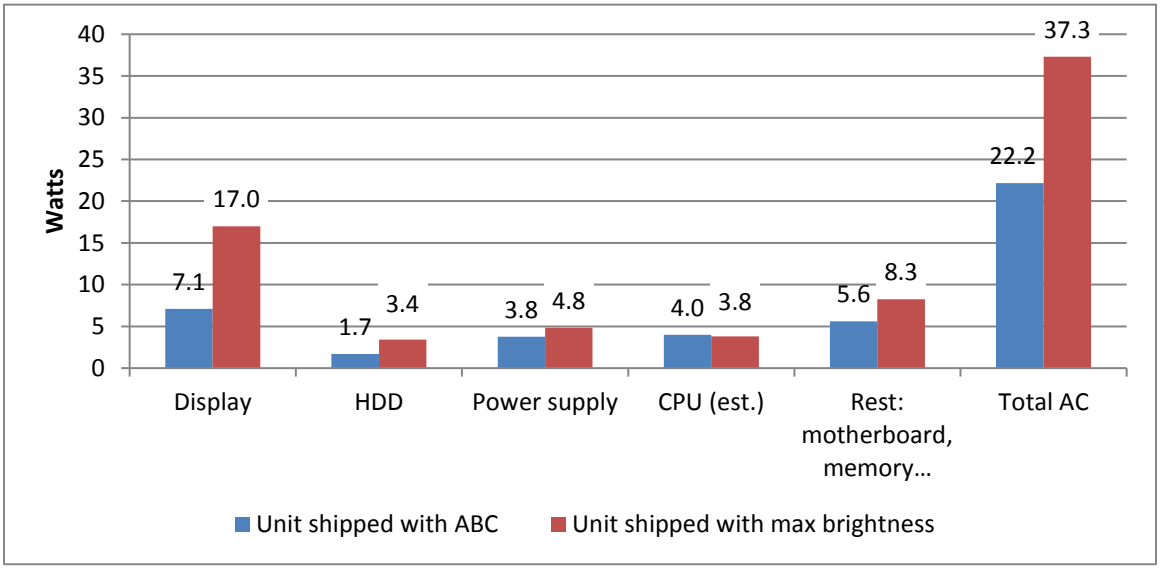
As indicated in our February comments, the v6 test procedure requires that the displays of all-in-one and notebook computers be calibrated to a fixed brightness prior to testing. The problem is that display brightness has a large impact on power use, and if the brightness setting is not changed by the user, shipping with maximum brightness may result in a much higher energy use as experienced by the user than as measured by ENERGY STAR.

As part of the CEC rulemaking, NRDC and Aggios tested two all-in-one computers with comparable specifications (21.5-inch displays with same resolution and both using IPS technology, and similar computing performance).[4] Both displays were responsible for a large share of system idle power demand (40 and 50 percent). However, one display was shipped with auto-brightness control (ABC) enabled, while the other was shipped with maximum brightness settings. The latter drew 2.4x the power of the former and was responsible for the majority of the difference in short idle power demand between the two computers as shown in Figure 3.

[4] http://docketpublic.energy.ca.gov/PublicDocuments/14-AAER-02/TN211601_20160523T103613_Pierre_Delforge_Comments_AggiosNRDC_AllInOne_Computer_Idle_Powe.pdf

This difference was not captured by the test procedure because both computers were recalibrated and tested at the same brightness. Not only is this not representative of real-world energy use, but it also fails to reward units shipped with ABC enabled and to penalize units shipped with max brightness.

Figure 3 – Impact of Display Brightness on System Idle Power Demand



Recommendation regarding display brightness: One approach would be to test as shipped, with a minimum brightness level to avoid an incentive to ship with very low brightness just to qualify for ENERGY STAR.

If ABC is enabled as shipped, and is sufficiently persistent (does not get disabled through unrelated settings changes, per the TV test procedure), it should remain enabled and be tested in realistic lighting conditions to be defined.

Thank you for the opportunity to participate in this specification development process and for your consideration of our comments.

Sincerely,

Pierre Delforge
Director, High Tech Sector Energy Efficiency
Natural Resources Defense Council