January 18, 2013

Mr. Robert Meyers
United States Environmental Protection Agency
Office of Air and Radiation
1200 Pennsylvania Ave NW
Washington, DC 20460

Subject: Comments regarding Version 6.0 Draft 3 Computer Specification

Dear Mr. Meyers,

The Natural Resources Defense Council (NRDC) respectfully submits the following comments in regards to the ENERGY STAR Version 6.0 Draft 3 Computer Specification issued November 29, 2012 and addendum dated January 3, 2013.

Desktop and notebook computers represent one of the largest electricity electronic end uses. They consume over 70 TWh annually in the U.S., the equivalent output of 25 medium-size 500 MW coal-fired power plants. This represents approximately 2% of US electricity use, and is equivalent to all data centers and server rooms in the country. In context of continued growth of the computer market in the US and globally, capturing energy saving opportunities in computers is critical to reducing air and climate pollutants from power generation.

Summary

EPA's version 6.0 draft 3 proposes a much improved computer specification framework over version 5, including a simplified and updated categorization system, the inclusion of display energy for computers with integrated displays, more granular graphics adders, an updated duty cycle, and incentives for graphics switching and premium efficiency power supplies. NRDC strongly supports these improvements which potentially enable a more effective ENERGY STAR program for computers.

However we are concerned that Draft 3 of the Version 6.0 specification does not take into account the dramatically more efficient computer models and graphics cards placed on the market in 2012 and will be outdated by the time the new specification goes into effect. The energy limits and graphics allowances proposed by ENERGY STAR are based on outdated data and are in some cases much higher than justified based on the 2011-2012 market data we have analyzed. This would lead to qualification rates far in excess of 25 percent of the market in some computer categories by the specification's effective date, and would fail to drive the market to adopt more efficient computers and capture cost-effective energy savings opportunities in personal computers.

In the case of graphics cards, Draft 3 graphics adder levels appear to be approximately twice as large as warranted by recent market data, and could have the net effect of an ENERGY STAR computer being allowed 200 kWh/yr instead of levels around of 100 kWh/yr. The much higher than justified allowances could even have the perverse effect of encouraging the sale of systems with oversized and overpowered graphics cards that result in higher energy consumption because they can more easily qualify for ENERGY STAR. This could mislead customers into purchasing higher energy computers than they would otherwise because of their ENERGY STAR label.

We urge EPA to revise its analysis using 2011 and 2012 market data for energy limits and the test data from the recent CLASP-NRDC and PG&E studies for graphics adders. The alternative levels proposed by NRDC in these comments would more effectively capture the 25 percent most efficient computers on the market in each performance category, and help the market adopt the more energy efficient computer technologies that are available today.

If EPA adopts the levels recommended by NRDC, a more stringent ENERGY STAR specification would save an additional 5-10 percent of overall computer energy consumption, or the equivalent output of one and a half medium-sized 500 MW power plant. This would result in national savings of $430 million/yr in avoided electricity bills, and would prevent the release of 2.3 million tons of CO2/yr.

Our comments cover the following areas:

1. **Base Energy Limits**: NRDC's analysis of 2011 and 2012 computers that qualified for ENERGY STAR shows that proposed typical energy consumption (TEC) levels are too high, particularly for desktop computers, as well as for some notebooks, and will lead to qualification rates well as high as 50 percent in some categories at the specification effective date. 2012 computers are significantly more energy efficient than 2010 and 2011 models. **V6.0 energy limits should be based on 2012, or at most 2011 and 2012 models, not on 2010 models.**
2. **Discrete Graphics Adders**: Draft 3 discrete graphics adders are based on outdated data and a flawed methodology. They do not reflect the current state of the market where many discrete graphics cards include GPU technology that uses up to 50% less energy than proposed adders. This would likely lead to: 1) Much higher qualification rates for computers equipped with discrete graphics than the target 25 percent; and 2) Perverse incentives for manufacturers to produce systems with high-end graphics that consume more energy than the market would otherwise demand. Appropriate graphics adders are critical to an effective specification. **We urge EPA to update its analysis using 2011-2012 data and the NRDC-CLASP methodology.**
3. **Categorization**: NRDC supports the adoption of the ITI categorization system for desktops, and urges EPA to **separate desktops and integrated desktops into distinct categories** so that ENERGY STAR encourages the most efficient designs for each type of computer.
4. **Switchable Graphics Incentive**: NRDC supports EPA's intention to provide an incentive for manufacturers to implement switchable graphics by default in AC power mode, which for

desktops alone could save approximately 1 billion kWh in annual electricity consumption in the US, or 5% of US desktop computer energy use. However we have concerns with the draft 3 switchable graphics incentive proposal that need to be resolved in order to make this incentive effective and avoid unintended consequences that would impact the effectiveness of the overall specification. **We propose language that clarifies and tightens the requirements for the incentive, to ensure it works as intended.**

5. **Power Supply Efficiency Incentive**: Despite current ENERGY STAR V5 efficiency requirements, power supplies remain one of the components responsible for the highest energy use in computers when considering their efficiency in real operating conditions. The current requirements are becoming less effective as computers spend more time at lower load levels such as 10 percent of power supply rated power. NRDC appreciates EPA's inclusion in draft 3 of a slightly modified version of NRDC's proposal for power supply efficiency incentive. **NRDC urges EPA to adjust incentive values to ensure the incentive is significant enough to have an impact on the market.** An improved power supply efficiency incentive has the potential to save **2-4% of US computer energy use**. ENERGY STAR has a unique opportunity to set a new standard which once incorporated into manufacturers standard design requirements will ensure higher efficiency at no extra cost.
6. **Energy Efficient Ethernet:** EPA should require or incentivize Energy Efficient Ethernet enabled as-shipped on all ENERGY STAR computers.
7. **Information Requirements**: NRDC recommends additional information reporting requirements for qualified products that are key to the effectiveness of the graphics switching incentive and will inform power supply incentives and requirements in future revisions of the specification.

Detailed Comments

1. Energy (TEC) Limits

NRDC analyzed Draft 3 levels against 2011 and 2012 products in the ENERGY STAR Qualified Product List (QPL), and found that proposed levels are much higher than warranted in some categories, particularly for desktops, and would result in higher qualification rates than the target 25 percent.

Desktops

Category	Estimated Pass rate	Notes
DT 0	47%	
DT I1	63%	
DT I2	36%	
DT I3	64%	
DT Dx	-	Not analyzed due to lack of data on discrete graphics data in the QPL.
Average	**57%**	

Notebooks

Category	Estimated Pass rate	Notes
NB 0		Insufficient data to estimate a meaningful pass rate
NB I1	31%	
NB I2	27%	
NB I3		Insufficient data to estimate a meaningful pass rate
NB D1	34%	
NB D2		Insufficient data to estimate a meaningful pass rate
Average	**31%**	

Notes on NRDC's analysis:

1. These estimates are based on the 2011 and 2012 products in the QPL. As the QPL does not contain information on graphics and storage adders, we included average adder values derived from the distribution of adders in the EPA draft 2 dataset and the proposed Draft 3 adder values.
2. This analysis of desktops includes both traditional and integrated desktops. Separating these two types into distinct categories would lead to different pass rates for each.

2012 computers are significantly more energy efficient than 2010 and 2011 models. V6.0 energy limits should be based on 2012, or at most 2011 and 2012 models.

EPA indicated on the December 10, 2012 webinar that Draft 3 TEC levels were based on 2010 and 2011 products. NRDC believe that levels should be based on 2011-2012 products instead. While a few 2010 products may still be shipping today, they most likely no longer will by 2014 and 2015 when the specification will be in effect. On the other hand 2012 products are the most representative of

products that will be available on the market in 2014 and 2015 when v6.0 will be in effect.

The charts below show the improvement trends in pass rates for Draft 3 levels from 2010 to 2012. In each category, the pass rate for 2012 (green bar) is significantly higher than the pass rates for 2010 and 2011 (blue and red bars):

Figure 1: Pass Rate Trend 2010-2012 – Traditional Desktops

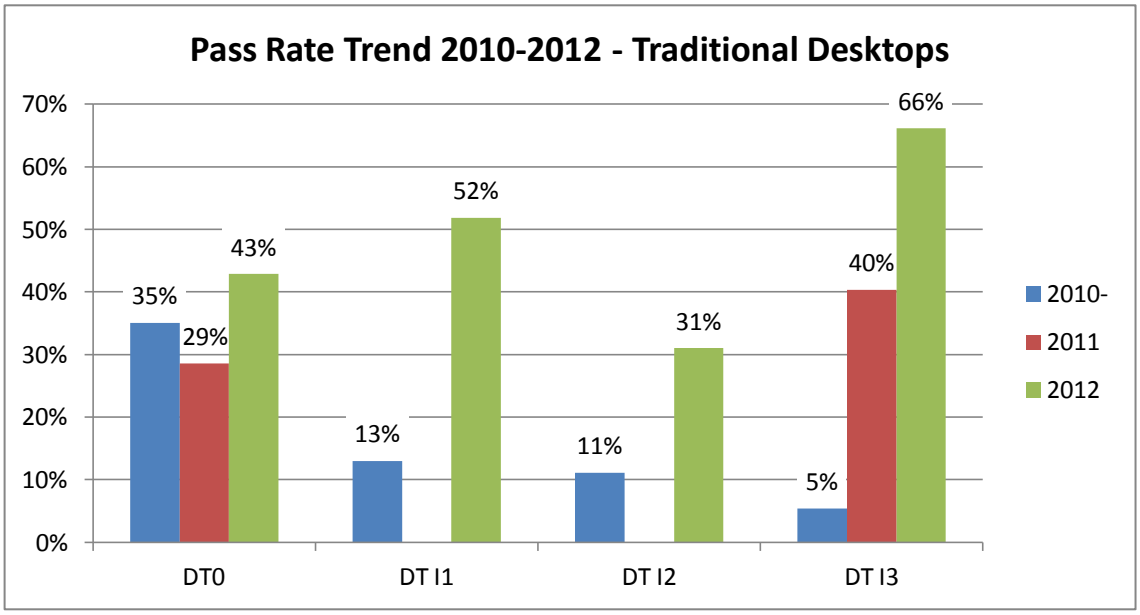
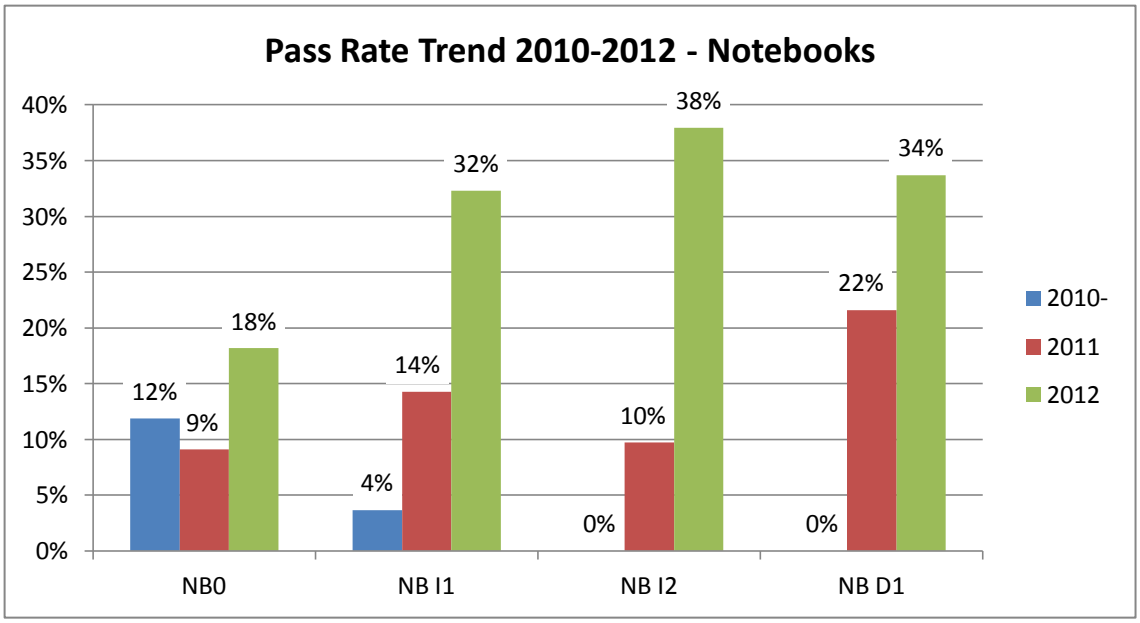


Figure 2: Pass Rate Trend 2010-2012 – Notebooks



This is why it is critical to focus primarily on 2012 data when setting levels for a specification which

will be in effect in 2014 and 2015. V6 energy limits should be based on 2012, or at most 2011 and 2012 models, not on 2010 models.

NRDC Recommended Levels

Ideally we would recommend targeting pass rates of 20% or lower for the 2011-2012 data, in order to hit approximately 25% by the effective date of the specification. With rapid improvements in the energy efficiency of computers, targeting 25% on 2011-2012 data will lead to higher pass rates by 2014, and therefore a less effective specification.

However given that EPA has been targeting 25% of its analysis dataset and is not accounting for efficiency improvements in the market by the effective date of the specification, the levels we provide below are based on EPA's approach applied to the 2011-2012 dataset. As such they are directly applicable to the draft specification. Despite that, we still encourage EPA to target a 20% pass rate instead and would be happy to provide corresponding TEC values.

We also recommend separating traditional and integrated desktops into distinct categories so that each type is equally incentivized to be designed efficiently, see Section 3-Categorization for a detailed justification on this point.

We recommend the following TEC limits for both scenarios:

<u>Separate</u> Traditional and Integrated Desktops Categories

<u>Traditional Desktops</u>

Category	Draft 3 TEC Limit (kWh/yr)	NRDC Proposed TEC Limit (kWh/yr)	Resulting Estimated Pass Rate (w/o gfx adders)
DT 0	69	50	29%
DT I1	112	75	25%
DT I2	120	100	18%
DT I3	135	100	28%
DT D1	118	85	No data
DT D2	137	95	No data
Weighted average			**25%**

<u>Integrated Desktops</u>

Category	Draft 3 TEC Limit (kWh/yr)	NRDC Proposed TEC Limit (kWh/yr)	Resulting Estimated Pass Rate (w/o gfx adders)
DT 0	69	37	22%
DT I1	112	62	25%
DT I2	120	78	13%
DT I3	135	78	32%

Category	Draft 3 TEC Limit (kWh/yr)	NRDC Proposed TEC Limit (kWh/yr)	Resulting Estimated Pass Rate (w/o gfx adders)
DT D1	118	65	No data
DT D2	137	75	No data
Weighted average			**25%**

Combined Traditional and Integrated Desktops Categories

Category	Draft 3 TEC Limit (kWh/yr)	NRDC Proposed TEC Limit (kWh/yr)	Resulting Estimated Pass Rate (w/o gfx adders)
DT 0	69	45	25%
DT I1	112	70	26%
DT I2	120	93	16%
DT I3	135	93	27%
DT D1	118	80	No data
DT D2	137	90	No data
Weighted average			**25%**

Note that we propose the same levels for DT I2 and DTI3 because there is no significant difference in energy levels between these two categories in the QPL.

Notebooks

Category	Draft 3 TEC Limit (kWh/yr)	NRDC Proposed TEC Limit (kWh/yr)	Resulting Estimated Pass Rate (w/o gfx adders)
NB 0	14	14	Insufficient data
NB I1	22	21	21%
NB I2	24	24	18%
NB I3	28	26	Insufficient data
NB D1	16	14	26%
NB D2	18	16	Insufficient data
Weighted average			**25%**

Why Appropriate TEC Levels Matter

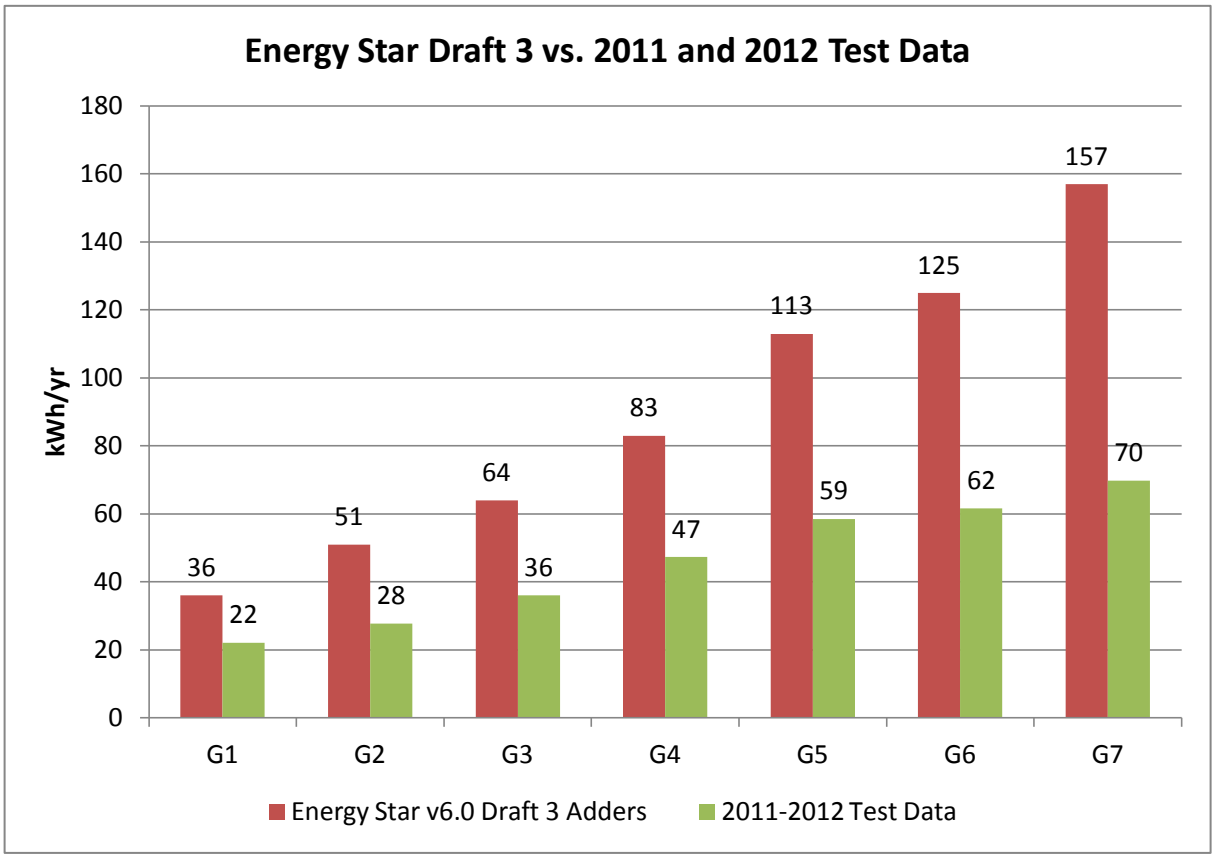
Computers represent the 2nd highest electronic energy end-use after TVs, and have a large energy savings potential as demonstrated by the most efficient models on the market today. In order for ENERGY STAR to be effective at helping the market adopt these high efficiency technologies, it is

critical that v6.0 be truly based on the top 25 percent most efficient models at effective date. Given the rapid innovation cycle of the computer industry, 2012 data is the most meaningful to project computer energy consumption in 2014 and 2015 when v6.0 will be in effect.

2. Discrete Graphics Adders

Draft 3 proposed graphics adders are nearly twice as high as justified by 2011-2012 market data. This creates a very large unwarranted allowance, especially in the G5-G7 graphics categories.

Figure 3: Draft 3 adders vs. 2011-2012 Test Data



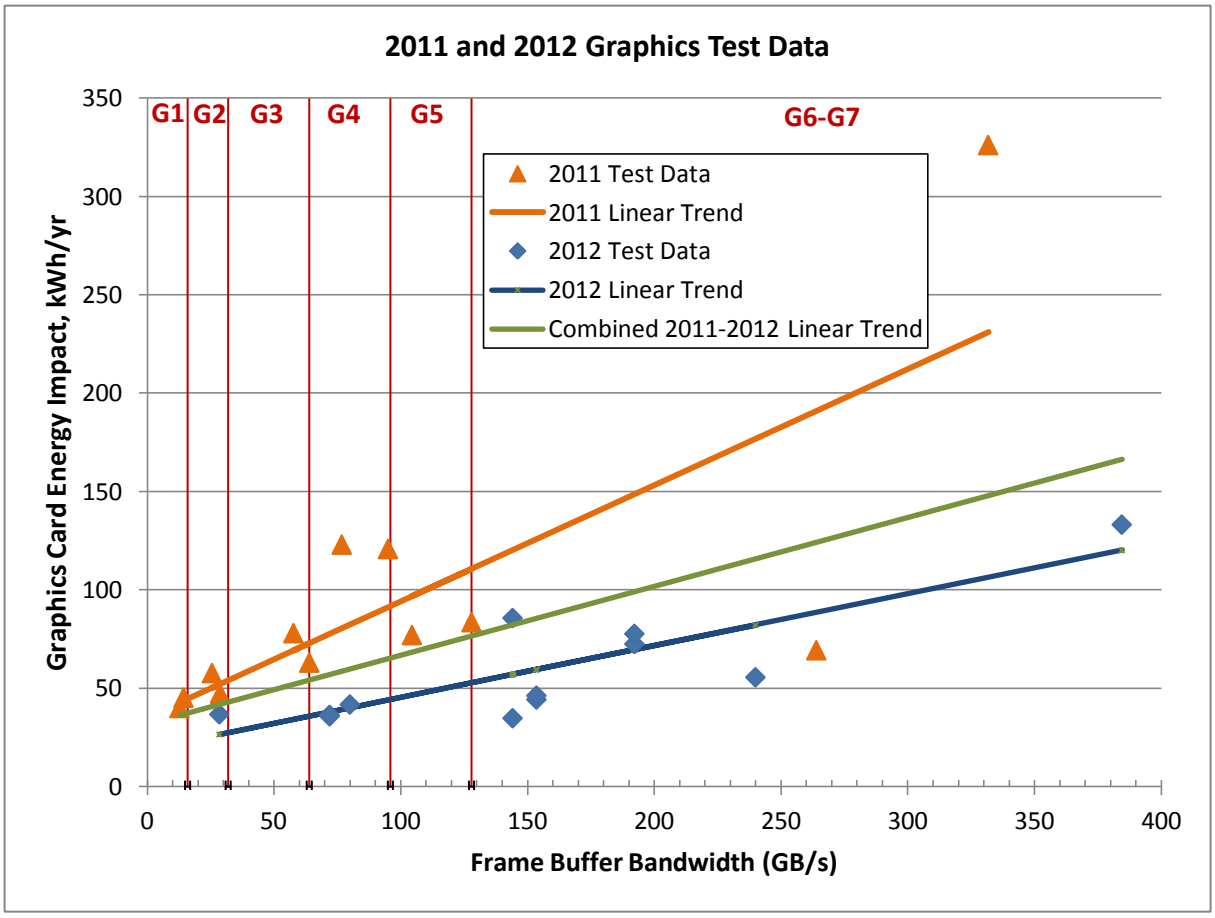
The green bars represent the combination of the results of two graphics card power measurement projects:

1. The 2011 graphics card data is from the NRDC and Collaborative Labeling and Appliance Standards Program (CLASP) study of a sample of 12 desktop discrete graphics cards representative of 2011 GPU technology.
2. The 2012 graphics card data is from a similar study just completed by Pacific Gas and Electric (PG&E) on a sample of 12 desktop discrete graphics cards representative of 2012 GPU technology. The 2012 graphics card sample consists of eight G7 cards, three G4 cards and one G2 card, all of them utilizing 2012 GPU architectures (AMD GCN and Nvidia Kepler), which represent best-practices in terms of graphics card energy efficiency in idle mode as of 2012.

Draft 3 proposed adders (in red) are approximately twice as high as the data of both studies, and more than twice as high as the 2012 data alone.

Figure 4 below shows the dramatic improvements in energy efficiency of 2012 (blue line) vs. 2011 (orange line) graphics technology. The green line represents the linear trend of the combination of 2011 and 2012 data.

Figure 4: 2011 and 2012 Graphics Test Data



EPA could justifiably base Version 6.0 on 2012 data alone (blue line), as this represents a broad sample of products already available in the market today, and will be the majority of the market in 2014 and 2015. However, in the spirit of compromise, NRDC proposes to set Version 6.0 levels based on the combined 2011-2012 test data (green line), as represented by the table at the end of this section. This constitutes a data set of 24 graphics cards which represents approximately one third of GPUs introduced on the market over the 2011-2012 period.

The combined results show that the power requirements of G7 graphics cards in idle mode and the resulting impacts on system typical energy consumption are much lower than the proposed Draft 3 adder, by as much as 33 kWh/yr for 2011 and 87 kWh/yr for 2012 cards. To put this in perspective, 87 kWh/yr is higher than the base allowance for category DT1 desktop! This would essentially be a free giveaway to systems that use 2012 or later G7 cards, which will be most or all of the G7 cards sold by the specification's effective date.

Unduly high adders jeopardize the effectiveness of the v6.0 specification and may even lead to higher energy consumption for some configurations.

High-end graphics (G5 and higher) are becoming increasingly common in consumer and some segments of the commercial desktop markets, and this will likely continue as the price of high-performance graphics continues to drop following Moore's Law.

These data suggest that graphics adders as currently proposed will lead to particularly high qualification rates for desktops equipped with G5 or higher discrete graphics, as adders for high-end graphics represent a large portion, in some cases the majority, of the total system energy allowance.

This would incentivize manufacturers to propose more configurations using G5-G7 graphics than the market would otherwise demand, due to the fact that it will be easier to qualify for ENERGY STAR in high-end vs. low-end or integrated graphics categories.

Draft 3 proposes a strong framework for the v6.0 specification, adjusting graphics adders to appropriate values is a simple fix and will ensure that the specification is effective.

Draft 3 proposed graphics adders are based on outdated data and a flawed methodology that uses graphics card internal idle power levels to derive adders. Our latest data shows that the energy efficiency of discrete graphics in idle mode using the latest GPU architectures has improved dramatically relative to legacy technology, and the methodology developed by NRDC and CLASP, based on system-level measurements, is much more relevant to adder setting than the methodology used in Draft 3.

NRDC recommends that graphics adders be aligned with the combined 2011-2012 test data. 2011-2012 data is the most representative of graphics technology that will be on the market in 2014 and 2015 when the specification will be in effect.

Desktop discrete graphics adders based on combined 2011-2012 test data (kWh/yr):

ECMA Category	G1	G2	G3	G4	G5	G6	G7
Draft 3	36	51	64	83	113	125	157
2011-2012 Test Data	22	28	36	47	59	62	70

Adder values higher than those required by 2011-2012 graphics cards would result in excessive qualification rates for computers equipped with discrete graphics cards, and would fail to drive higher market adoption of high efficiency graphics cards and computers.

Notebooks

NRDC supports EPA's approach of setting notebook graphics adders to be 37% of desktop adders.

It is particularly important that discrete graphics adders for notebooks not be too high because of the broad availability of graphics switching technology in notebooks. If discrete graphics adders are too generous, they can provide a perverse incentive for manufacturers not to implement graphics

switching when connected to AC power in order to benefit from the higher graphics adder.

3. Categorization

In its January 3, 2013 revision of Draft 3, EPA adopted the ITI categorization proposal for all types of computers. NRDC supports this approach which is simpler, more durable and easier to update. The separation of discrete and integrated graphics also reduces the spill-over effects in the event of graphics adders being misaligned with the market, which is significant given the complexity of getting graphics adders right and how large they are relative to base energy limits.

Desktops and integrated desktops should be separated into distinct categories to encourage the most efficient designs for each form factor.

These two types of desktops have very different power signatures. Due to size and space constraints, integrated desktops tend to utilize more efficient architectures and components. Grouping the two form factors together results in setting levels that are either too lenient for integrated desktops resulting in unduly high qualification rates, or too stringent for traditional desktop resulting in very few being able to qualify. Separating both categories will ensure that ENERGY STAR encourages the most efficient designs for each form factor.

Differences are not limited to energy use, **integrated and traditional desktops also provide different functions:**

- Traditional desktops are fully upgradeable, whereas integrated desktops have minimal upgradability.
- Traditional desktops offer more flexibility with the choice of display: users can either reuse existing displays, or upgrade to different displays over the life of the product.
- Integrated desktops offer sleeker designs and form factors, which is the main raison d'être of this type of computers.

The differences in functions should enable EPA to categorize them separately. They are comparable to the differences in function between notebooks and desktops. **T**he categorization of computers with discrete and integrated graphics in separate categories also creates a precedent where the differences in functions are less substantial.

Alternatively, EPA could consider creating an upgradability adder for traditional desktops, and base desktop levels on integrated desktops, however we believe that separate categories are a simpler approach.

Lastly, integrated desktops represent approximately 30% of total desktop models in the QPL and their share of the desktop market is growing. There are enough of them in each category to set standards:

Unique desktop models in the 2011-2012 QPL:

Category	Desktop		Integrated		Grand Total
DT0	28	55%	23	45%	51
DT I1	57	52%	52	48%	109
DT I2	87	79%	23	21%	110
DT I3	198	78%	57	22%	255
Total	**370**	**70%**	**155**	**30%**	**525**

4. Switchable Graphics

NRDC supports EPA's intention to provide an incentive for manufacturers to implement switchable graphics (functionality that allows both integrated and discrete graphics to be used at different times depending on the graphics rendering needs of the user). While most notebook computers on the market already implement switchable graphics in battery mode, very few enable it in AC power mode, and even fewer desktops if any currently utilize this functionality. The implementation of switchable graphics in AC power mode for desktops alone could save approximately 1 billion kWh in annual electricity consumption in the US, or 5% of US desktop computer energy use.

However we have concerns with the Draft 3 switchable graphics incentive proposal that should be resolved in order to make this incentive effective and avoid unintended consequences that would impact the effectiveness of the overall specification.

EPA proposes that desktops that implement switchable graphics be given an incentive equal to half of the G1 graphics adder, and that notebooks be given no incentive.

We have the following concerns and counter proposals on switchable graphics as proposed in Draft 3:

1. The definition of switchable graphics lacks details, such as whether it is automatic or user-initiated, and what graphics rendering conditions should minimally trigger the switch. **We recommend that the switch between discrete and integrated graphics must be automatic, and must be triggered at a minimum in idle mode per the ENERGY STAR test method.** Switchable graphics should also be enabled by default as shipped, and not require any user involvement during initial setup so as not to encourage users to disable the functionality before they even try it.
2. Draft 3 does not propose a test method for determining which computers have switchable graphics. As this functionality is not always obvious in computer specs and documentation, **it should either be included in the test method, or at a minimum be a mandatory reporting requirement by manufacturers as part of the information requirements.** The following information should be reported:
    a. **Does the computer have automatic switchable graphics capability?**
    b. **Is it enabled by default in AC power mode?**
3. We believe that EPA's intent is that notebooks capable of switchable graphics may not claim any graphics adders. This would provide a strong incentive for manufacturers to enable switchable graphics in AC mode, and eliminate the need for an additional incentive. **If this is the case NRDC strongly supports this approach, however this needs to be clarified in the specification.** It also requires that the declaration of switchable graphics capability be reliable and trustworthy, and therefore mandatory as part of information requirements. If EPA chooses not to require mandatory testing or reporting of switchable graphics, or to allow notebooks to claim graphic adders even if they have the capability, we would favor that the incentive of (50% * G1 adder) be extended to notebooks, however we strongly prefer the first approach given the high penetration of switchable graphics capability in current notebooks.
4. For desktops, we believe the proposed incentive of (50% * G1 adder) is appropriate: it provides a meaningful but reasonable incentive. **We caution against making this incentive scalable across graphics categories** as suggested by some stakeholders, as this could rapidly result in disproportionate incentives. Scalable incentives could eventually be higher than the energy consumed by discrete graphics cards in idle, given that we are already seeing some latest generation G7 cards consume less than 40 kWh annually.

5. Power Supply Efficiency Incentive

NRDC urges EPA to adjust incentive values to ensure the incentive is significant enough to have an impact on the market.

NRDC appreciates EPA's inclusion in Draft 3 of a slightly modified version of NRDC's proposal for power supply efficiency incentive. Despite current efficiency requirements, power supplies remain one of the components responsible for the highest energy use in computers when considering their efficiency in actual operating conditions rather than the efficiency rating per standard test methods.

In order for this incentive to be effective, it needs to be meaningful while not providing an allowance higher than expected savings, which could cause the energy savings from higher efficiency power supplies to be offset through less efficient design choices.

Using Draft 3 proposed TEC limits and typical adder values, the current proposals of 1.5% and 3% of TEC for the two levels of incentive for desktops, and 0.75% and 1.5% for notebooks yield typical incentive values of between **1 and 8 kWh/yr for desktops** and **0.2 to 0.9 kWh/yr for notebooks**. This seems a bit low but workable for desktops, but it **is too low to impact notebook designs .**

	Base TEC (kWh/yr)	Adders (illustrative)	Total TEC allowance	Level 1 incentive	Level 2 incentive	Level 1 incentive value (kWh/yr)	Level 2 incentive value (kWh/yr)
Desktops							
DT 0	65	10	75	1.5%	3.0%	**1.1**	**2.3**
DT 1	115	20	135	1.5%	3.0%	**2.0**	**4.1**
DT 2	130	30	160	1.5%	3.0%	**2.4**	**4.8**
DT 3	205	50	255	1.5%	3.0%	**3.8**	**7.7**
Notebooks							
NB 0	14	12	26	0.75%	1.5%	**0.2**	**0.4**
NB I1	22	12	34	0.75%	1.5%	**0.3**	**0.5**
NB I2	24	15	39	0.75%	1.5%	**0.3**	**0.6**
NB I3	28	15	43	0.75%	1.5%	**0.3**	**0.6**
NB D1	16	30	46	0.75%	1.5%	**0.3**	**0.7**
NB D2	18	40	58	0.75%	1.5%	**0.4**	**0.9**

1-8 kWh

<1 kWh

In order to make this power supply incentive effective and simpler, we propose to use the same incentive factors for notebooks as for desktops and to round them up as follows:

Power Supply Type	Minimum Efficiency at Specified Proportion of Rated Output Current				Minimum Avg Efficiency	Incentive
	10%	20%	50%	100%		
Internal	0.81	0.85	0.88	0.85		**0.02**
	0.84	0.87	0.90	0.87		**0.04**
External	0.83				0.88	**0.02**

	0.84				0.89	**0.04**

This would yield the following incentive values:

	Base TEC (kWh/yr)	Adders (illustrative)	Total TEC allowance	Level 1 incentive	Level 2 incentive	Level 1 incentive value (kWh/yr)	Level 2 incentive value (kWh/yr)
Desktops							
DT 0	65	10	75	2.0%	4.0%	**1.5**	**3.0**
DT 1	115	20	135	2.0%	4.0%	**2.7**	**5.4**
DT 2	130	30	160	2.0%	4.0%	**3.2**	**6.4**
DT 3	205	50	255	2.0%	4.0%	**5.1**	**10.2**
Notebooks							
NB 0	14	12	26	2.0%	4.0%	**0.5**	**1.0**
NB I1	22	12	34	2.0%	4.0%	**0.7**	**1.4**
NB I2	24	15	39	2.0%	4.0%	**0.8**	**1.6**
NB I3	28	15	43	2.0%	4.0%	**0.9**	**1.7**
NB D1	16	30	46	2.0%	4.0%	**0.9**	**1.8**
NB D2	18	40	58	2.0%	4.0%	**1.2**	**2.3**

1-10 kWh

0.5-2.5 kWh

We believe these revised incentive values are still very modest compared to other adders and incentives. They would still be on the order of the energy savings and would not provide undue allowances. NRDC would even support slightly higher factor of 3% and 6% if EPA would consider them.

This power supply efficiency incentive has the potential to save **2-4% of US computer energy use**. ENERGY STAR has a unique opportunity to set a new standard which once incorporated into manufacturers standard design requirements will ensure higher efficiency at no extra cost.

6. Energy Efficient Ethernet

EPA should require or incentivize Energy Efficient Ethernet enabled as-shipped on all computers.

Energy Efficient Ethernet (IEEE 803.2az or EEE) is a technology that dynamically adjusts the speed and power consumption of Ethernet ports to the data traffic requirements. Gigabit Ethernet ports with EEE enabled can reduce power from 0.7W to 0.1W, even in active mode as most of the data traffic does not require Gigabit bandwidth, and when it does, EEE can ramp the power up and then down again until the next burst. A 0.6W average power reduction would yield of the order of 2.6 kWh annual savings

EPA has included EEE in its draft Small Network Equipment specification, however this will only yield energy savings if the edge devices also have this technology enabled. Draft 3 of the computer spec only requires computers to reduce power in Off and Sleep, not in Active mode.

We encourage EPA to specify that EEE be enabled by default either as a requirement, if the technology is sufficiently deployed in the market already, or as an incentive if it is not broadly available yet.

7. Information Reporting Requirements

NRDC recommends the following reporting requirements for qualified products and for this data to be submitted into the Qualified Products List:

- Does the computer have automatic graphics switching capability in idle mode (Y or N?)?
- Is graphics switching enabled by default in AC power mode (Y or N?)?
- Report certified efficiency levels of the power supplies at 10 percent load as well as at each load level specified by the standard external and internal power supply test protocols.

The graphic switching information requirements are critical to the effectiveness of the graphics switching incentive.

The power supply efficiency information requirement will help evaluate the efficiency of power supplies used in qualified products and will inform the development of future revisions of the specification.

Thank you for considering our comments.

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