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Desktop Power Supplies ENERGY STAR Version 6 Baseline Methodology and Specification Influence Review

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Summary

From 2004-2010, Northwest Energy Efficiency Alliance (NEEA) supported the adoption of energy efficient desktop computer internal power supplies (IPS) through its work on the 80 PLUS® program. By advocating for the inclusion of power supplies in ENERGY STAR Computer requirements, as well as offering incentives to manufacturers and supporting customer awareness campaigns, NEEA's work helped to transform the desktop power supply market. This includes influencing ENERGY STAR Program Requirements for Computers (ENERGY STAR Computers), Version 4 and Version 5. These findings were documented in previous 80 PLUS Market Progress Evaluation Reports¹.

Since 2010, EPA has updated the ENERGY STAR computer requirements twice, Version 6 and Version 7 (start dates of 2014 and 2018, respectively). In light of these updates, NEEA was interested in understanding its influence on the computer market. Therefore, in late 2018, NEEA contracted with Apex Analytics, in partnership with Research into Action (the Apex team) to inform its planning team on NEEA's influence and baseline associated with the ENERGY STAR Computers requirements, Version 6 and Version 7. The research objectives include:

- Did NEEA, through previous 80 PLUS initiative and general comments to the EPA, influence the advancement of the ENERGY STAR Version 6 specification?
- Is there evidence that NEEA's comments also influenced other products such as residential desktops and laptops?
- Is NEEA's proposed baseline approach reasonable, specifically for 2015-2018? Are there suggestions for improvement on the approach?

¹ Market Progress Evaluation Report #4

<https://neea.org/img/uploads/80-PLUS@-market-progress-evaluation-report-4.pdf>

Market Progress Evaluation Report #5

<https://neea.org/img/uploads/80-PLUS@-market-progress-evaluation-report-5.pdf>

- Is there evidence of a connection between NEEA's support of the 80 PLUS program and ENERGY STAR Version 7?
- If so, what insight can we provide on the recommended baseline approach for NEEA's influence in Version 7?

Evaluation Approach

To conduct this assessment, the Apex team:

- **Reviewed ENERGY STAR documentation and specifications.** The Apex team reviewed NEEA and 80 PLUS team input into the ENERGY STAR Computer Version 6 and Version 7 specifications². We reviewed EPA response documents, as well as the final specifications, to identify which of NEEA's comments were incorporated into the final specifications. We also reviewed historic Market Progress Evaluation Reports³.
- **Conducted six expert interviews** with staff from NEEA staff and 80 PLUS, as well as the EPA Product Manager and EPA's technical expert in the specification process.
- **Reviewed Baseline Assumptions.** Based on the information gained in the tasks above, the Apex Analytics team reviewed NEEA's baseline assumptions regarding ENERGY STAR Version 6.

Throughout this memo, we separate two areas related to the ENERGY STAR Computer requirements:

- **Internal Power Supply Requirements:** This aspect of the requirements is directly related to NEEA's historic involvement in the 80 PLUS program. Yet, IPS is a small component of the ENERGY STAR Computer requirements, particularly for Version 6 and Version 7.
- **Other Computer Requirements:** The ENERGY STAR Computer requirements also include many other aspects of efficiency for computers (both desktops and laptops). For example, the Total Energy Consumption (TEC) requirements is a primary efficiency driver in the requirements.

For the following sections, the Apex team has structured our findings as follows:

- **Historic NEEA Influence.** This provide recent research into NEEA's historic influence in the 80 PLUS organization.
- **ENERGY STAR Version 6 Findings.** Within this section, we first review the NEEA comments and process. Then, we highlight the resulting changes to the specifications that were a result of the actions. Finally, we summarize the research objectives and our findings with evidence from our research.

² https://www.energystar.gov/products/spec/computer_specification_version_6_0_pdf,
https://www.energystar.gov/products/spec/computers_specification_version_7_0_pdf

³ <https://neea.org/resources-reports/browse?resourceType=market-research-evaluation-reports>

- **ENERGY STAR Version 7 Findings.** Similar to Version 6 findings, we review comments and process, resulting changes and the findings to the research questions.

Findings: Historic NEEA Influence

80 PLUS Organization

For this assessment, the Apex team asked interviewees about the historic importance of NEEA's role in the 80 PLUS organization. 80 PLUS staff described NEEA's role as a "cornerstone, founding member" to be "pretty tremendous", for providing "early seed money to keep the organization staffed". The interviewee reported that they weren't sure if the 80 PLUS program would have found the funds to continue without NEEA. This idea was echoed by the NEEA staff interviewee who described NEEA's role as that of a venture capitalist, funding the organization early in the process and therefore NEEA deserves some credit for the long-term gains. Yet, it is also worth noting that 80 PLUS has worked with over twenty utilities to support its IPS programs and has also been funded through fees paid by manufacturers to certify power supplies.

Findings: ENERGY STAR Computer Requirements Version 6

Version 6 Comments and Process

NEEA participated in the specification revision process for the ENERGY STAR Version 6 Computer requirements in multiple ways, including attending meetings and providing comments. NEEA worked with other energy efficiency advocates to provide comments to the EPA⁴. NEEA sent a total of three sets of comments: one set of stand-alone comments, one set of comments in collaboration with the NRDC and one set of comments with the California IOUs⁵. The following bullets summarize these comments, as well as their timing and topics:

- [Comments on Energy Star 6.0 Kickoff](#) (April 2011). These comments were sent directly from NEEA to EPA. They included comments on graphics cards performance, consumption and scalability, idle power, external and internal power supplies, battery charger systems, integrated displays, total energy consumption (TEC) levels and network connectivity in test procedures.
- [Comments on Version 6.0 Draft 2 Computer Specification](#) (June 2012). These comments were combined comments by NRDC and NEEA. The comments cover: graphics adders, TEC allowances, computer system categories and mode weighting.

⁴ https://www.energystar.gov/products/spec/computer_specification_version_6_0_pd.

⁵ NEEA also sent a set of comments on Version 6.0 Draft 2 Computer Specification in April 2012, but these comments were not posted on the ENERGY STAR website and NEEA did not provide a copy of these comments.

- [Comments on Version 6.0 Draft 3 Computer Specification](#) (January 2013). These comments were in combination with Pacific Gas and Electric, Southern California Edison, and San Diego Gas and Electric. They covered: TEC limits, graphics adders, categorization, switchable graphics incentives, power supply incentives, information requests, energy efficient ethernet and display adders.

Although the ENERGY STAR website⁶ kept record of most NEEA comments, NEEA did not maintain detailed records. NEEA was unable to provide one set of comments and NEEA did not maintain records documenting the NEEA process for developing the comments, the level of engagement in the process and the team's perspective on the resulting influence. Due to staff turnover, the Apex team was unable to interview staff that directly participated in the NEEA process.

Specification Influence

EPA staff reported that non-manufacturer stakeholder comments are valuable to balance the manufacturer perspective in the requirements process. For Version 6, EPA staff recalled that NRDC was the most influential non-manufacturer stakeholder and that the IOUs and EPRI also provided comments⁷. Although EPA did not directly mention NEEA's influence, this is important as NEEA assesses influence in combination with partnering organizations (i.e., other energy efficiency advocates).

Related to specific comments, Table 2 below shows the key comments from NEEA through its stand-alone and collaborative comments and their resulting impact. Although IPS efficiency requirements were not increased for Version 6, the EPA included an optional allowance⁸ (i.e., increase to maximum total energy consumption) for desktop power supplies at the 80 PLUS Silver or Gold level. For the other computer requirements listed, NEEA and its collaborators influenced the efficiency of the specification.

⁶ Please note that as the ENERGY STAR Website was available during report writing due to the U.S. government shutdown. Therefore, it should not be viewed as reliable documentation.

⁷ EPA Interviewee did not recall the impact of NEEA comments, yet the staff member was not in the product lead at the time.

⁸ Power supply allowance is provided to power supplies that meet the optional more stringent efficiency levels specified in Table 5 of ENERGY STAR Version 6. It is defined as (1+ALLOWANCE) and is multiplied by other factors to determine the maximum TEC.

Table 2: NEEA Version 6 Comments and Responses

Topic*	Comments	EPA Response	Included in Final Requirements?
Internal power supplies (Desktops only)	Recommends 80 PLUS Silver (April 2011 Comments); Recommendation of TEC allowance with 10% load factor (June 2012 comments); Support of NRDC-proposed structure with recommended increase in incentive levels (Jan 2013 comments)	Recognized importance of power supplies in increasing efficiency, but that it constrained the market in the past. Therefore, added an optional power supply allowance in Version 6.	Yes, optional allowance included, although at lower incentive rates than recommended by NEEA.
External power supplies	Average of 89% efficiency (April 2011 comments), then same combined comments with Internal Power Supplies Above	Same as above	Same as above
Total energy consumption (TEC) levels	Create more stringent TEC levels and revise product categories to ensure customers can rely on ENERGY STAR (April 2011), Include natural TEC trends in setting TEC allowances (June 2012), Base TEC limits on 2012 data and separate integrated and traditional desktops (Jan 2013)	EPA used its own 2011 and 2012 data and reduced TEC adders.	Yes, TEC was based on 2012, but was higher than recommended by 2013 NEEA comments
Graphics cards performance and adders	Include a graphics performance per watt specification (April 2011), Reduce idle consumption by setting energy consumption specification at 25% below average introduced in 2010 (April 2011); Graphics adders generally consistent with new test results except in one category (June 2012); Adders are too high based on test data (January 2013).	Multiple stakeholders expressed concern that adders were too high therefore EPA conducted analysis and adjusted in final specification.	Yes, graphics card performance in final requirements and adders were included and reduced, but at lower-than-recommended rates

*Additional topics that were discussed in comments but not analyzed in detail include: Switchable graphics, Idle power, Battery charger systems, integrated displays, network connectivity in test procedures, Energy Efficient Ethernet, Display adders

Findings

Research Question: *Did NEEA, through previous 80 PLUS initiative and general comments to the EPA, influence the advancement of the ENERGY STAR Version 6 specification? Is there evidence that NEEA's comments also influenced other products such as residential desktops and laptops?*

For Energy Star Version 6, NEEA participated throughout the update process and provided both stand-alone and collaborative comments with NRDC and California IOUs. NEEA's collaborative comments influenced the specification and were reported by EPA staff as valuable. There are two areas of influence:

- **Internal Power Supplies:** NEEA funded 80 PLUS at a pivotal time in its existence, which was reported by 80 PLUS staff to have an important and long-lasting impact on the organization. Additionally, NEEA's Version 6 comments included IPS recommendations. Yet, for ENERGY STAR Version 6, the EPA did not increase IPS efficiency requirements from 80 PLUS Bronze defined in Version 5. Instead, the requirements included an optional allowance for higher efficiency power supplies (i.e., 80 PLUS Silver or Gold).⁹
- **Other Computer Requirements:** NEEA's continued engagement and collaborative comments had some influence on the ENERGY STAR Computer requirements (including residential desktops and laptops), in particular with TEC levels and graphics cards performance. We did not find that the 80 PLUS program influenced the other aspects of the computer specification.

Research Question: *Is NEEA's proposed baseline approach reasonable, specifically for 2015-2018? Are there suggestions for improvement on the approach?*

NEEA's Version 6 baseline approach¹⁰ assumes a flat market share of commercial desktops from 2014-2018 using a 2008 baseline of 62.8%¹¹.

- **Internal Power Supplies:** If it is possible for NEEA to isolate the IPS portion of the requirements, we believe it is reasonable to assume some level of NEEA influence due to historic 80 PLUS engagement. Yet, because the specification stayed at 80 PLUS Bronze for Version 6, it is likely that the baseline of 62.8% is too low; it was likely closer to the 2013 market share of 72.6%. To isolate IPS, NEEA should assess whether data

⁹ This research did not assess the data availability for tracking the market for the optional allowance.

¹⁰ For more information on NEEA baseline see "ES67 Eval Memo Outline.doc" provided by NEEA to Apex team.

¹¹ NEEA determined 2013 to be the baseline year for ENERGY STAR Version 6. To determine a baseline value, a proxy was found by calculating the ENERGY STAR market share in 2008 (i.e., 62.8%) the year before Version 5 went into effect.

exist to estimate the number of units meeting the optional higher efficiency levels, as this was the only IPS efficiency gain in Version 6. Finally, although NEEA has historic influence on 80 PLUS activities, it is unlikely that all changes to ENERGY STAR Computer requirements for IPS are due to NEEA (and its collaborators) influence. Assuming a declining level of influence after initiatives have ended would retain some degree of attribution but discount this influence over time.

- **Other Computer Requirements:** As noted above, NEEA had some influence on the rest of the requirements through collaborative comments. For the overall market, we find that the starting place of 62.8% is a reasonable ENERGY STAR baseline. Yet, it is unlikely that without NEEA's intervention, the desktop market would have stayed at this level from 2013-2018. This is primarily due to the fast rate of technological change in the computer market. NEEA's engagement in this specification appears more similar to other NEEA codes and standards efforts, where only a portion of the influence is assumed to be due to NEEA and its partners. Therefore, NEEA should specify or research an influence portion, which could be applied to the market share estimate (thereby increasing the market share), or add this factor when estimating savings (i.e., per-unit savings * (market – baseline) * influence portion).

Findings: ENERGY STAR Version 7

Version 7 Comments and Specification Influence

For the ENERGY STAR Version 7, NEEA did not provide comments directly to the EPA. As reported by the NEEA staff interviewee, NEEA felt that the market had sufficient momentum and therefore it was not necessary for NEEA to engage in the stakeholder process.

The EPA staff described the 80 PLUS team as engaged and helpful for the Version 7 process, especially in providing test data. Additionally, as shown in Table 3, the 80 PLUS team provided comments on low-power efficiency, although the Version 7 requirements did not ultimately change due to these comments. The final Version 7 specification included an increase in the IPS requirements to 80 PLUS Gold, but only for those desktops >500 Watts. Additionally, Version 7 increased the optional allowance efficiency levels to the 80 PLUS Platinum and Titanium levels.

Table 3: 80 PLUS Program Version 7 Comments

Topic	Commenter /Date	Comments	EPA Response	Included in Final Spec?
Low-power efficiency performance	EPRI and 80 PLUS Program Team (Oct 2017)	Design capabilities for IPS supports increase in ENERGY STAR requirements based on efficiency and power factor (Oct 2017, in collaboration with EPRI), Supportive of the EPA adding a percentage, or wattage, load requirement to collect low power efficiency performance data on desktop internal power supplies (Oct 2017)	<p>No changes due to need to confirm benefit of requirements at low load points and resolve testing challenges.</p> <p>EPA does not have data to support additional low load IPS requirements in Version 7.0 for desktops. EPA welcomes data that help inform additional IPS low load requirements and data collection approaches.</p>	No

Findings

Research Question: *Is there evidence of a connection between NEEA’s support of the 80 PLUS program and ENERGY STAR Version 7?*

The EPA’s initial draft and final Version 7 increased IPS requirements to 80 PLUS Gold level for >500 Watt desktop computers and the optional allowance increased to 80 PLUS Gold and Titanium. Although 80 PLUS didn’t comment on this, we believe it is reasonable to assume that 80 PLUS program’s historic and continued market efforts led to this change. The 80 PLUS program did submit comments related to low-load efficiency for Energy Star Version 7, but no changes were made to the IPS specification due to this feedback. 80 PLUS comments were not related to the rest of the requirements and NEEA did not engage in the ENERGY STAR process.

Research Question: *If so, what insight can we provide on the recommended baseline approach for NEEA’s influence in version 7?*

- **Internal Power Supplies:** If it is possible to isolate the IPS portion of the requirements, we believe it is reasonable for NEEA to assume some level influence on IPS requirements, at a declining rate over time. To isolate the IPS portion, NEEA should

assess whether data exist to estimate the number of units at the >500 Watt level and for the optional allowance.¹² If data exist for these units, then NEEA's current Version 6 assumption is likely reasonable (i.e., market share set at the year before the previous requirement started).

- **Other Computer Requirements:** Neither 80 PLUS nor NEEA participated in the updating process and therefore the Apex team did not find influence on the rest of the specification, including residential desktops and laptops. Therefore, we do not recommend NEEA estimates a baseline for the rest of the requirements.

Recommendations

The Apex team offers the following recommendations for NEEA to consider:

- **Historic Initiatives.** Where NEEA has historically had an initiative, NEEA should consider developing polices for claiming savings that accounts for declining influence. As described in this memo, NEEA had substantial historic influence on 80 PLUS, yet other factors have sustained the organization since NEEA stopped its initiative. One option would be to assume a declining share of influence over time (e.g., 10% reduction in influence over a certain number of years, possibly tied to frequency of specification revisions). Another approach would be to assess how much of NEEA's initial support accelerated the progress of the 80 PLUS organization, identifying the likely delay of specification revisions if NEEA had not been involved.
- **Improved Documentation.** When engaging in influencing ENERGY STAR requirements, NEEA should clearly document those efforts, including maintaining records of all comments and summarizing perceived influence in a document. This will ensure that NEEA influence and efforts are not lost to staff turnover, memory loss or a lapse in ENERGY STAR website availability.
- **Future Engagement.** We recommend that NEEA continues to engage with the EPA in computer specifications. It is a large, fast-moving market and efficiency gains in this market are beneficial to Northwest consumers. EPA and other interviewees were clear that NEEA involvement is valuable in providing perspectives to balance the manufacturer comments¹³. EPA staff reported that Version 8 process will likely happen in 2019 and they expect that it will be focused on desktops¹⁴.

¹² This research did not assess the data availability for tracking the market for the optional allowance.

¹³ EPA staff recommended that stakeholders provide less-technical comments at the Discussion Guide stage, as the process becomes focused on technical arguments later in the process. They also noted that it's most helpful for stakeholders to provide data, research or even anecdotes about impact on customers that they can use as a counter-weight (rather than just opinions).

¹⁴ Please note that this statement was made prior to the 2018-2019 government shutdown and therefore may change.