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# NEEA Market Progress Evaluation Report #4: 80 PLUS

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## EXECUTIVE SUMMARY

The 80 PLUS program certifies energy-efficient power supplies for desktop personal computers (PCs) and servers. As a sponsor of 80 PLUS from 2004 to 2011, the Northwest Energy Efficiency Alliance (NEEA) provided financial incentives to computer manufacturers for commercial sales of desktop PCs and servers incorporating 80 PLUS certified power supplies within the Northwest region. This is the fourth Market Progress Evaluation Report (MPER) on NEEA's 80 PLUS program. The key objectives of this MPER are to understand market trends, update the Alliance Cost-Effectiveness (ACE) model assumptions on market share, baselines, and incremental costs, and to determine if the energy-efficient power supplies market has transformed to the point that it will sustain itself.

### Trends in U.S. PC Sales

**Total PC (i.e., combined desktop and portable PCs) sales will likely grow significantly in the next three years after a brief dip in 2011.** Total domestic PC sales declined in 2011, from approximately 75.1 million PCs sold in 2010 to 70.3 million in 2011 based on industry analyst IDC's year-end data. IDC forecasts that total U.S. PC sales will exceed 93 million by 2015.

**Desktop PC sales have remained relatively flat at around 27 to 28 million shipments per year in the last three years.** However, in terms of market share, desktop PCs have declined from 55 percent in 2007 to roughly 38 percent in 2011, due to the significant growth in portable PC sales since 2007.

**Desktop PC sales will likely decrease slightly in the next three years.** IDC estimates that consumers and businesses purchased nearly 27 million desktop PCs in the U.S. in 2011 and forecasts several years of minor decline. Industry analysts such as IDC and Gartner have revised their forecasts of desktop PC sales several times in recent years because the decline in desktop PC sales has not been as sharp as originally forecasted.

**These trends indicate that the commercial desktop PC market will remain a sizeable market for the foreseeable future.** Although some market observers have predicted the demise of the desktop PC, the decline in sales has not been as severe as forecasts from several years ago had predicted.

### 80 PLUS and ENERGY STAR Market Share and Incremental Costs

**Current 80 PLUS market share is approximately 70 percent of commercial desktop PCs.** Navigant estimated that approximately 48 percent of all 2011 U.S. desktop PCs included 80 PLUS or equivalent power supplies, based on interviewed original equipment manufacturers' (OEMs') self-reports. IDC data indicate that the self-reports were conservative, and as much as 70 percent of *commercial* desktop PCs were ENERGY STAR (and thus used 80 PLUS Bronze power supplies) in 2011. Nearly all desktop PCs sold by the interviewed OEMs with 80 PLUS power supplies are also ENERGY STAR certified.

**The incremental cost of 80 PLUS power supplies has decreased, but remains a deterrent to greater adoption of 80 PLUS power supplies.** OEMs report that the incremental cost of 80

PLUS Base has decreased significantly and that the cost of 80 PLUS Bronze has started to decrease as well, although it is important to note that even small incremental costs of \$10 can be a deterrent to manufacturers who are selling low-margin machines that retail as low as \$299 per machine. As a case in point, one of the largest manufacturers of desktop PCs, Hewlett-Packard (HP), has reduced its incorporation of 80 PLUS in its desktop PCs from 75 percent in 2010 to 60 percent in 2011, due in part to the need to compensate for increasing costs of other components such as memory and hard drives.

## **Status of Market Transformation**

Navigant reviewed the findings of MPER #4 in the context of the six market barriers identified in the program logic model to determine if market transformation progress to date has successfully removed those barriers. While most barriers no longer impede adoption of energy-efficient power supplies, Navigant concludes that the *incremental cost* of 80 PLUS power supplies and the *lack of customer awareness* of power supply energy use remain as impediments to greater market transformation.

**Incremental cost continues to be a barrier to successful market transformation.** OEMs reported on several market dynamics that, combined with incremental costs, place the currently high levels of 80 PLUS adoption at risk. Specifically, these market dynamics are *the low profit margin of the desktop PC* and *the fluctuating materials costs and uncertain supply chain for PC components*. OEM interviewees emphasized that the desktop PC has become highly commoditized, indicating low profit margins and thus suggesting that OEMs may be highly sensitive to even small component cost increases. OEMs rely on an international supply chain that can be disrupted by natural disasters, including recent flooding in Thailand, which is driving up hard drive prices by up to \$80 per unit. These unexpected cost increases may lead OEMs to seek opportunities to cut costs on other components such as power supplies, because they need to maintain their (very thin) profit margins without significantly raising the price on their PCs.

**Low customer awareness of the 80 PLUS brand also continues to be a barrier to successful market transformation.** Customer demand for ENERGY STAR is currently high, but customers rarely seek out desktop PCs with 80 PLUS power supplies that are not also ENERGY STAR. Thus, the fate of 80 PLUS is currently linked to the continued success of ENERGY STAR as a consumer marketing platform.

**There is significant uncertainty in the future of ENERGY STAR specifications and its effect on qualifying desktop PCs' prices and availability.** The U.S. Environmental Protection Agency released a new draft ENERGY STAR specification for desktop PCs in February 2012, and while it does not incorporate an increased efficiency requirement for desktop PC power supplies, it is not certain how aggressive the other components of the standard will be and how much difficulty OEMs will have in reaching the new standard, which could lead to higher prices for ENERGY STAR desktop PCs.

**If ENERGY STAR market share drops significantly, it appears likely that 80 PLUS market share will drop as well.** Whether the OEMs revert to non-80 PLUS levels or simply drop back from 80 PLUS Bronze (the current ENERGY STAR requirement) to 80 PLUS Base, there is a real risk that OEMs will not continue to pay the incremental cost associated with 80

PLUS if they are not receiving the benefit of marketing their ENERGY STAR compliance to customers.

## Conclusions

ENERGY STAR and 80 PLUS market share is currently strong at 70 percent of commercial desktop PCs; however, because the 80 PLUS initiative did not fully remove two of the identified market barriers (incremental cost and low customer awareness), 80 PLUS market share is vulnerable to several market dynamics that would not otherwise have threatened to decrease 80 PLUS market share. Due to the close relationship between 80 PLUS and ENERGY STAR and the likelihood that ENERGY STAR market share will drop when the new ENERGY STAR specifications go into effect later in 2012, it is unlikely that 80 PLUS market share will sustain itself at current levels. The evidence leads the evaluation team to conclude that 80 PLUS has *partially transformed* the market for energy-efficient power supplies and is unlikely to achieve full market transformation under the current program logic and level of investment.

## Next Steps for NEEA

Based on the conclusions described above, Navigant identified four possible options for NEEA to pursue, depending on whether the objective is greater market transformation or merely maintenance of market transformation gains thus far, and whether market share naturally sustains itself at current levels after the ENERGY STAR 6.0 specification goes into effect. These options include the following:

- ***Option 1: Reinstate an incentive for ENERGY STAR qualified desktop PCs for at least one full year subsequent to the new ENERGY STAR specifications taking effect.*** Incentives may assist OEMs in maintaining their current levels of ENERGY STAR market share during this period of uncertainty.
- ***Option 2: Reinstate an incentive for desktop PCs using 80 PLUS power supplies (but not necessarily ENERGY STAR).*** A financial incentive may encourage the OEMs to directly market the benefits of 80 PLUS power supplies to their customers in lieu of ENERGY STAR.
- ***Option 3: Initiate an end-user-focused marketing campaign*** to reintroduce the 80 PLUS brand to commercial buyers who have previously focused on ENERGY STAR.
- ***Option 4: Phase out support for 80 PLUS.*** The final option is for NEEA to recognize that its efforts have successfully effected a significant—though partial—transformation of the market for energy-efficient power supplies and phase out the initiative.

# 1. INTRODUCTION

The 80 PLUS program certifies energy-efficient power supplies for desktop (PCs) and servers. As a sponsor of 80 PLUS from 2004 to 2011, the Northwest Energy Efficiency Alliance (NEEA) provided financial incentives to computer manufacturers for commercial sales of PCs and servers incorporating 80 PLUS certified power supplies within the Northwest region.

The primary objectives of this fourth Market Progress Evaluation Report (MPER #4) are to update the ACE model assumptions related to market share, baselines, and costs, and to assess whether the market for energy-efficient power supplies has transformed to the point that it will sustain itself. A related objective is to update NEEA's understanding of the market for energy-efficient power supplies - specifically, to improve understanding of the trends, status, and dynamics of the market for energy-efficient power supplies in PCs in order to identify any additional actions necessary for NEEA to ensure a sustainable transformation of the market. Additionally, NEEA seeks a review and response to its comments on Navigant's recommendations pertaining to the logic model and market progress indicators (MPIs) made in MPER #3.

This MPER addresses the following topics:

1. **Market characterization:** recent trends and future outlook in the markets for commercial PCs and energy efficient power supplies;
2. **NEEA's Alliance Cost-Effectiveness (ACE) model:** an update of the ACE model assumptions based on findings from the market research; and
3. **Recommendations for the future of NEEA's 80 PLUS initiative,** including the degree to which 80 PLUS has transformed the market for energy-efficient power supplies and whether NEEA should continue funding the initiative.

## 1.1 80 PLUS Program Overview

In 2004, NEEA became the first funder of the 80 PLUS program, which certifies energy-efficient power supplies and incents manufacturers to sell 80 PLUS certified power supplies with their desktop PCs and servers within sponsoring regions.<sup>1</sup> The original 80 PLUS specification for desktop PC power supplies required 80 percent efficiency. Over the following years, the program added new certification levels to push the market toward higher efficiencies, labeled as Bronze, Silver, Gold, Platinum, and Titanium.

NEEA worked closely with the U.S. Environmental Protection Agency (EPA) to incorporate the 80 percent efficient power supply into the ENERGY STAR standard for desktop PCs. In 2007, the EPA adopted the 80 PLUS standard as part of the ENERGY STAR 4.0 requirements for desktop PCs. The latest ENERGY STAR 5.0 desktop PC specification, which went into effect in July 2009, requires an 80 PLUS Bronze equivalent power supply.

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<sup>1</sup> The 80 PLUS certification does not cover laptops.

In January 2010, to focus the market on higher levels of efficiency, NEEA phased out incentives for 80 PLUS non-ENERGY STAR desktop PCs and servers, and for some time, the 80 PLUS program offers incentives only for ENERGY STAR qualified desktop PCs and servers sold within the Northwest region. As of January 2011, NEEA no longer provides incentives for this program.

Table 1 summarizes the minimum efficiencies required for 80 PLUS certification as well as the year the standards took effect and when they were incorporated into the ENERGY STAR requirements (if applicable).

**Table 1. Summary of 80 PLUS Efficiency Certification Levels**

<b>80 PLUS Level</b>	<b>Minimum Efficiency for Desktops, Workstations, and Non-Redundant Servers</b>	<b>Minimum Efficiency for Redundant Servers</b>	<b>Year Introduced</b>	<b>ENERGY STAR Requirement</b>
Base	80%	N/A	2004	July 2007-July 2009
Bronze	85%	85%	2008	July 2009-present
Silver	88%	89%	2008	N/A
Gold	90%	92%	2008	N/A
Platinum	92%	94%	2010	N/A
Titanium	N/A	96%	2011	N/A

Note: Minimum efficiencies vary at different percentages of rated load; for simplicity of comparisons, this table specifies only the minimum efficiency at 50% of rated load.  
N/A indicates that the ENERGY STAR requirement is not applicable.  
Source: Ecos Plug Load Solutions website

## 1.2 Program Logic Model

Table 2 presents NEEA’s logic model for the 80 PLUS program, which articulates NEEA’s theory of change in the power supply market. Navigant’s research for this MPER focused primarily on the market barriers (identified in the first column) as well as the expected long-term outcomes as they pertain to the question of whether NEEA has transformed the power supply market.

NEEA identified the following barriers at the program outset:

- Power supplies are differentiated by price, not performance
- No availability of more efficient power supply options
- No testing protocol to verify power supply efficiency
- Incremental cost of energy-efficient power supplies compared to standard power supplies
- Lack of a rigorous ENERGY STAR specification for computer power supplies
- Lack of customer awareness of power supply energy use

This report revisits these barriers in the Conclusions section to assess whether the program has transformed the market for energy-efficient power supplies for desktop PCs.

**Table 2. Program Logic Model from MPER #2**

Situation <i>The context and need that gives rise to an initiative</i>	Inputs <i>The resources, contributions, &amp; investments made in response to the situation</i>	Activities <i>What you do with your inputs (lead to outputs)</i>	Outputs <i>The desired outputs (tools, materials, plans, etc.) from your activities (lead to outcomes)</i>	Outcomes		Impact <i>Changes in the market resulting from the preceding outcomes</i>
				Short Term <i>The results and benefits</i>	Longer Term <i>The results and benefits</i>	
<p><b>Barriers:</b></p> <ul style="list-style-type: none"> <li>- Desktop computer power supplies are treated as a commodity, differentiated by price instead of performance.</li> <li>- No supply of more efficient power supplies.</li> <li>- No testing protocol to verify power supply efficiency.</li> <li>- Likely cost differential between conventional and efficient power supplies.</li> <li>- Existing ENERGY STAR efficiency standard for power supplies sets a very low bar for industry.</li> <li>- Commercial sector computer purchasers are unaware of power supply energy use.</li> </ul> <p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>- Power supplies that are at least 80% efficient can provide 82 kWh/yr of cost-effective savings.</li> <li>- Participate in a national initiative that can help influence an upgrade to the ENERGY STAR specification for desktop computers.</li> </ul>	<p><b>Initiative Lead (Ecos Consulting) for</b></p> <ul style="list-style-type: none"> <li>- Project administration</li> <li>- Marketing</li> <li>- Incentive processing and tracking</li> </ul> <p><b>Budget for:</b></p> <ul style="list-style-type: none"> <li>- Marketing</li> <li>- Incentives</li> <li>- Incentive administration</li> <li>- Evaluation</li> </ul>	<p><b>Develop and implement marketing plan, including</b></p> <ul style="list-style-type: none"> <li>- General outreach to media outlets serving OEMs, SIs, power supply manufacturers (PSM) and prospective purchasers</li> <li>- Providing content for manufacturers' communication channels</li> <li>- Developing materials for outreach by regional utilities</li> </ul> <p><b>Develop and manage national initiative beginning in August 2004, including</b></p> <ul style="list-style-type: none"> <li>- Meet with OEMs and SIs to explain benefits of 80 PLUS</li> <li>- Recruit PSMs</li> <li>- Develop a test protocol for power supplies</li> <li>- Test and certify power supplies</li> <li>- Receive and pay invoices of participating computer manufacturers</li> <li>- Secure participation of at least one other utility or energy organizations in the initiative</li> <li>- Update information on the initiative website</li> <li>- Share production and sales data with EPA</li> </ul> <p><b>Evaluate progress of initiative</b></p>	<p><b>Marketing</b></p> <ul style="list-style-type: none"> <li>- Marketing plan</li> <li>- Website is active</li> <li>- Marketing collateral developed for manufacturers, purchasers and utilities</li> </ul> <p><b>Initiative</b></p> <ul style="list-style-type: none"> <li>- Power supply testing protocols are developed</li> <li>- \$5 incentive is offered to help bridge price differential between conventional and 80 PLUS power supplies</li> <li>- At least two OEMs and SIs contacted to participate in initiative</li> <li>- PSMs submit units for testing and approval</li> <li>- At least one additional potential initiative sponsor contacted</li> <li>- At least one PSM contacted</li> </ul> <p><b>ENERGY STAR</b></p> <ul style="list-style-type: none"> <li>- Participate in public process for developing revised specification</li> <li>- Assess need for any additional support once specification goes into effect</li> </ul> <p><b>Evaluation</b></p> <ul style="list-style-type: none"> <li>- RFP for evaluation contractor</li> <li>- Select contractor</li> <li>- Conduct MPERs</li> </ul>	<p><b>Marketing</b></p> <ul style="list-style-type: none"> <li>- Marketing materials generate inquiries from: <ul style="list-style-type: none"> <li>- PSMs</li> <li>- OEMs and SIs</li> <li>- Electric utilities</li> <li>- Large consumers (<i>awareness</i>)</li> </ul> </li> <li>- Website usage increases over time (<i>awareness</i>)</li> </ul> <p><b>Initiative Management</b></p> <ul style="list-style-type: none"> <li>- Contractor posts and maintains power supply testing protocol on website</li> <li>- Contractor reimburses OEMs and SIs \$5 for each qualifying PC sold in NW (\$10 for each desktop server)</li> </ul> <p><b>Response from computer industry:</b></p> <ul style="list-style-type: none"> <li>- At least one major desktop PC OEM participates (<i>availability</i>)</li> <li>- At least one more PSM offers and supplies qualifying product (<i>availability</i>)</li> <li>- OEMs and SIs deliver sales of at least 70,000 qualifying units before end of 2005 (<i>market share/penetration</i>)</li> <li>- Participating OEMs and SIs receive \$5 incentive (\$10 for desktop servers) for each qualifying unit sold in NW</li> <li>- Buy-down spurs OEM and SI sales of qualifying PCs</li> </ul> <p><b>Support from other interested parties:</b></p> <ul style="list-style-type: none"> <li>- At least one other major utility or energy efficiency organization provides greater than \$1 million in support (<i>availability</i>)</li> </ul> <p><b>ENERGY STAR</b></p> <ul style="list-style-type: none"> <li>- EPA includes at least an optional power supply in its proposed revision to ENERGY STAR for computers by early 2005 (<i>awareness</i>)</li> <li>- EPA finalizes the revised standard, to take effect in early 2006 (<i>market share/penetration</i>)</li> </ul>	<ul style="list-style-type: none"> <li>- 75% or higher market share of 80 PLUS equipped PCs by 2010</li> <li>- Industry will continue to embrace ENERGY STAR as a significant marketing advantage</li> </ul>	<ul style="list-style-type: none"> <li>- All PCs meet ENERGY STAR specification</li> <li>- NEEA and/or utility support not needed</li> </ul>

OEM: Original equipment manufacturer (PCs); SI: systems integrator; PSM: power supply manufacturer

### 1.3 Terminology Used in the Report

There is a wide variety of terminology used in the computer industry. This report divides the personal computers (PCs) most relevant to this research into two broad classes: desktop PCs and laptops. For the purposes of this report, Navigant has adopted the following terms:

- **Desktop PCs** include any category of personal computer that is not portable. One subset of desktop PCs are **workstations**, which are powerful, high-end performance computers used primarily for technical or scientific applications. Both desktop PCs and workstations typically use the type of internal power supply that is applicable to the 80 PLUS program.
- **Laptops** include any category of personal computer that is portable and uses a traditional PC operating system, including notebooks, mini-notebooks, and netbooks. Some industry analysts include tablet computers in the laptop category, but Navigant refers to tablets separately (see definition below). Laptops primarily use external power supplies, which are not included in the 80 PLUS certification program.

Navigant refers to three other classes of computing products in the report, but these are not a primary focus of the research:

- **Servers**,<sup>2</sup> in the hardware context, are powerful computers that link other computers or devices together to form a network. Common applications for servers in a business context are mail servers, file servers, database servers, and print servers.
- **Tablets** are mobile computing devices used primarily for accessing the internet and other forms of media. They are similar to netbooks, but typically use a mobile operating system more akin to a smartphone than a traditional PC, although they are incorporating increasingly advanced mobile operating systems. Tablets usually have a touchscreen and no keyboard, and they often can charge via a power adapter or through a USB port on a computer. Some industry analysts consider tablets to be part of the laptop category, but for the purposes of this report, they are not included.
- **Thin clients** are the user interfaces for a virtualized PC in which all of the computing power, applications, and user data reside on a remote server, and the machine on the desk in front of the user is simply a display and input device. Thin clients can be either portable or stationary; also, some manufacturers use tablet computers as thin clients.

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<sup>2</sup> Although MPER #3 discussed servers, this MPER #4 focused solely on personal computers.

## 2. EVALUATION ACTIVITIES

The evaluation activities conducted for this MPER included both primary and secondary research. Evaluation activities began with secondary research on the commercial desktop PC and laptop markets. Subsequent to that, the team contacted NEEA program staff and program implementers at Ecova (formerly Ecos Consulting) for additional background on the program. The principal research activity consisted of interviews with relevant market actors including Tier 1 and Tier 2 computer manufacturers (original equipment manufacturers, or OEMs) and industry experts with insights into the market for energy-efficient computer power supplies.

Table 3 summarizes the evaluation activities that independent third parties have conducted for the 80 PLUS program in the past three MPERs as well as in the current research effort.

**Table 3. Overview of Historical Evaluation Activities**

Evaluation Activity*	MPER #1	MPER #2	MPER #3	MPER #4 (Current Research)
<b>Secondary Research on PC and Server Market</b>	✓	✓	✓	✓
Review of Program Logic Model	✓	✓	✓	
<b>Review of Program ACE Model Assumptions</b>	✓	✓	✓	✓
<b>Interviews:</b>				
<b>NEEA and 80 PLUS Program Staff</b>	✓	✓	✓	✓
<b>OEMs</b> (participating & non-participating)	✓	✓	✓	✓
System Integrators (SIs) (participating & non-participating)	✓	✓	✓	
Power Supply Manufacturers (PSMs) (participating & non-participating)	✓	✓	✓	
Commercial End-Users		✓	✓	
<b>EPA Staff</b>	✓	✓		✓
<b>Industry Experts</b>				✓
Program Sponsors (other than NEEA)	✓			

\* Activities conducted for MPER #4 are in bold.

The following sections provide details on the evaluation activities undertaken by Navigant to meet NEEA's objectives.

### 2.1 Research Objectives

Navigant designed the research plan around NEEA's information needs presented in the first four columns of Table 4. In contrast to previous MPERs, for this initiative NEEA did not seek an update of the market progress indicators (MPIs)<sup>3</sup>; instead, MPER #4 focuses on updating ACE

<sup>3</sup> MPER #3 was completed less than one year prior to MPER #4 and thus the status of many MPIs likely have not changed significantly; key MPIs likely to have changed (such as 80 PLUS market share) are updated in MPER #4.

model assumptions and answering the question of the extent to which the 80 PLUS program has transformed the market for energy-efficient power supplies in desktop PCs.

Note that while Navigant has developed point estimates (as opposed to ranges) for metrics such as market share and baseline activity in order to provide direct inputs for the ACE model, the evaluation team recognizes that many of the topics researched in the development of this MPER involve a great deal of uncertainty. In particular, the discussion of naturally occurring baseline activity (i.e., what would have happened in the hypothetical absence of the 80 PLUS program) requires synthesis of qualitative information from multiple sources, as does the discussion of future activity in this large, dynamic, and internationally-influenced market. As such, Navigant sought to be conservative in recommending changes to the current ACE model assumptions and only recommended changes when the preponderance of evidence supported those changes.

Table 4 summarizes the research objectives and ACE model inputs updated in this report.

**Table 4. Mapping of NEEA's Information Needs to Research Objectives**

NEEA's Information Needs*			Navigant's Research Objective(s)	Direct Input to ACE Model?	Relevant Report Section
Priority (identified by NEEA)	Tiers	Description			
<b>Market Share</b>					
High	80 PLUS	2011 Market share	Market share – 80 PLUS - 2011	Yes, in combination with total desktop PC unit sales data	Section 3.2.1
High	ES 5.0	2011 Market share	Market share – ES 5.0 - 2011		
High	ES 5.0 + 20%	2011 Market share of ES 5.0 + 20% units	Market share – ES 5.0 + 20% - 2011		
High	ES 5.0	Extrapolation methodology for ENERGY STAR units not captured by Ecova's tracking system	<i>Methodology presented in discussion of ES 5.0 market share estimates.</i>	No	
Review	80 PLUS & ES 5.0	Market share forecast	Market share - 80 PLUS - forecast	Yes	Section 3.2.2
			Market share - ENERGY STAR - forecast		
<b>Naturally Occurring Baseline</b>					
High	80 PLUS & ES 5.0	2010 Naturally occurring baseline	Naturally occurring baseline – 80 PLUS - 2010	Yes	Section 3.3
			Naturally occurring baseline – ES 5.0 - 2010		
High	80 PLUS & ES 5.0	2011 Naturally occurring baseline	Naturally occurring baseline - 80 PLUS - 2011		
			Naturally occurring baseline - ES 5.0 - 2011		
Review	80 PLUS & ES 5.0	Naturally occurring baseline market share forecast	Naturally occurring baseline - 80 PLUS – forecast	Yes	Section 3.3
			Naturally occurring baseline - ENERGY STAR – forecast		
<b>Measure Life</b>					
Med	80 PLUS & ES 5.0	Percent of retired desktops that are being replaced with (1) laptops vs. (2) thin clients, tablets, iPads, etc.	Percent of retired desktops that are replaced with laptops, thin clients, or tablets	Not directly; affects measure life input	Section 3.4
Review	80 PLUS & ES 5.0	Measure life	Expected measure life of commercial desktop PC	Yes	

<b>Incremental Cost</b>					
Low	80 PLUS	Incremental cost of 80 PLUS Base power supply	Incremental cost of 80 PLUS Base power supply	Yes	Section 3.5
Med	ES 5.0	Price premium of 80 PLUS and ES 5.0 desktops compared to non-qualified desktops	Incremental cost of 80 PLUS Bronze power supply	Yes	
<b>Per-Unit Savings</b>					
Review	80 PLUS & ES 5.0	Savings rate analysis by Ecova	Per-unit energy savings for 80 PLUS power supply	Yes	Section 3.6
			Per-unit energy savings for ENERGY STAR 5.0 computer		
Low	80 PLUS & ES 5.0	Operating hour assumptions for a PC with and without a network PC power management installed	Operating hour assumptions for a PC with and without a network PC power management installed	Not directly; affects per-unit savings inputs	
Review	80 PLUS & ES 5.0	Share of desktops that would have Network PC power management in place	Share of desktops that have Network PC power management in place	Yes	
* Source: NEEA (Statement of Work to perform MPER #4)					

## 2.2 Secondary Research

Navigant conducted secondary research to document the evolution of the 80 PLUS program and the U.S. PC market in general. The research focused on recent and anticipated trends in the PC market, with particular attention paid to corporate information technology (IT) trends and trends in form factor (e.g., desktop PCs, laptops, tablets, etc.). Navigant reviewed a wide variety of sources, including:

- Industry analyst reports (e.g., IDC, Gartner, DisplaySearch)
- Business news sources (e.g., *Forbes*, *Bloomberg Businessweek*)
- PC industry publications and websites (e.g., *PC World*, *CNET*, *Macworld*)
- Ecova Plug Load Solutions (80 PLUS) website
- ENERGY STAR website
- OEM websites

The secondary research informed the development of the interview guides and provided a useful reality check on interviewees' responses.

## 2.3 Market Actor Interviews

The two primary market actor groups interviewed by Navigant are as follows:

- ***Tier 1 Computer Original Equipment Manufacturers (OEMs)***: These companies manufacture computers and/or servers in high volume, and include popular brands such as Dell, Hewlett Packard (HP), Apple, and Lenovo.
- ***Tier 2 Computer Original Equipment Manufacturers (Tier 2 OEMs)***: Like Tier 1 OEMs, these companies manufacture computers and/or servers, but at a smaller scale, and they often do not manufacture their own components.
- ***Industry Experts***: This category includes NEEA and Ecova staff who are knowledgeable about the 80 PLUS program as well as other industry experts with insights into 80 PLUS, ENERGY STAR, and power supply manufacturing.

Appendix C presents selected responses to open-ended interview questions.

### 2.3.1 Sample Design

Navigant designed the sample for interviewees to focus on the market actors who could most knowledgeably contribute to achieving the research objectives for this MPER, namely OEMs that participate in the 80 PLUS program or publicly acknowledge using energy-efficient power supplies. The research excluded any OEM, such as Toshiba, that did not produce commercial desktop computers. Navigant also interviewed industry experts who can provide insights into the overall market and the history of 80 PLUS and ENERGY STAR.

### 2.3.2 Interview Guide Design

The Navigant team developed OEM interview guides designed to understand the current market share of 80 PLUS and ENERGY STAR, including the naturally occurring baseline activity,

retirements of commercial PC stock, and the incremental costs of an 80 PLUS power supply. Using a subset of questions from the OEM interview guides, the team also explored overall market trends, naturally occurring baseline activity, incremental costs, savings rates and operating hour assumptions in its interviews with industry experts, including Ecova.

### 2.3.3 Interview Methodology

Navigant’s interviewers made phone calls and sent emails to introduce the objectives of the call to potential computer OEM and industry expert interviewees. The team called all contacts a minimum of five times and left a minimum of three voicemails, if needed.

Navigant completed a total of ten market actor interviews, as summarized in Table 5. The four Tier 1 OEMs accounted for approximately 66 percent of PC sales in the United States in 2011, based on data from IDC (2012), and three of the OEMs represent 100 percent of the Tier 1 OEMs that participate in the 80 PLUS program.

**Table 5. Completed Interviews by Market Actor Group**

<b>Market Actor Group</b>	<b>Targeted Interviews (n)</b>	<b>Completed Interviews (n)</b>
Tier 1 OEMs	5	4
Tier 2 OEMs		3
Industry Experts	3-5	3
<b>Total</b>	<b>8-10</b>	<b>10</b>

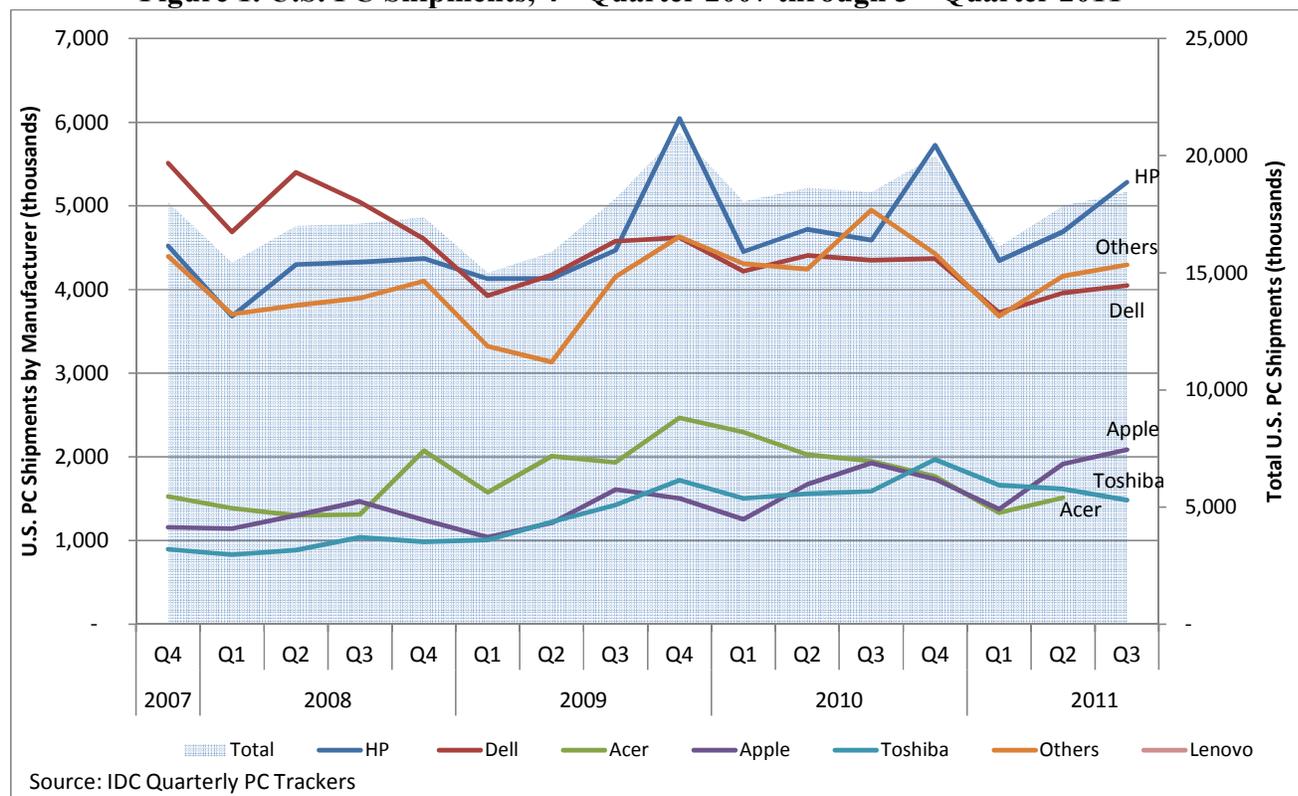
### 3. MARKET PROGRESS ASSESSMENT AND ACE MODEL INPUTS

#### 3.1 Market Characterization

##### 3.1.1 Trends in U.S. Sales of Desktop and Portable PCs

U.S. PC sales (including both desktop and portable PCs) declined in 2011, from approximately 75.1 million PCs sold in 2010 to 70.3 million in 2011 based on preliminary IDC year-end data. As shown in Figure 1, the major OEMs have jockeyed for market share position in recent year; HP emerged with a significant lead over Dell with more than 5 million PCs sold in Q3 2011, compared to Dell’s 4 million. Acer gained and then lost significant market share, and Apple gained enough market share to emerge as the third largest OEM in the country with more than 2 million PCs sold in Q3 2011.

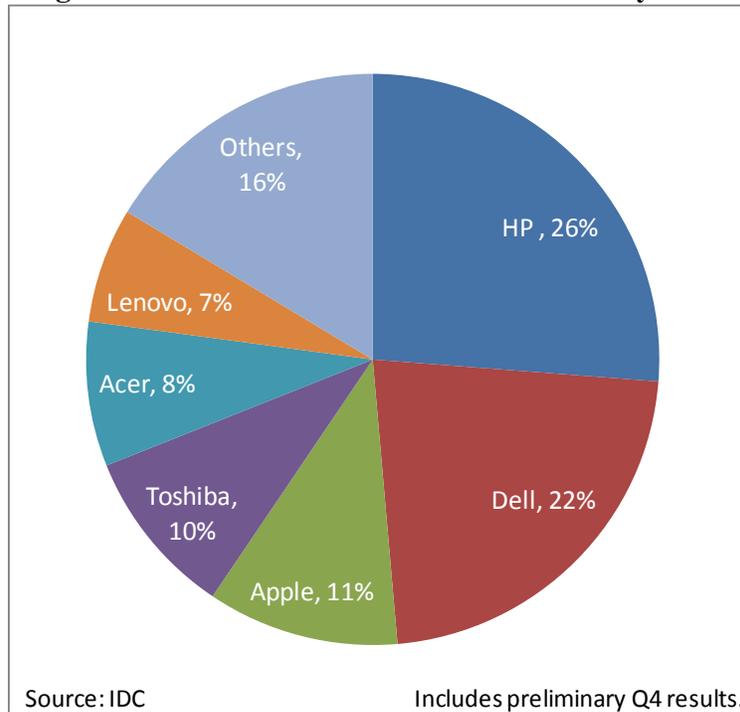
**Figure 1. U.S. PC Shipments, 4<sup>th</sup> Quarter 2007 through 3<sup>rd</sup> Quarter 2011**



IDC forecasts that U.S. PC shipments will continue their decline in first quarter 2012; IDC expects shipments to decrease by 5.1 percent (Ricadela 2012).

Figure 2 summarizes the current market share of each major OEM based on 2011 U.S. PC sales. Lenovo has gained significant market share in recent years and is now the sixth largest OEM in the country.

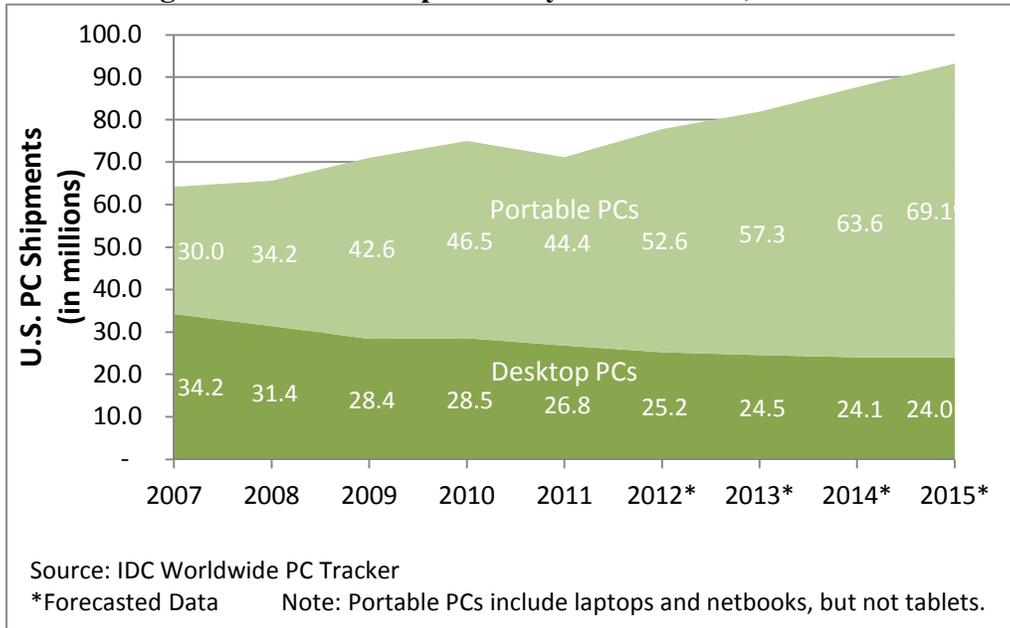
**Figure 2. 2011 U.S. PC Sales Market Share by OEM**



### 3.1.2 Trends by Form Factor

Desktop PC sales have remained relatively flat in recent years, although as a percentage of all PCs sold, desktop PCs have declined significantly in market share from 55 percent in 2007 to roughly 38 percent in 2011. (IDC 2011). Figure 3 illustrates the past and forecasted U.S. sales trends for desktop PCs and portable PCs through 2014. Industry analyst IDC estimated sales of 26.8 million desktop PCs in 2011 and forecasts several years of minor decline, though current forecasts indicate that annual U.S. desktop PC sales will continue to exceed 24 million units through 2015.

**Figure 3. U.S. PC Shipments by Form Factor, 2007-2015**



Although most OEMs reported that their desktop PC sales have remained steady or declined slightly, two Tier 1 OEM interviewees indicated that desktop PC sales have been increasing within the past two years. In the highly competitive desktop PC market, these Tier 1 OEMs with an international presence are constantly jockeying for market share by shifting geographic focus or expanding product lines to attract new customers.

Lenovo has made a special effort in the last few years to expand its presence in the U.S. market. Lenovo’s global desktop PC sales increased by 34 percent between 2010 and 2011 and they are now the top manufacturer of consumer desktop PCs and the third largest manufacturer of commercial desktop PCs in the world. (Lenovo 2012).

HP has also made a strong push to increase its desktop PC market share. HP indicated that they were exceeding projections for desktop PC sales in 2011, until the announcement that HP would stop selling PCs; HP subsequently reversed that decision, but the announcement did have a slowing effect on HP’s PC sales. HP’s laptop sales have declined in the past year, and they attribute this to the increase in smartphones and tablets.

The desktop PC market is evolving, with a trend toward smaller form factor PCs and all-in-ones (desktop PCs which integrate the processor and hard drive into the display to create a stand-alone unit). Industry analyst DisplaySearch estimated that worldwide sales of all-in-one desktop PCs increased 39 percent in 2011. Similarly, IDC has forecasted a significant increase in the sales of all-in-one desktop PCs, a view shared by many of the interviewed OEMs. Apple currently has 33 percent of the all-in-one market, which may help explain their growing overall PC market share as consumer preference shifts toward that form factor. HP introduced a new line of all-in-one desktop PCs in late 2011. (Ricadela and Edwards 2012).

### 3.1.3 Commercial PC Usage

Commercial PC buyers purchase desktop PCs and portable PCs at similar rates, although desktop PCs still have a slight edge in the commercial market. IDC data indicates that approximately 18 million commercial desktop PCs and 17 million commercial portable PCs were sold in the U.S. in 2011. (IDC 2012). In 2011, commercial customers purchased more than two-thirds (68 percent) of all desktop PCs sold in the U.S.

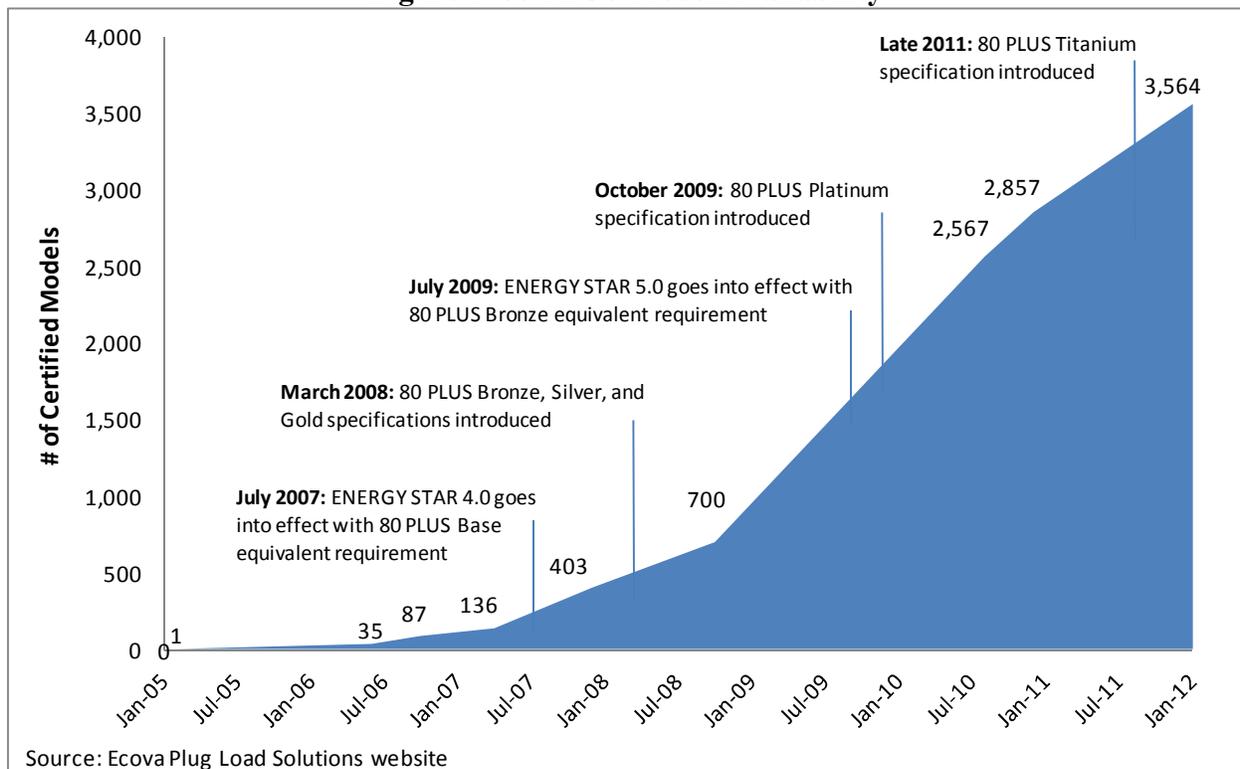
One OEM interviewee indicated that the trend toward all-in-one PCs is not limited to the consumer market; workers want to use the same type of computer at home and in the office. IDC predicts that all-in-one PCs will account for 15.7 percent of commercial desktop PCs by September 2012, an increase from 9.9 percent estimated in September 2011. (Paul 2011).

## 3.2 80 PLUS and ENERGY STAR Market Share

### 3.2.1 Current Market Share Estimates

According to Ecova, every major power supply manufacturer (PSM) is involved in the 80 PLUS program, including Acbel, Chicony, and Delta; the participating PSMs represent over 90 percent of power supplies sold in the U.S. The number and variety of 80 PLUS certified power supplies models continues to grow, and as of January 2012, there are 3,564 certified models for OEMs to choose from. Figure 4 presents the growth in 80 PLUS certified models since program inception.

**Figure 4. 80 PLUS Model Availability**



Most interviewed OEMs (five out of the seven interviewees) have moved beyond 80 PLUS Base and are using mainly 80 PLUS Bronze power supplies. OEMs chose to move to 80 PLUS Bronze

largely because of the incorporation of that efficiency level into the ENERGY STAR 5.0 specifications. Indeed, of the four Tier 1 OEMs interviewed, only Dell uses 80 PLUS power supplies in desktop PCs that *do not* also receive ENERGY STAR certification; while 20-25 percent of Dell’s desktop PCs use 80 PLUS power supplies, only approximately 10 percent of the company’s desktop PCs are ENERGY STAR. HP, Apple, and Lenovo all use 80 PLUS Bronze or higher power supplies and receive ENERGY STAR certification on all models with these efficient power supplies.

Table 6 summarizes the levels of 80 PLUS power supplies in use for each interviewed OEM as well as the percentage of 2011 desktop PC sales meeting 80 PLUS and ENERGY STAR criteria. Note that HP saw a decline in the percentage of desktop PCs that are ENERGY STAR certified from 2010 to 2011; in MPER #3, Navigant reported that 75 percent of HP’s 2010 desktop PC sales were ENERGY STAR compared to their current estimate of 60 percent in 2011. HP attributed this decline in their ENERGY STAR share to rising costs in other components; they had to make a compromise on power supplies to keep costs level for their customers.

**Table 6. 80 PLUS Use by OEMs**

OEM	80 PLUS Levels in Use				Percentage of Desktop PCs Sold in 2011 with...	
	Base	Bronze	Silver	Gold	80 PLUS or equivalent power supplies	ENERGY STAR certification
HP				✓	60%	60%
Dell		✓			20-25%	10%
Apple*		✓			100%	100%
Lenovo*		✓			50%	50%
Nor-Tech	✓	✓			75-80%	~75-80%
Equus	✓	✓			20%	~20%
CTL		✓			>90%	>90%

\* 80 PLUS Bronze at a minimum; some higher power supply efficiencies may also be used.  
 Note that these estimates refer to *all* desktop PCs, not just commercial desktop PCs.  
 Source: Navigant interviews and secondary research on OEM websites.

Combining the information presented in the preceding table with the market share data presented in Section 3.1.1, Navigant estimated the overall 2011 market share for 80 PLUS and ENERGY STAR desktop PCs to be 48 percent and 43 percent, respectively.

Table 7 presents findings for 80 PLUS market share, including 1) the detailed analysis and assumptions used to estimate 80 PLUS sales, 2) each OEM’s share of 80 PLUS power supplies, and 3) the national 80 PLUS market share. By these estimates, HP accounts for nearly 40 percent of the 80 PLUS equivalent power supplies sold in the U.S. in 2011. Apple accounts for nearly one-quarter, and Dell and Lenovo account for most of the remainder.<sup>4</sup>

<sup>4</sup> Note that a number of assumptions have to go into an analysis such as this, including the percentage of PCs sold that are desktop PCs for each OEM and estimation of the extent to which smaller Tier 2 OEMs (for whom IDC does

**Table 7. 80 PLUS Market Share Estimates for U.S. Desktop Sales, 2011**

	<b>US PC Shipments (2011) (in thousands) (A)</b>	<b>% Desktops (B)</b>	<b># Desktops (in thousands) (C)</b>	<b>Share of 80 PLUS Equivalent (%) (D)</b>	<b># 80 PLUS Equivalent (in thousands) (E)</b>	<b>Market Share of 80 PLUS Equivalent (%)</b>
HP	18,703	45%	8,416	60%	5,050	39%
Dell	15,957	45%	7,181	25%	1,795	14%
Apple	7,727	38%	2,936	100%	2,936	23%
Toshiba	6,785	0%	-	0%	-	0%
Acer	5,814	37%	2,151	20%	645	5%
Lenovo	4,635	45%	2,086	50%	1,043	8%
Others	11,678	37%	4,438	35%	1,553	12%
<b>Total</b>	<b>71,300</b>	<b>38%</b>	<b>27,208</b>	<b>48%</b>	<b>13,023</b>	<b>100%</b>
<i>Source</i>	<i>IDC for market share for top 5 OEMs and overall market; Lenovo estimated to have 7% market share, remainder in Others.</i>	<i>IDC (38% overall); see below for OEM-specific assumptions.</i>	<i>Calculated by multiplying PC shipments by % desktops (Col. A * B)</i>	<i>Secondary research and Navigant interviews with OEMs. Total is weighted average based on OEM market share.</i>	<i>Calculated by multiplying # desktops by % 80 PLUS equivalent. (Col. C * D)</i>	<i>Calculated by dividing # 80 PLUS equivalent by total (Col E div Total Col E)</i>

**Assumptions:**

- *Desktop Share Assumptions: Secondary research confirmed that 0% of Toshiba PCs are desktop PCs and 38% of Apple PCs are desktop PCs. Secondary research also indicated that HP and Lenovo likely have above-average desktop PC sales due to their strong enterprise and government customer bases, and that Acer is weak in desktop PC sales. Thus, HP, Dell, and Lenovo PC sales were assumed to be 45% of all PCs and the desktop PC share for the other OEMs was calculated to make the overall market share equal 38%, which is IDC's best estimate of the share of 2011 U.S. PC sales that are desktop PCs.*
- *80 PLUS Share for Acer and "Others": Navigant made assumptions for Acer and the "Others" category which includes smaller OEMs. Acer now has an ENERGY STAR qualified desktop PC line and Navigant conservatively estimated that it accounts for 20% of Acer's desktop PCs sales. For the "Others" category, Navigant considered the fact that two of the interviewed Tier 2 OEMs indicated that 75-90% of their desktop PCs used 80 PLUS.*

Navigant conducted the analysis for ENERGY STAR market share with the exact same methodology, but using OEM estimates of ENERGY STAR market share and similar assumptions as described above. Table 8 presents the ENERGY STAR market share estimates for 2011.

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not report market share or unit sales data) have adopted 80 PLUS and ENERGY STAR. Navigant conducted this analysis separately for 80 PLUS and ENERGY STAR market share, although note that the ENERGY STAR market share is a sub-component of 80 PLUS market share (the two tables are not mutually exclusive).

**Table 8. ENERGY STAR Market Share Estimates for U.S. Desktop Sales, 2011**

	<b>US PC Shipments (2011) (in thousands) (A)</b>	<b>% Desktops (B)</b>	<b># Desktops (in thousands) (C)</b>	<b>Share of ENERGY STAR (%) (D)</b>	<b># ENERGY STAR (in thousands) (E)</b>	<b>Market Share of ENERGY STAR (%)</b>
HP	18,703	45%	8,416	60%	5,050	43%
Dell	15,957	45%	7,181	10%	718	6%
Apple	7,727	38%	2,936	100%	2,936	25%
Toshiba	6,785	0%	-	0%	-	0%
Acer	5,814	37%	2,151	30%	645	6%
Lenovo	4,635	45%	2,086	50%	1,043	7%
Others	11,678	37%	4,438	30%	1,331	11%
<b>Total</b>	<b>71,300</b>	<b>38%</b>	<b>27,208</b>	<b>43%</b>	<b>11,724</b>	<b>100%</b>
<i>Source</i>	<i>IDC for market share for top 5 OEMs and overall market; Lenovo estimated to have 7% market share, remainder in Others.</i>	<i>IDC (38% overall); see below for OEM-specific assumptions.</i>	<i>Calculated by multiplying PC shipments by % desktops (Col. A * B)</i>	<i>Secondary research and Navigant interviews with OEMs; see below for OEM-specific assumptions. Total is weighted average based on OEM market share.</i>	<i>Calculated by multiplying # desktops by % ENERGY STAR. (Col. C * D)</i>	<i>Calculated by dividing # ENERGY STAR equivalent by total (Col E div Total Col E)</i>

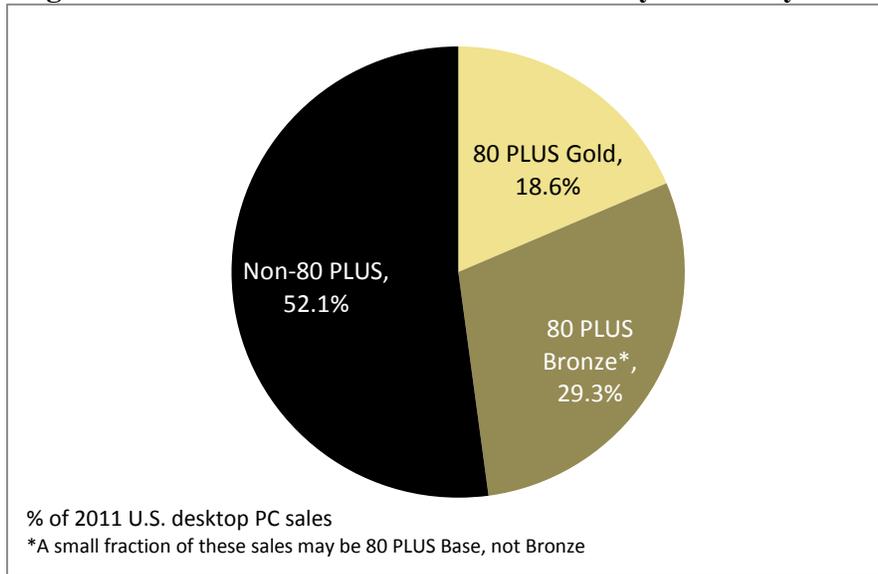
*Note:* The ENERGY STAR market share is a sub-component of 80 PLUS market share. Thus Table 7 and Table 8 are not mutually exclusive.

*Assumptions:*

- *Desktop Share Assumptions:* Secondary research confirmed that 0% of Toshiba PCs are desktop PCs and 38% of Apple PCs are desktop PCs. Secondary research also indicated that HP and Lenovo likely have above-average desktop PC sales due to their strong enterprise and government customer bases, and that Acer is weak in desktop PC sales. Thus, HP, Dell, and Lenovo PC sales were assumed to be 45% of all PCs and the desktop PC share for the other OEMs was calculated to make the overall market share equal 38%, which is IDC’s best estimate of the share of 2011 U.S. PC sales that are desktop PCs.
- *ENERGY STAR Share for Acer and “Others”:* Navigant made assumptions for Acer and the “Others” category which includes smaller OEMs. Acer now has an ENERGY STAR qualified desktop PC line and Navigant conservatively estimated that it accounts for 20% of Acer’s desktop PCs sales. For the “Others” category, Navigant considered the fact that two of the interviewed Tier 2 OEMs indicated that 75-90% of their desktop PCs used 80 PLUS and ENERGY STAR.

As shown in the preceding table, Navigant estimates that approximately 43 percent of all desktop PCs sold in the U.S. in 2011 were ENERGY STAR certified, based on OEM interviewees’ self-reports and secondary research. The majority of those ENERGY STAR desktop PCs used 80 PLUS Bronze power supplies, according to the OEM interviewees, but it is important to note that HP, the largest U.S. OEM, uses the significantly more efficient 80 PLUS Gold power supply. As shown in Figure 5, approximately 19 percent of all desktop PCs sold in the U.S. in 2011 used 80 PLUS Gold power supplies, 29 percent used 80 PLUS Bronze or equivalent, and the remainder used non-80 PLUS power supplies.

**Figure 5. Estimated 80 PLUS Market Share by Efficiency Level**

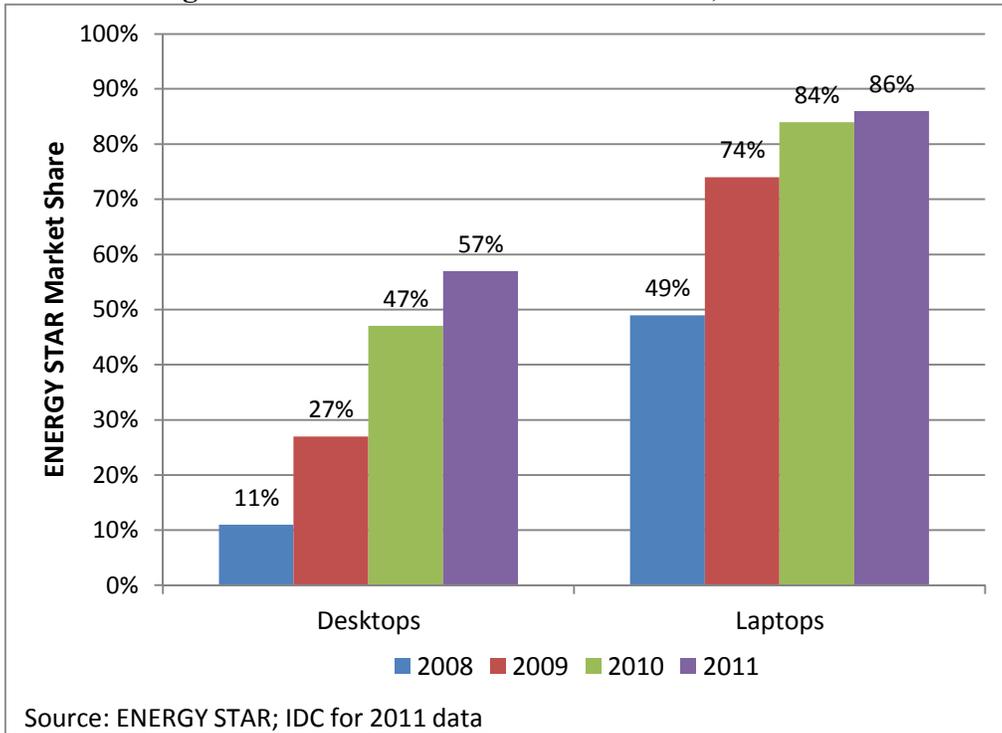


Source: OEM interviews, Navigant analysis

ENERGY STAR publishes an annual report of the market share for all ENERGY STAR product categories based on shipment data from manufacturers and industry associations. Official 2011 data is not yet available to compare to Navigant’s 43 percent ENERGY STAR market share estimated in this report, but IDC reported an estimated 57 percent of desktop PCs sold in the U.S. in 2011 were ENERGY STAR (IDC 2012), indicating that Navigant’s estimate based on OEM’s self-reported figures was too conservative.

Figure 6 presents ENERGY STAR market share for desktop PCs, workstations, and laptops for 2008-2011. ENERGY STAR estimated that market share for desktop PCs rose dramatically from 27 percent in 2009 to 47 percent in 2010. Note that the 2010 estimate from ENERGY STAR indicates that MPER #3’s estimate of 80 PLUS market share (37 percent) was also too conservative; it must have been at least 47 percent in 2010 because all ENERGY STAR desktop PCs use 80 PLUS or equivalent power supplies.

**Figure 6. ENERGY STAR Market Share, 2008-2011**



The 80 PLUS and ENERGY STAR market share estimates presented in Figure 6 above include both commercial and consumer PCs. Navigant was able to obtain ENERGY STAR market share estimates specific to the commercial market for 2011 only. IDC estimated that 70 percent of 2011 commercial desktop PC sales were ENERGY STAR certified, compared to 31 percent of consumer desktop PCs. (IDC 2012). By assuming that ratio between the commercial and consumer ENERGY STAR market share estimates has remained constant for the past few years, Navigant was able to use the overall ENERGY STAR market share estimates from 2008-2010 to estimate commercial desktop PC ENERGY STAR market share.

**Figure 7. Commercial Desktop PC ENERGY STAR Market Share Estimates, 2008-2011**

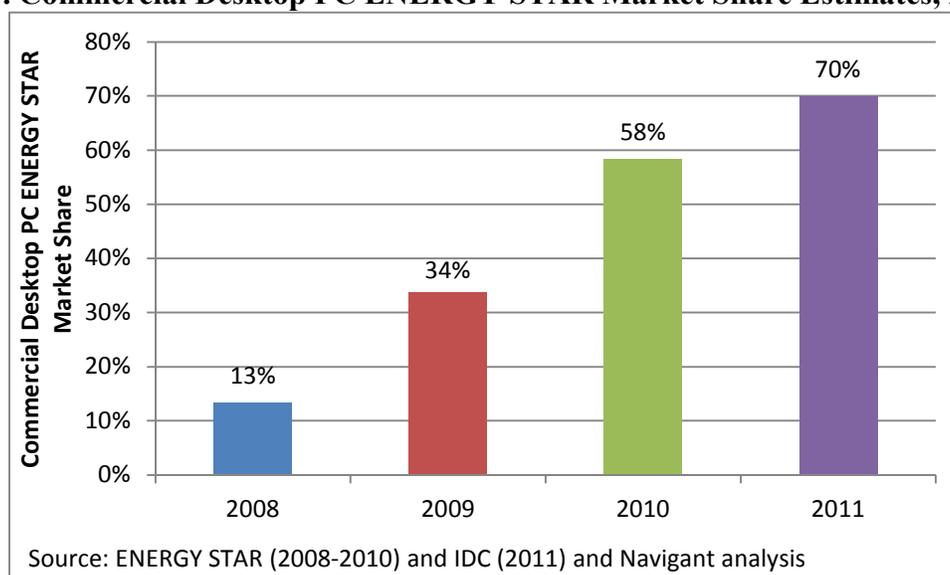


Table 9 presents recommended values for 80 PLUS and ENERGY STAR market share, based on Navigant’s analysis.

**Table 9. ACE Model Inputs: Current Market Share**

Input Category	Input	Recommended Value
Market Share	Market share – 80 PLUS – 2010*	58% of 2010 <i>commercial</i> desktop PC sales
	Market share - 80 PLUS - 2011	70% of 2011 <i>commercial</i> desktop PC sales
	Market share - ENERGY STAR - 2011	70% of 2011 <i>commercial</i> desktop PC sales
	Market share - ENERGY STAR + 20% - 2011	30% of 2011 <i>commercial</i> desktop PC sales**

\*Note that the scope of MPER #4 did not include an update of the 80 PLUS market share for 2010; however, upon reviewing the 2010 ENERGY STAR market share data made available by EPA and new data from IDC about the split between commercial and consumer desktop PCs, Navigant concluded that increasing the market share value for 2010 to 58% is warranted.

\*\*Based on Navigant’s estimate that HP comprises 43% of all ENERGY STAR desktop PC sales (see Table 8) and the fact that HP uses 80 PLUS Gold in its ENERGY STAR desktop PCs, rather than the minimum requirement of 80 PLUS Bronze.

### 3.2.2 Forecasted Market Share

The shift toward smaller footprint desktop PCs and all-in-one PCs *may* present a challenge to maintaining the current market share of 80 PLUS qualified power supplies as PSMs have to develop new models to meet the smaller and/or more oddly shaped dimensions required by these newer form factors. However, the interviewed market actors had differing perspectives on whether energy-efficient power supplies are readily available in dimensions that fit the all-in-one and smaller footprint desktop PCs. The Tier 1 OEMs indicated that they have not had any issues with locating and/or developing energy-efficient power supplies that fit their all-in-ones and smaller form factor desktop PCs, but some Tier 2 OEMs—who more often have to purchase off-the-shelf components rather than specifying components themselves—indicated that there is less availability of 80 PLUS power supplies for these newer form factor desktop PCs.

Another factor that may affect future 80 PLUS and ENERGY STAR market share is volatile costs and uncertain supply of components such as hard drives and memory. One OEM interviewee indicated that a recent spike in memory costs, combined with their desire to keep their PCs at a steady cost, caused them to put fewer high efficiency power supplies in their desktop PCs.

A shortage in hard drives caused by flooding in Thailand in late 2011 will further put pressure on OEMs to reduce costs and some may sacrifice selection of energy-efficient power supplies as a way to offset the increased costs of other components. (Chao and Lee 2012). According to one industry analyst, hard drive prices increased by \$10-25 as a result of the Thailand floods. (Ricadela 2011). Other sources say hard drive prices have increased by \$50 to \$80 as a result of the floods. (Crothers 2011). Some industry analysts predict that the hard drive shortage may persist through 2012. Nearly half (40-45 percent) of hard drives produced in the first half of 2011 were manufactured in Thailand, so any disruption to their manufacturing is certain to create a ripple effect through the PC industry. (Trefis Team 2011).

International market forces can also affect 80 PLUS market share in positive ways. A driver of increased 80 PLUS market share has been changes to efficiency requirements in other countries in which the major OEMs are also active, particularly Europe and Japan; this trend has helped to bring incremental costs down and has forced OEMs to be more aggressive in their energy efficiency and sustainability efforts. If other countries continue to mandate higher efficiency levels for power supplies, the incremental cost of 80 PLUS may decrease further.

The most significant source of uncertainty in 80 PLUS market share forecasts is the upcoming change in ENERGY STAR specifications. The EPA released the draft ENERGY STAR 6.0 specifications on February 14, 2012. Although they do not include a requirement for a higher level of energy-efficient power supplies (the draft specification requires an 80 PLUS Bronze power supply, same as ENERGY STAR 5.0 specification), it is unclear whether OEMs will struggle to meet the other requirements contained in the new specification. It is probable that ENERGY STAR market share will decline slightly or hold steady rather than continue its trajectory of dramatic growth (as shown in Figure 6 above) when the new specification takes effect, although that effect will likely be temporary. ENERGY STAR seeks to increase efficiency requirements any time a product reaching an ENERGY STAR market share of 50 percent or more (ENERGY STAR 2012), so that the ENERGY STAR label continues to represent the top tier of efficiency; thus, the intended effect of the new ENERGY STAR specification is to *reduce the market share of ENERGY STAR certified desktop PCs*.

Given that the vast majority of 80 PLUS qualified power supplies are going into ENERGY STAR desktop PCs and customers primarily recognize and demand the ENERGY STAR brand and not 80 PLUS, it is expected that 80 PLUS market share will track closely with ENERGY STAR market share.

The draft ENERGY STAR 6.0 specification does not include an increased requirement for 80 PLUS Silver. It therefore seems unlikely that OEMs will voluntarily move beyond 80 PLUS Bronze, with the exception of HP which has already moved to 80 PLUS Gold. One OEM indicated that they were ready to increase their power supply efficiency but they were waiting to find out what the next ENERGY STAR requirement would be; they stated, “We are primed to turn the wheel [to a higher level of 80 PLUS] when it happens, we just don’t know what the

specification will be yet.” This suggests that the ENERGY STAR specification is the primary driver for deciding what level of 80 PLUS power supply to use in desktop PCs. Thus, market share for the higher levels of efficiency (Silver and above) is unlikely to increase in the near future.

**Table 10. Summary: Trends and Market Forces that May Influence Future 80 PLUS Market Share**

<b>Market Forces that May Increase 80 PLUS Market Share in Near Future</b>	<b>Market Forces that May Decrease 80 PLUS Market Share in Near Future</b>
<ul style="list-style-type: none"> <li>➤ Growing customer demand for ENERGY STAR, particularly from the government and education sectors</li> <li>➤ OEMs are getting more aggressive with energy efficiency and sustainability in their product design as they strive to meet a variety of international regulations</li> <li>➤ OEMs with higher use of 80 PLUS (e.g., Apple, HP, and Lenovo) are experiencing growth in desktop PC sales; OEMs with less 80 PLUS use are losing market share</li> </ul>	<ul style="list-style-type: none"> <li>➤ Uncertainty in effects and timing of next ENERGY STAR specification, which may increase prices</li> <li>➤ Increased component costs for hard drives due to a temporary supply chain disruption may force OEMs to compromise on other “premium” components such as energy-efficient power supplies</li> <li>➤ Possible lack of available 80 PLUS certified models to fit all-in-one and smaller form factor desktop PCs</li> </ul>

*Source: Navigant interviews with OEMs*

Taking all of these factors into account, it seems likely that the growth in 80 PLUS and ENERGY STAR market share seen leading up to 2010 has already begun to slow, and market share may decline if the new ENERGY STAR specifications turn out to be aggressive enough to make costs go up. 80 PLUS and ENERGY STAR are now so closely intertwined that any decline in ENERGY STAR market share will likely result in a corresponding decline in the use of 80 PLUS certified power supplies. For the next year or two, it appears that there is significant uncertainty in the market for energy-efficient power supplies and Navigant’s best estimate is that market share may hold steady at 2011 levels for the near future.

**Table 11. ACE Model Inputs: Forecasted Market Share**

<b>Input Category</b>	<b>Input</b>	<b>Recommended Value</b>
Market Share	Market share - 80 PLUS - forecasted	Hold steady at 2011 levels for 2012; review again after more is known about ENERGY STAR 6.0
	Market share - ENERGY STAR - forecasted	Hold steady at 2011 levels for 2012; review again after more is known about ENERGY STAR 6.0
	Market share - ENERGY STAR + 20% - forecasted	Current level is approximately 19% of U.S. desktop PC sales based on HP’s sales. Navigant forecasts very little increase; without ENERGY STAR pushing to 80 PLUS Silver or higher, OEMs are unlikely to voluntarily move beyond 80 PLUS Bronze (except for HP, which is already at 80 PLUS Gold).

### 3.3 Naturally Occurring Baseline Activity

Naturally occurring baseline activity is market activity that would have occurred due to other market influences, in the absence of NEEA’s 80 PLUS initiative. Navigant queried OEMs about their usage of energy-efficient power supplies prior to participation in the 80 PLUS program and

about other organizations (besides 80 PLUS) that have been influential in their use of energy-efficient power supplies. Navigant based its findings presented in this section on seven interviews conducted with OEMs and three interviews conducted with industry experts with knowledge of the power supply industry and the 80 PLUS program, as well as personal communication with a representative of the EPA, which administers the ENERGY STAR program.

**Tier 1 OEMs’ perspectives.** Among the OEMs, Apple was the first to seriously pursue the development of energy-efficient power supplies, which the company began *prior to* the development of the 80 PLUS specification. Given this history, one might consider much of Apple’s use of energy-efficient power supplies to be naturally occurring baseline activity, especially since the company still does not participate in the program. However, since no chipset for 80 PLUS was available at the time of program inception (according to the interview with NEEA staff), 80 PLUS likely played a role even in Apple’s adoption of the 80 percent efficiency specification. Furthermore, Apple’s move to higher levels of efficiency (80 PLUS Bronze and above) may be at least partly attributable to the 80 PLUS program’s efforts, as well as the desire to meet the ENERGY STAR 5.0 specifications.

Of the three largest OEM participants (Dell, Lenovo, and HP), both Lenovo and HP used energy-efficient power supplies prior to participation in the 80 PLUS program, spurred by the ENERGY STAR 4.0 desktop PC specification. All the Tier 1 OEMs cite the customer demand for ENERGY STAR as a primary influence on their decision to adopt high-efficiency power supplies. This suggests that there may have been some adoption of efficient power supplies without 80 PLUS, but perhaps not without ENERGY STAR—which itself derived power supply efficiency standards from 80 PLUS. In fact, the 80 PLUS program was instrumental in getting energy-efficient power supplies incorporated into the ENERGY STAR standard, and an EPA representative indicated to Navigant that the ENERGY STAR desktop PC specification would certainly have been developed, but would have likely taken several years to develop if 80 PLUS had not already developed a specification and testing protocol:

*“If no other viable standards existed (i.e., standards that met ENERGY STAR’s needs), then ENERGY STAR would have eventually developed its own, independent requirements. However, this would have taken much longer and involved a great deal of effort on our part. This hypothetical ENERGY STAR power supply standard would also have not been as broadly or rapidly adopted as 80 PLUS. It’s difficult to estimate the amount of time and effort saved on our end by the adoption of the 80 PLUS program’s requirements, but it has been substantial.”*

Navigant reviewed the findings of the previous MPERs to learn whether earlier interviewees could further illuminate likely baseline activity. Such a “prospective” view of market actor interviewees from earlier in the program’s history would be valuable to compare to the “retrospective” view of similar market actors in 2012. However, there is no explicit discussion of naturally occurring baseline activity in MPER 1 or 2, and the term “baseline” does not appear in either document. MPER 2 emphasizes the role that the 80 PLUS initiative played in getting an 80 PLUS requirement incorporated into the ENERGY STAR 4.0 specification, which lends credence to Navigant’s perspective that the acceleration of ENERGY STAR’s adoption of a

power supply efficiency requirement is the most significant accomplishment of the 80 PLUS program.

**Other market actors' perspectives.** Similar to the Tier 1 OEMs, two of the three interviewed Tier 2 OEMs also used energy-efficient power supplies prior to participation in the 80 PLUS program. However, participating Tier 2 OEMs describe a more direct cause-and-effect relationship between the 80 PLUS program incentives and their sales of 80 PLUS qualified power supplies than do the Tier 1 OEMs. This may be due to Tier 2 OEMs experiencing higher incremental costs than the larger Tier 1 OEMs who have more buying power (see Section 3.5 for more discussion of incremental cost).

The power electronics expert interviewee, who served as a technical advisor to the 80 PLUS program, described the early years of 80 PLUS as a time when the idea of 80 percent efficiency at 50 percent of rated load was simply something that “got laughed at.” When asked if the shift to an 80 percent efficient power supply would have happened without the 80 PLUS initiative, he responded “No, no absolutely not. I can’t tell you how many places I got laughed at and laughed out of when I mentioned 80 PLUS, and it wasn’t that the technology couldn’t do it.” He indicated that OEMs “were not willing to add even a dollar to the cost to increase efficiency” at that time, and it took more than a year of heavy effort working with manufacturers to get one power supply that could surpass 80 percent efficiency at 20 percent, 50 percent, and 100 percent of rated load. He also described the importance of the third party testing that 80 PLUS provides, which was motivating for PSMs because they wanted to be able to market the fact that they were hitting the highest levels of efficiency.

**Market influences.** Besides ENERGY STAR, another source of non-80 PLUS market influences is the fact that each major OEM involved in the 80 PLUS program (as well as some that are not participating) are international companies producing desktop PCs that are used throughout Europe, Asia, and often the developing world, and each region has its own set of mandatory or voluntary efficiency standards. European governments are requiring that schools purchase equipment (including PCs) which meets the Blue Angel specifications, similar to ENERGY STAR. After Japan’s recent earthquake and nuclear plant disaster, Japanese companies (and individuals) were asked to make significant efforts in energy efficiency and conservation, which—according to one OEM interviewee—is driving increased sales of energy-efficient PCs.

Overall, OEMs are being more aggressive with energy efficiency and overall sustainability in the design and production of their PCs because they have to meet customer demand and standards set by many different countries. These influences are international in scope and contribute to the difficulty of estimating what “naturally occurring” activity would exist in the absence of the 80 PLUS program. However, they do confirm that—in the absence of the 80 PLUS program—other influences would have eventually moved the OEMs to higher levels of power supply efficiency.

**Baseline market share.** NEEA’s ACE model shows the first significant registering of 80 PLUS market share by 2008 (~7 percent), with market share accelerating significantly within two years, reaching at least 37 percent by 2010 (Navigant 2011). With updated information from ENERGY STAR and IDC, Navigant now estimates that 80 PLUS/ENERGY STAR reached 58 percent market share by 2010. Navigant’s interviews with 10 OEMs and industry experts suggest that the 80 PLUS initiative’s primary effect on the market was the acceleration of incorporating energy-

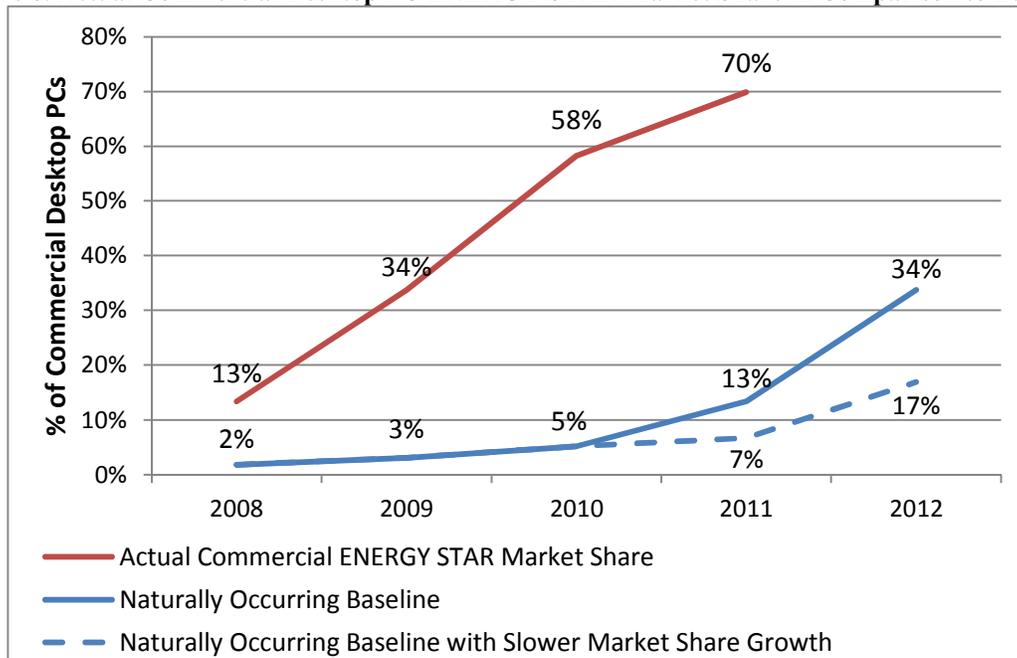
efficient power supply requirements into the ENERGY STAR desktop PC specification. Interviewees suggest that 80 PLUS accelerated that process by roughly two to three years, though most acknowledged the inherent uncertainty in such speculations.

Thus, Navigant believes that an appropriate naturally occurring baseline curve mimics the actual growth of ENERGY STAR market share with a three-year delay (in other words, the 2011 baseline market share would be the 2008 actual ENERGY STAR market share, and so on).

Another way to view the baseline assumption is to recognize that in the absence of the 80 PLUS initiative, ENERGY STAR likely would have adopted an 80 percent efficiency standard within about three years (by 2010, going into effect in 2011). After that point in the hypothetical baseline scenario, consumer demand for ENERGY STAR would result in roughly the same trajectory of ENERGY STAR market share growth as it did in reality during the 2008-2011 period, just three years later. There is evidence from EPA and others that in the absence of the 80 PLUS initiative's advocacy and incentives to engage market actors and build up supply capacity, the rate of growth in ENERGY STAR's market share after adoption of the new specifications may have been slower than the historic rate observed between 2007-2011. Even if this is true, insufficient data exists upon which to quantify this effect; a reasonable estimate is that the ENERGY STAR market share would have been half of the observed values for a period of three years beyond the three-year delay in adoption of the standard by ENERGY STAR discussed above (i.e., in 2011-2013).

Figure 8 provides a visual representation of the estimated naturally occurring baseline for 2008-2012 (both with and without a slower adoption rate in 2011-2012) in comparison to the actual ENERGY STAR market share.

**Figure 8. Actual Commercial Desktop PC ENERGY STAR Market Share in Comparison to Baseline**



Source: ENERGY STAR (2008-2010, red line); IDC (2011, red line), NEEA ACE model (2008-2010, blue line), Navigant analysis (2011-2012, blue lines)

Note that Navigant recommends the same baseline estimates for both 80 PLUS and ENERGY STAR because - in the absence of an 80 PLUS initiative - Navigant assumes that ENERGY STAR would have largely accomplished the same outcomes that the 80 PLUS initiative accomplished (several years later), but ENERGY STAR would not have promoted the use of 80 percent or higher efficiency power supplies in non-ENERGY STAR desktop PCs. The fact that most OEMs do not incorporate 80 PLUS power supplies into their non-ENERGY STAR desktop PCs supports this decision to create a single baseline for all desktop PCs incorporating energy-efficient power supplies.

**Uncertainty in the Baseline Assumptions.** Navigant believes that the use of actual ENERGY STAR market share with a three-year lag is an appropriate, conservative approach for estimation of naturally occurring baseline activity. However, there is considerable uncertainty in the efficiency levels of the ENERGY STAR specifications and in the rate of adoption of ENERGY STAR.

- *Efficiency.* The exact specification of whatever power supply standards ENERGY STAR would have adopted in the absence of the 80 PLUS initiative is unknown. EPA was investigating new power supply specifications for ENERGY STAR as early as 2002, and included an 80 percent specification for 50% loading in its early proposals. However, the agency’s recommendation for 80 percent efficiency at all loads was a direct outcome of advocacy from NEEA and 80 PLUS advocates. Thus, it is possible that the EPA would have adopted new power supply efficiency standards that were less rigorous than those espoused by 80 PLUS. In this case, the standards would likely have taken effect in a similar timeframe to what actually occurred, and almost certainly within three years of the actual 2007 ENERGY STAR 4.0 specification.
- *Rate of market share growth.* There may be merit to the argument that the 80 PLUS program not only accelerated the timeline of when ENERGY STAR *began* requiring 80 percent efficient power supplies, but also accelerated the rate of ENERGY STAR market share growth after that point. Figure 8 above portrays this scenario in the dashed line labeled “Naturally Occurring Baseline with Slower Market Share Growth.”

**Table 12. ACE Model Inputs: Naturally Occurring Baseline**

Input Category	Input	Recommended Value
Naturally occurring baseline	Naturally occurring baseline – 80 PLUS - 2010	5% of commercial desktop PCs
	Naturally occurring baseline – ES 5.0 - 2010	
	Naturally occurring baseline - 80 PLUS - 2011	13% of commercial desktop PCs
	Naturally occurring baseline - ES 5.0 - 2011	
	Naturally occurring baseline - 80 PLUS - forecast	34% in 2012; 58% in 2013; 70% in 2014
	Naturally occurring baseline - ENERGY STAR - forecast	

### 3.4 Measure Life

Most interviewed market actors believe that customers are replacing computers less frequently. They attribute this trend toward longer refresh cycles, which started in the 2007-2008 time

frame, largely to economic factors. One interviewed Tier 2 OEM stated, “We saw the refresh cycle go from 3 years, to 4 years, to 5 years.” Another attributed the increased lifetime of a PC to increased reliance on cloud computing, and indicated that “more than 4 years is common now.”

One Tier 2 OEM interviewee indicated that in the past few years, despite exciting developments in the software arena, there has not been a compelling reason for customers to accelerate the replacement of PCs, especially in the current economic climate.

An interviewed OEM similarly stated that they have seen the refresh cycle extend, although it varies by product line, and another OEM indicated that the economic downturn does not appear to have a major effect on the useful life that customers seek from their PCs.

Lenovo indicated that they have not struggled with customers refreshing their desktop PCs at longer intervals; their rapid growth in the U.S. market and subsequent influx of new customers may be shielding them from the detrimental effects of the slowed refresh rate experienced by other market actors, or perhaps the economy is starting to recover to the point that commercial PC buyers are replacing PCs more frequently again.

Although no interviewees were able to estimate the percentage of desktop PCs replaced with laptops, thin clients, or tablets, all indicated that they believe that desktop PCs will continue to play a significant role in their product mix, particularly in the commercial market. All interviewees agree with the IDC research indicating that desktop PC sales will decline slightly in absolute numbers, but will continue to rapidly lose market share as a percentage of all PCs sold due to the dramatic growth in portable PC sales (see also Section 3.1.2 for more discussion of overall market trends by form factor). The IDC data indicate that consumers and businesses replace the majority of desktop PCs with new desktop PCs, but additional (non-replacement) sales of laptops fuel the growth in overall PC sales.

One Tier 2 OEM interviewee stated, “There is still more bang for your buck with a desktop.” Another Tier 2 OEM interviewee listed a myriad of “workhorse” functions in which mobility is not necessary and a desktop PC remains the logical choice, for instance, PCs used in restaurants, warehouses, and kiosks. While information workers increasingly require the mobility provided by a laptop or even a tablet, companies will likely continue to opt for more affordable desktop PCs for these other functions which do not require mobility.

**Table 13. ACE Model Inputs: Measure Life**

<b>Input Category</b>	<b>Input</b>	<b>Recommended Value</b>
Measure Life	Expected measure life of commercial desktop PC	Five years (no change to current assumption). <sup>5</sup>
	Percent of retired desktops that are replaced with laptops, thin clients, or tablets	Estimated to be close to zero.

<sup>5</sup> Note that the current Verdiem measure life assumption is 4 years, not 5 year; that in combination with Lenovo’s experience that commercial PC buyers aren’t pushing for longer PC life spans may justify a move to 4 years, but in the interest of being conservative, Navigant recommends the continued use of the current ACE model assumption of 5 years.

## **3.5 Incremental Costs**

Navigant discussed the incremental cost of 80 PLUS power supplies with OEMs, a power electronics expert, and with Ecova, who has similarly obtained incremental cost estimates from PSMs and OEMs.

### **3.5.1 Incremental Cost of 80 PLUS Base**

PSMs told Ecova that their 80 PLUS Base qualified power supplies cost \$8-\$12 more than non-80 PLUS power supplies to manufacture, due in part to the need for higher quality capacitors. However, Ecova found that the larger OEMs can generally get 80 PLUS Base power supplies for zero additional cost compared to non-80 PLUS due to their buying power, which is consistent with the statements made by the OEMs interviewed by Navigant.

Smaller OEMs told Ecova that there was a \$10-\$17 incremental cost for them to purchase 80 PLUS Base power supplies, which is consistent with the one Tier 2 OEM interviewee that was able to provide an incremental cost estimate of roughly \$10 for 80 PLUS Base. Tier 2 OEMs have less buying power than the larger Tier 1 OEMs and thus continue to face an incremental cost not experienced by the Tier 1 OEMs.

### **3.5.2 Incremental Cost of Higher Levels of Efficiency**

OEMs indicated that costs for higher levels of efficiency (e.g., 80 PLUS Bronze, Silver, and Gold) continue to exceed those of non-80 PLUS and 80 PLUS Base, although most indicated that the incremental cost was decreasing over time. One major OEM has found that the incremental cost is going up due to changing materials costs, but not enough to deter them from offering it as an option to their customers.

A power electronics expert interviewee indicated that higher levels of efficiency require additional raw materials (e.g., copper and silicon) that naturally increase the cost of the power supply; to go from non-80 PLUS to 80 PLUS Base required mostly reconfiguring existing materials and the addition of power factor correction, but to go to higher efficiencies required these additional materials with variable costs. It also requires additional engineering analysis to limit parasitic losses.

Table 14 summarizes the Navigant team's best available estimates of the incremental cost of the different levels of 80 PLUS power supplies. As in the interviews conducted for MPER #3, many interviewees were unable to get more specific than, "We're approaching price parity" or "incremental costs are still going down." The incremental costs presented in Table 14 come from those interviewees that were able to provide rough estimates as well as information gleaned from interviews with Ecova and interviews conducted as part of MPER #3.

**Table 14. Incremental Costs Observed by OEMs**

<b>80 PLUS Level</b>	<b>Incremental Cost Over Non-80 PLUS</b>	<b>Incremental Cost Over 80 PLUS Base</b>
Base	\$0-\$10	Not applicable
Bronze (current ENERGY STAR requirement)	\$5-\$13	\$3-\$5
Silver	\$8*	\$8-\$10
Gold	N/A	\$10
Platinum	N/A	
Titanium	N/A	
Source: Navigant interviews of OEMs (n=3) and industry experts (n=1), Ecova interviews with OEMs and PSMs, and MPER #3 findings. N/A = estimate not available *Incremental cost over a 75% efficient power supply, which is likely higher than other non-80 PLUS power supplies.		

While incremental costs appear to continue on their downward trend, it is important to remember that for highly commoditized products such as desktop PCs with very small profit margins, even a small incremental cost of \$10 is a significant additional cost for a product with a retail price as low as \$299.

Table 15 summarizes Navigant’s recommended values for the ACE model assumptions on incremental costs. While the larger OEMs estimate incremental costs for 80 PLUS Base as roughly \$0, the smaller Tier 2 OEMs report a continuing incremental cost of up to \$10. Since the interviewed OEMs account for roughly two-thirds of the total U.S. PC market, the average incremental cost of an 80 PLUS Base power supply is likely much closer to zero than \$10.

**Table 15. ACE Model Inputs: Incremental Costs**

<b>Input Category</b>	<b>Input</b>	<b>Recommended Value</b>
Incremental Costs	Incremental cost of 80 PLUS Base power supply	\$2
	Incremental cost of 80 PLUS Bronze power supply	\$7

### 3.6 Per-Unit Savings Estimates

Navigant reviewed Ecova’s per-unit savings rate analysis, with particular attention given to two factors called out in NEEA’s information needs table (Table 4 in Section 2.1): 1) the operating hours assumptions with and without network PC power management in place and 2) the market share of network PC power management.

### 3.6.1 Operating Hours Assumptions

Navigant reviewed the current ACE model assumptions<sup>6</sup> for desktop PC operating hours with and without network PC power management and conducted additional secondary research to determine whether the current assumptions remain reasonable.

Navigant found that nearly all of the literature available on desktop PC operating hours in different modes (i.e., unplugged, off, sleep, idle, and active), including data used by ENERGY STAR, refer back to a 2004 Lawrence Berkeley National Laboratory (LBNL) study in which Ecova (then Ecos Consulting) was also involved. Similarly, the only evaluations of network PC power management as an efficiency measure that Navigant could identify were the PSE and Avista studies, which the Regional Technical Forum (RTF) referenced in its document that formed the basis of the ACE model assumption on network PC management’s impact on PC duty cycle.

A Beacon Consultants report indicates that at least 31 utilities and energy efficiency organizations around the country are offering incentives for network PC power management, yet they also found that no utilities have conducted formal third party evaluations of this efficiency measure. (Walker 2009). Navigant concluded that the current estimates of operating hours compiled by Ecova and incorporating the latest RTF spreadsheet is the best available data source for this assumption at this time.

### 3.6.2 Share of Desktop PCs with Network PC Power Management

Navigant conducted some secondary research to attempt to find an estimate the share of desktop PCs with network PC power management but did not identify any reliable sources of information on this topic. Navigant recommends that NEEA continue to use the current ACE model assumption of 3 percent market share.

Note that the recently released draft ENERGY STAR 6.0 specification for computers specifically asked for stakeholder feedback on network PC power management.

**Table 16. ACE Model Inputs: Savings Rate**

Input Category	Input	Recommended Value
Savings Rate	Per-unit energy savings for 80 PLUS power supply	No recommended changes to current savings values
	Per-unit energy savings for ENERGY STAR 5.0 computer	No recommended changes to current savings values
	Operating hour assumptions for a PC with and without a network PC power management installed	No recommended changes to current values
	Share of desktops that have Network PC power management in place	3% (no change to current assumption)

<sup>6</sup> The document Navigant reviewed is *80 PLUS ACE Model Assumptions: Draft*, dated October 5, 2011.

## 4. REVIEW OF NEEA’S RESPONSES TO MPER #3 RECOMMENDATIONS

In MPER #3, Navigant provided a number of recommendations to NEEA regarding the future of the 80 PLUS program. NEEA responded to those recommendations in a memo dated November 28, 2011. This section presents Navigant’s review of NEEA’s responses.

Summary of MPER #3 Recommendation	NEEA’s Response (verbatim)	MPER #4 Response
<p><b>80 PLUS as a minimum standard.</b>            Navigant recommended that NEEA promote 80 PLUS Base as a federal standard for minimum power supply efficiencies.</p>	<p>“NEEA does recommend that every manufacturer adopt 80 PLUS or better as the minimum standard. NEEA thinks that the ENERGY STAR program will help ensure that the 80 PLUS or better program is encouraged. No additional effort is needed by NEEA at this time. NEEA is supportive of the national standard. No further action required at this point, the market should take care of itself.”</p>	<p>Navigant’s recommendation was that NEEA consider advocating for 80% efficient power supplies as the mandatory federal standard, not the voluntary ENERGY STAR specification. A federal standard would signify a truly transformed market and there is little evidence to suggest that this will occur absent a well-organized advocate.</p>
<p><b>Incentives for higher levels of efficiencies.</b>            Navigant recommended that NEEA provide incentives only for power supplies that meet one of the higher 80 PLUS levels, such as Silver or Gold.</p>	<p>“NEEA plans to stop funding of 80 PLUS power supplies with the exception of being an aggregator for individual funders (i.e., Northwestern, Energy Trust of Oregon and potentially a modest amount of others). NEEA believes that natural market adoption is occurring and there is no need for additional incentives. The reasons for this are that the ENERGY STAR standard and/or the migration to laptops, notepads, thin clients or cloud desktop computing is making the desktop a retiring technology (losing significant market share and population).”</p>	<p>Navigant believes that providing incentives for higher levels of 80 PLUS power supplies is still warranted and that the market may not be transformed to the point where NEEA’s support is no longer needed. See Section 5.1 for more discussion.</p>
<p><b>End-user education.</b>            Navigant recommended that NEEA consider working to educate commercial end-users about the financial and operational benefits of efficient power supplies.</p>	<p>“NEEA will not attempt to educate the market as part of the 80 PLUS strategy or program. Other initiatives are being discussed that may or may not include the education of commercial buyers when it comes to specifying and purchasing energy efficient desktop computers.”</p>	<p>At this time, Navigant recommends that NEEA wait to see how the next ENERGY STAR specification affects the sales of 80 PLUS qualified power supplies before taking on an end-user education initiative. If ENERGY STAR desktop PCs become more expensive or less available, there may be a need to reintroduce the 80 PLUS brand to commercial buyers who previously focused on ENERGY STAR.</p>
<p><b>Promote virtualization through end-user education of both energy and functional benefits.</b></p>	<p>“Server and desktop virtualization is currently being reviewed &amp; considered under a different initiative at this point. No further action in this area is required for the 80 PLUS program.”</p>	<p>Navigant agrees that NEEA could best promote virtualization through another initiative, not as part of the 80 PLUS program.</p>

## 5. CONCLUSIONS AND RECOMMENDATIONS

Two of the desired outcomes of the MPER #4 research are to 1) provide an update on the status of market transformation of the efficient power supply market and 2) if needed and appropriate, recommend ways for NEEA to continue supporting transformation of the power supply market. This final chapter of MPER #4 explains Navigant's conclusion that the 80 PLUS program has reached the limit of what it can achieve under the current program logic and level of investment and provides options for NEEA's future engagement in the market.

### 5.1 Status of Market Transformation

One of the key questions that NEEA seeks to answer through this MPER is, "Is the market transformed?" In other words, will the market for energy-efficient power supplies in desktop PCs sustain itself if NEEA withdraws its support of the 80 PLUS program? One indication of a transformed market is the removal of identified barriers;<sup>7</sup> if a program removes only some barriers, then the market may be only "partially" transformed. Navigant reviewed the findings of MPER #4 in the context of the six market barriers identified in the program logic model to determine if market transformation progress to date has successfully removed these barriers.

Table 17 summarizes the current status of these barriers. While most barriers no longer impede adoption of energy-efficient power supplies, Navigant concludes that the incremental cost of 80 PLUS power supplies and the lack of customer awareness of power supply energy use remain as impediments to greater market transformation.

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<sup>7</sup> NEEA defines market transformation as "the strategic process of intervening in a market to create lasting change in market behavior *by removing identified barriers [italics added]*" to the adoption of energy-efficient products, services, and practices. See *NEEA's Definition of Market Transformation*, p.2, undated. Sourced March 20, 2012 at [http://neea.org/participate/docs/NEEA\\_Definition\\_of\\_MarketTransformation.pdf](http://neea.org/participate/docs/NEEA_Definition_of_MarketTransformation.pdf).

**Table 17. Current Status of Logic Model Barriers**

Barrier Type	Barrier	Status	Impact on Market
Supply-side	No testing protocol to verify power supply efficiency	Removed	80 PLUS developed a testing protocol which has enabled PSMs to test and certify the energy efficiency of their power supplies.
	No availability of more efficient power supply options	Removed	OEMs can now choose among nearly 3,600 different models of 80 PLUS certified power supplies.
	Power supplies are differentiated by price, not performance	Removed	The 80 PLUS brand enables OEMs to compare and select power supplies from different PSMs based on performance, not only price.
	Incremental cost of energy-efficient power supplies compared to standard power supplies	<i>Significantly reduced</i>	Incremental costs have decreased significantly but remain a barrier for smaller OEMs with less purchasing power and can be a barrier for larger OEMs as well when faced with increases in other component costs.
	Lack of a rigorous ENERGY STAR specification for computer power supplies	Removed	ENERGY STAR 4.0 and 5.0 specifications for desktop PCs incorporated power supply efficiency standards based on 80 PLUS Base and Bronze specifications.
Demand-side	Lack of customer awareness of power supply energy use	<i>Partially reduced</i>	Customers—particularly commercial customers—strongly demand the ENERGY STAR label, due in part to government and corporate purchasing policies, but customers are largely unaware of the 80 PLUS brand.

Source: 80 PLUS Logic Model (from MPER #1) and Navigant analysis.

As shown above, the 80 PLUS program and other market influences such as ENERGY STAR have successfully removed most of the supply-side barriers identified in the 80 PLUS program logic model. Incremental cost remains a modest barrier, and lack of customer awareness is a more significant impediment to greater market transformation.

ENERGY STAR (and therefore 80 PLUS) market share is currently very high at 70 percent of commercial desktop PCs in 2011, but because the 80 PLUS initiative did not fully remove two of the identified market barriers (incremental cost and low customer awareness), 80 PLUS market share is vulnerable to several market dynamics that would not otherwise have threatened to decrease 80 PLUS market share.

There are two market dynamics related to *incremental cost* that contribute to the uncertainty in future 80 PLUS market share:

- **Commoditization of the desktop PC and its corresponding low profit margin.** Two OEM interviewees emphasized that the desktop PC has become highly commoditized, implying low profit margins and thus suggesting that OEMs may be highly sensitive to even small component cost increases.
- **Fluctuating materials costs and uncertain supply for PC components.** OEMs rely on an international supply chain that can be disrupted by natural disasters, and the PC industry is currently experiencing a major disruption in the supply of hard drives caused by flooding in Thailand expected to last through 2012. The price of specific types of hard

drives has spiked because of the disrupted supply (by up to \$80 per hard drive), and one OEM has also reported a recent spike in the price of memory. These unexpected component cost increases may lead OEMs to seek opportunities to cut costs on other components such as power supplies, because they need to maintain their (very thin) profit margins without significantly raising the price on their PCs. One OEM has confirmed that this trade-off is already occurring and will affect their future use of 80 PLUS power supplies.

The incremental cost of energy-efficient power supplies may never reach zero, but that may be unimportant as long as OEMs and customers recognize the benefits of paying the additional cost for increased efficiency. However, it does not appear that customers are aware of the 80 PLUS brand to the extent necessary to sustain market share in the event that ENERGY STAR market share decreases.

Customer awareness of power supply energy use is difficult to assess, but according to the interviewed OEMs, customer awareness of and demand for the ENERGY STAR brand is high. Customers rarely seek out desktop PCs with 80 PLUS power supplies that are not also ENERGY STAR, and—with the exception of Dell—few OEMs even offer customers an 80 PLUS/non-ENERGY STAR desktop PC option. Without a strong effort to increase customer awareness of the 80 PLUS brand as a separate entity from ENERGY STAR, the fate of 80 PLUS power supplies and the future savings attributable to the 80 PLUS program are likely to remain linked to the continued success of ENERGY STAR as a consumer marketing platform. Thus, a major source of uncertainty for future 80 PLUS market share relates to *low customer awareness* of 80 PLUS and power supply energy use in general:

The barriers of incremental cost and lack of customer awareness are compounded by ENERGY STAR's specifications and its effects on qualifying desktop PCs' prices and availability. The EPA released a new draft ENERGY STAR specification for desktop PCs in February 2012, and while it does not incorporate an increased efficiency requirement for desktop PC power supplies, it is not certain how aggressive the other components of the standard will be and how much difficulty OEMs will have in reaching the new standard. It is possible that the new ENERGY STAR specification may result in a higher incremental cost, and that ENERGY STAR market share may drop as a result of the increased cost and potentially decreased availability of ENERGY STAR models as OEMs work to meet the new standard.

If ENERGY STAR market share drops significantly, it appears likely that 80 PLUS market share will drop as well. Whether the OEMs revert to non-80 PLUS levels or simply drop back from 80 PLUS Bronze (the current ENERGY STAR requirement) to 80 PLUS Base, it seems unlikely that OEMs will continue to pay the incremental cost associated with higher levels of 80 PLUS if they are not receiving the benefit of marketing their ENERGY STAR compliance to customers. The 80 PLUS program has hitched its wagon to the ENERGY STAR, so major changes to the ENERGY STAR program will almost certainly affect the sales of 80 PLUS power supplies.

**Conclusion on the status of market transformation:** The 80 PLUS program (in conjunction with other market forces) has successfully removed most of the barriers identified in the program logic model, and the majority of commercial desktop PCs now incorporate 80 PLUS equivalent power supplies. However, due to the close relationship between 80 PLUS and ENERGY STAR and the likelihood that ENERGY STAR market share will drop when the new ENERGY STAR

specifications go into effect later in 2012, it is unlikely that 80 PLUS market share will sustain itself at current levels.

The evidence leads the evaluation team to conclude that 80 PLUS has *partially transformed* the market for energy-efficient power supplies and is unlikely to achieve full market transformation under the current program logic and level of investment. However, the potential costs of further actions may exceed the benefits, and any new investments in the partially transformed market for efficient power supplies will consume funds that could potentially yield greater savings through other market transformation initiatives.

## 5.2 Options for Future Investment in 80 PLUS

As discussed in the preceding section, 80 PLUS has *partially transformed* the market for energy-efficient power supplies and there is uncertainty in future market share due to the continuing state of flux of the desktop PC market and the upcoming change in ENERGY STAR specifications. The program has successfully removed many of the barriers originally facing this market, although barriers of incremental cost and low customer awareness persist. It appears unlikely that the 80 PLUS initiative, in its current form, will promote a full and sustainable transformation of the market. NEEA has several options moving forward, the value of each depending on whether the objective is greater market transformation or merely maintenance of market transformation gains thus far, and whether market share naturally sustains itself at current levels after the introduction of the ENERGY STAR 6.0 specification. If ENERGY STAR maintains or increases its sizeable market share after the 6.0 specification takes hold, that would be a strong indication that the market for energy-efficient power supplies has been transformed and that NEEA's support is no longer needed.

Options for future investment in the 80 PLUS initiative include:

- 1) **Reinstate an incentive for ENERGY STAR desktop PCs**, until NEEA can directly observe the effects of the next ENERGY STAR specification and the current pressure on OEMs' profit margins due to the hard drive shortage. If ENERGY STAR market share slips due to increased stringency or higher costs, 80 PLUS usage is certain to decrease as well, so NEEA's incentives may assist OEMs in maintaining their current levels of ENERGY STAR market share during this period of uncertainty.
- 2) **Reinstate an incentive for desktop PCs using 80 PLUS power supplies (but not necessarily ENERGY STAR)**. If customer demand for ENERGY STAR declines significantly due to increased costs (or decreased availability of ENERGY STAR options), OEMs will no longer have an incentive for incorporating 80 PLUS power supplies into desktop PCs, and a financial incentive may encourage them to directly market the benefits of 80 PLUS to their customers in lieu of ENERGY STAR.
- 3) **Initiate an end-user focused marketing campaign** to reintroduce the 80 PLUS brand to commercial buyers who have previously focused on ENERGY STAR. If ENERGY STAR market share begins to decline significantly after the 6.0 specification takes hold, additional steps may be necessary to sustain 80 PLUS market share independently of ENERGY STAR, which would require a focused effort to increase customer awareness of the 80 PLUS brand. This would constitute a major structural change in the way that the

80 PLUS initiative intervenes in the market, although it is linked directly to one of the barriers identified in the program logic model (customer awareness of power supply energy use).

- 4) **Phase out support for 80 PLUS.** The final option is for NEEA to recognize that its efforts have successfully effected a significant—though partial—transformation of the market for energy-efficient power supplies and phase out the program altogether. If NEEA elects to move this program to the “long-term monitoring and tracking” (LTMT) phase, *Navigant recommends the following research activities for LTMT:*
- Encourage IDC to track 80 PLUS market share separately from ENERGY STAR market share.
  - Investigate the efficiency levels of the non-80 PLUS power supplies currently in use by OEMs.

Although future 80 PLUS market share is uncertain, the 80 PLUS initiative has successfully and permanently removed most of the significant supply-side barriers in this market, and the efficiency of desktop PC power supplies is likely to continue at levels significantly above what they would have been in the absence of NEEA’s support.

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## Appendix B: Market Actor Interview Guide

### Participating Computer OEM Interview Guide

Hi, my name is \_\_\_\_\_ with Navigant Consulting. We are not selling anything, but rather we are conducting an evaluation of the 80 PLUS power supply program for the Northwest Energy Efficiency Alliance (NEEA). We are generally interested in trends that your company is experiencing in the energy efficient power supply market. We received your name and contact information from Ecova, formerly Ecos Consulting. This may take about 20-30 minutes. Is this a good time? **[IF NOT, SCHEDULE A CALLBACK.]**

Before we begin, I want to assure you that any information that you provide related to your company's sales of 80 PLUS products will remain confidential and will be presented in aggregate with the results of our other interviews to NEEA. There are no right or wrong answers.

Name:

Company:

Title:

What is your role at the company?

Contact info

Date/time of contact 1

Date/time of contact 2

Date/time of interview

**The objective of this interview guide is to gain insight into the following:**

- **Naturally Occurring Baseline**
- **Market Share**
- **First Cost**
- **Retirements**

*[This section covers the naturally occurring baseline of 80 PLUS and ENERGY STAR 5.0 equivalent power supplies. It is meant to be conversational but probe for the story behind the program, driving forces of the program, influences to adopt efficient power supplies past and present and past and current levels of 80 PLUS power supplies used. ]*

1. **I understand your company participates in the 80 PLUS program, how long have you been a participant?**

PROBE FOR:

DATE/YEAR

HOW DID YOU FIND OUT ABOUT THE PROGRAM?

WAS THERE AN OPTION FOR EFFICIENT POWER SUPPLIES BEFORE YOU STARTED PARTICIPATING ON THE PROGRAM?

**WHAT WAS THE NUMBER OF 80% UNITS AVAILABLE WHEN YOU JOINED THE PROGRAM?**

**HAS THE PERCENTAGE 80% EFFICIENT POWER SUPPLIES YOUR COMPANY USES CHANGED OVER TIME?**

2. **What factors first influenced your company's decision to utilize 80 PLUS certified power supplies?**

PROBE FOR:

**THE HISTORY OF 80% EFFICIENT POWER SUPPLIES – WHAT COMPANIES, ORGANIZATIONS OR INDUSTRY SEGMENTS WERE THE DRIVING FORCE BEHIND THE ADOPTION OF 80 PLUS AT YOUR COMPANY? (PROMPT FOR POWER SUPPLY MANUFACTURERS, ECOS, ENERGY STAR, ETC.). WHY DID IT COME ABOUT?**

**WHAT HAVE BEEN THE INFLUENCES IN USING 80% EFFICIENT POWER SUPPLIES?**

- REBATES
- ENERGY STAR CERTIFICATION
- RELIABILITY
- LOWER HEAT
- LOWER WARRANTY COSTS
- CUSTOMER DEMAND
- TOTAL COST OF OWNERSHIP
- FORM FACTOR
- CUSTOMER CORPORATE POLICIES, I.E. GREEN INITIATIVES, ETC.
- THE COMPANY'S COMPETITORS USE THEM

HAVE THESE INFLUENCES CHANGED OVER TIME, IF SO HOW, WHAT FACTORS ARE BEHIND THESE CHANGES?

**WHY DOES THE COMPANY CONTINUE TO USE 80 PLUS CERTIFIED POWER SUPPLIES?**

**IF YOUR COMPANY DID NOT RECEIVE A REBATE WOULD IT STILL USE 80% OR BETTER EFFICIENT POWER SUPPLIES?**

**WOULD THE COMPANY HAVE ADOPTED THEM WHEN THEY DID WITHOUT THE REBATE?**

3. **Do you think the shift to 80% efficient or better power supplies would have happened without the 80 PLUS program?**

PROBE FOR:

**WHAT WOULD HAVE BROUGHT ABOUT THE CHANGE?**

DO YOU THINK THE PERCENTAGE OF PCS YOU CURRENTLY PRODUCE WITH 80% EFFICIENT POWER SUPPLIES WOULD BE THE SAME TODAY WITHOUT THE PROGRAM?

4. **Does your company have an Energy Efficient/ENERGY STAR product line?**

PROBE FOR:

HOW LONG HAS THE PRODUCT LINE BEEN AVAILABLE

DO YOU HAVE ANY TOOLS TO AID IN THE SELECTION OF ENERGY EFFICIENT COMMERCIAL DESKTOPS?

DO YOUR CUSTOMERS TYPICALLY SPECIFY ENERGY EFFICIENCY AS A REQUIREMENT OF THE PCS THEY PURCHASE?

HAS THIS TREND CHANGED OVER TIME?

**DO YOUR COMMERCIAL CUSTOMERS IDENTIFY WITH ANY PARTICULAR CERTIFICATIONS OR PROGRAMS, I.E. ENERGY STAR, 80 PLUS, ETC.?**

### **Market Share**

*[These questions cover unit sales and trends as a whole, as well as 80 PLUS and ENERGY STAR]*

5. **What was the trend in 2010 for your company's sale of desktop PCs? What has been the trend in 2011?**

PROBE FOR:

**INCREASE OR DECREASE AND TO WHAT DEGREE; APPROXIMATE PERCENTAGE IF POSSIBLE**

**DOES THE COMPANY ANTICIPATE THESE TRENDS TO CONTINUE?**

**WHAT HAS BEEN THE TREND OF LAPTOPS SALES OVER THIS PERIOD?**

**INCREASE OR DECREASE AND TO WHAT DEGREE; APPROXIMATE PERCENTAGE IF POSSIBLE**

**DO YOU ANTICIPATE THIS TREND CONTINUING?**

*ENERGY STAR and 80 PLUS qualified PCs*

*[This section covers the share of PCs and servers that are 80 PLUS qualified or ENERGY STAR]*

6. **Approximately what proportion of all the desktop PCs your company sells are 80 PLUS qualified?**

PROBE FOR:

**PERCENT THAT ARE ENERGY STAR 5.0**

**PERCENT THAT ARE ENERGY STAR 5.0 +20% (ENERGY STAR 6.0)**

DOES YOUR COMPANY EXPECT THAT PERCENTAGE TO CHANGE OVER THE NEXT TWO YEARS? FOR 80 PLUS? FOR ENERGY STAR?

**DO YOU KNOW THE BREAKDOWN BETWEEN BASE, BRONZE, SILVER, ETC.?**

DO YOU EXPECT THIS MIX TO CHANGE IN THE FUTURE?

WHAT FACTORS WOULD INFLUENCE A SHIFT IN EFFICIENCY?

**First Cost**

*[This section covers the incremental costs of all levels of 80 PLUS power supplies]*

7. **Has the incremental cost to your company from manufacturers of 80 PLUS certified power supplies changed over the last two years (2010 & 2011)?**

PROBE FOR:

**DOLLAR AMOUNT OR PERCENT OF CHANGE**

WHAT FACTORS HAVE INFLUENCED THIS CHANGE?

**WHAT IS THE COST DIFFERENTIAL OF BASE VS. BRONZE VS. SILVER VS. GOLD VS. PLATINUM?**

**IS THE COST SAVINGS/INCREASE PASSED ALONG TO THE END-USERS/BUYERS BY YOUR COMPANY?**

**Retirements**

*[This section covers the expected life of a PC]*

8. **To what extent did the US economic downturn influence sales of desktop PCs in 2010? How have current economic conditions influenced sales of desktop PCs in 2011?**

PROBE FOR:

**HAS THE ECONOMY HAD ANY EFFECT ON THE TIMING OF DESKTOP REPLACEMENTS (USEFUL LIFE)?**

**PROBE FOR NUMBER OF YEARS OF USEFUL LIFE**

HAS THE ECONOMY HAD ANY EFFECT ON WHAT DESKTOP PCS ARE BEING REPLACED WITH, I.E. LAPTOPS, TABLETS, ETC.

WHAT HAS BEEN THE TREND FOR DESKTOP PC REPLACEMENTS?

**APPROXIMATELY WHAT PERCENTAGE OF DESKTOP PCS ARE BEING REPLACED BY SOMETHING ELSE, I.E. LAPTOP, TABLET, ETC.?**

If necessary would it be possible to speak with you again should I have any follow up questions?

**Thank you very much for your time today those are all of the questions I have.**

## Appendix C: Market Actor Interview Responses

This appendix presents interviewee responses from a selection of open-ended questions that convey the broad perspectives of the market for efficient PC power supplies. Navigant has combined OEM and other market actor responses to help preserve the anonymity of individual respondents.

### *Has the percentage of 80% efficient power supplies your company uses changed over time?*

- It has, it is being driven by customers wanting more efficient power supplies for energy savings so we use more of them.
- Not in the last 2 years but in the beginning yes.
- Oh yeah (up), there are still a fair amount of systems that go out with a cheap power supply, but the 80 PLUS power supplies are a big value add to the systems.
- There are certainly more choices today.
- Yes, in general it is up. Started in public sector, but has spilled over into enterprise market, they are specifying it in bids now. The highest awareness of energy efficiency is in the commercial space.
- It's more a factor of the percentage, computers are only a part of their business and it is a cyclical business. As far as numbers are concerned, they used to do more volume than now, but as far as percentage a much higher percentage use 80 PLUS power supplies.

### *What factors first influenced your company's decision to utilize 80 PLUS certified power supplies?*

- 90% of systems we sell are sold to re-sellers. What moved us was a lot of education bids coming through. Lots of requirements for ENERGY STAR and 80 PLUS or both. Also, we wanted our product to stand above other white boxes and make them more tier one like and wanted them ENERGY STAR. Finally finding power supplies without a stiff premium anymore.
- Awareness of efficiency and recognition of a standard of efficiency, 80 PLUS demystifies the standard. We wanted to be green, also government and school contracts called for energy efficiency.
- It was 100% the rebate program because of the big cost delta of \$30 at the beginning with limited supply. Rebate allowed us to do it and then offered it as a differentiator. We have positioned ourselves as environmentally concerned and go to market that way.
- Not 100% sure, however we have always tried to be the first with environmental and green products. At our company there are many groups with many levels of management, but desktops was the only one to have an Environmental Lead. We were the first to be ENERGY STAR and EPEAT certified.
- The first driver was ENERGY STAR 4.0 specification.
- There was a lot of organic growth of higher efficiency power supplies. We required high output in a small enclosure. Low noise and small form factor was a requirement.
- We wanted to do it before we even knew about the rebate, we wanted to be a green PC manufacturer and differentiate ourselves. Cooler, better manufacturing, fewer RMAs, lower energy cost.

***What companies, organizations or industry segments were the driving force behind the adoption of 80 plus at your company? Why did it come about?***

- 6 year history with Ecos and Climate Savers
- Climate Savers partnership has contributed to the growth. Climate Savers was going to be very stringent and 80 PLUS was a design capable test. Climate Savers moved towards 80 PLUS. Climate Savers and EPA have endorsed the 80 PLUS program.
- Ecos
- ENERGY STAR
- EPA and Epeat. Many of our sales are government related and they generally require Epeat and ENERGY STAR products.
- Government and schools, also the Blue Angel European requirement of 70% efficient power supplies in 2005.
- Regulatory programs like ENERGY STAR 4.0

***If your company did not receive a rebate would it still use 80% or better efficient power supplies?***

- 80 PLUS offers a very consistent test result. 80 PLUS sticker is not as important as getting product into the highest category, which is a marketing kudos for them. Valuable to have 3rd party testing. EPA doesn't do any testing for instance. Listing on website offers value because it levels the playing field. Originally, the incentive had some value, but now it doesn't make a heck of a lot of difference, especially by only shipping into some markets that have incentives. I don't think it has an influence on the number of designs submitted. One OEM does not participate because they do not want to give up specific sales information.
- Certainly for some of their customers where it is required, but there would be some drift without the incentive. Reps will stop talking about it without the incentive. I don't think it would be an all of a sudden thing, the reps would just focus on other things like price.
- Not a participant and still utilize high efficiency power supplies.
- We wanted to do it before we even knew about the rebate, we wanted to be a green PC manufacturer and differentiate ourselves. Without the rebate program though we would not have made it such a big component of our configurations. I know the program influences sales.
- Yes because we are providing solutions to its customers and for some energy efficiency is the requirement. We want to meet customer needs. We use the program as a sales tool to show savings. The program demystifies savings and levels expectations of customers. Helps customers calculate their returns.
- Yes, it is an added benefit but not the real driver. We use funds to fund other environmental programs, but we would still do it.
- Yes, we came into the program late and we were already using 80% efficient power supplies.

***Do you think the shift to 80% efficient or better power supplies would have happened without the 80 PLUS program?***

- From my perspective, probably not. 80 PLUS is still kind of a premium. Still sell more 78 - 80 % efficient power supplies, more than the number of bronze power supplies. For small business the decision is frequently a monetary decision.
- High efficiency would have happened one way or another - customers ask for it now. The program pushed the awareness to the customer much faster. 80 PLUS was clearly a switch at the time and the shift would not have happened in the timeframe it did.
- It would have because the EPA was driving it initially before the 80 PLUS program caught hold with the industry.
- No, no absolutely not. I can't tell you how many places I got laughed at and laughed out of when I mentioned 80 PLUS, and it wasn't that the technology couldn't do it. Technology was there but you had to put more silicon and copper in which was expensive. I don't believe an effort would have been made, OEM and power supply manufacturers were not pushing it, customers were asking for it.
- That is tough to say, they are not ridiculously more expensive only \$10 more expensive, but without the program push for OEMs to buy bigger volumes to drop the cost it may be more like \$20 or \$30 more expensive and then I don't know if it would have gone to 80%.
- Where it is required as part of a contract yes then the shift would have happened anyway but the rebate was the driver for us. It also played in nicely for product positioning as well.
- Yes, government regulations have caused more than 80 PLUS. Without it, it would have happened because of the focus on energy cost, carbon footprints, etc. People have become more aware of these things in PCs.
- Yes, it would have happened anyway, look at the Mac Mini. Design was driving the change, the obsession with a quiet machine and form factor was driving efficiency up.

***Do your customers typically specify energy efficiency as a requirement of the PCs they purchase?***

- Any government related or education related bid it is becoming more common but in small business, no. Small business may be the paint mixing machine at Minards or frame straightening machine at the auto shop.
- Commercial not as much but government and quasi government definitely but corporate it is a nice to have requirement. Harder to have a long standing standard in corporate IT departments.
- Yeah, people do ask for ENERGY STAR systems, more of a checklist item on the bigger bids.
- Yes, but the level of efficiency varies by segment but we do have people call out actual 80 PLUS levels required. Commercial customers ask for energy efficiency more often than residential customers because the savings are more clear on the larger commercial scale. It is more difficult to see savings on one system vs. thousands of units. Scale makes a big difference.
- Yes government always specifies EPEAT and ENERGY STAR.

***What was the trend in 2010 for your company's sale of desktop PCs? What has been the trend in 2011?***

- 2010 and 2011 hit the small business harder. 2010 was a little better than 2011.
- Actually, that segment has been exceptionally strong for the last 6 or 7 quarters. We have moved from number 3 to 2 and should take over number 1 from HP soon. Emerging markets are driving this greatly.
- I don't see the sales numbers, but Notebooks and Tablets are going up. I haven't looked at the trend of desktop sales.
- I would say in 1999 we were all predicting the demise of the desktop and now finally things are changing for the desktop form factor, things are shifting to mobile computing, especially on the corporate side. First to shift are consumers, then corporate, now education and eventually government will shift.
- I would say sideways at best. The business is more blended to sell other manufacturers PCs along with theirs. 100% of notebooks are other manufacturers. Fundamental shift from PCs to tablets, mobile, etc. The company is moving into servers, higher end part of the business. Trend continued into 2011 definitely.
- Our perspective is what the industry is seeing - look at IDC data. Desktops have a solid position in the overall portfolio. We would not offer desktops if the consumer did not want them. Residential customers still want PCs but they are marketed more to commercial units. I have two young kids and I don't want them on my laptop.
- We were trending up, in fact we were 15% above projections in 2011 when the decision was made to stop selling desktops and then rescinded. The trend in PCs has been strong since 2009, but laptop sales have declined.

***Approximately what proportion of all the desktop PCs your company sells are 80 PLUS qualified?***

- 15%-20%. Every platform has an 80 PLUS option, but few buy it.
- 20% are 80 PLUS, but that's a guess. Having models available for small cases is holding up more PCs that are 80 PLUS qualified.
- Right now about 50%. We have objectives to significantly increase this percentage.
- About 60%. This was higher last year, but there was an increase in the price of memory, which caused us to produce more desktops without 90% efficient power supplies to keep the cost level.
- I am going to guess 75% to 80%. It is a pretty significant number. Just desktops, we don't claim our servers. For December, 264 qualified out of 490. 490 systems went out with 80 PLUS out of 526 total.
- More than 90%.
- 100% ENERGY STAR 5.0.

***Has the incremental cost to your company from manufacturers of 80 PLUS certified power supplies changed over the last two years (2010 & 2011)?***

- 80 PLUS power supplies are more expensive. A standard desktop 300 w power supply from Sparkle is \$19. A Seasonic 350 w entry bronze power supply is \$32. This is confidential \$12-\$13 premium.
- Going up due to ERP requirements, etc. but not due to 80 PLUS, other material costs. Not significant enough not to offer it, but costs are trending up and now leveling off a bit.
- I don't have any hard numbers and don't look at it specifically because it is factored into the cost of the more green machines.
- I see we are not selling as many cheap power supplies. 80 PLUS is \$12-15 higher than the cheap \$20 power supply. \$32 for a 350 watt and \$45 for 400 watt dropped \$2-3 buck over the last two years.
- I think the price point now for cost parity is 80% model and now at 85% and that gap is probably closing as well and there is less incremental cost than at implementation.
- In 2005/06 a memo from Lite-On said it would be an additional \$12 on a \$13 power supply to make it 80% efficient. You need smaller heat sinks, more silicon and more copper to be 80% efficient. As you go up the price increases significantly, i.e. Base to platinum.
- It has come down. It used to be that an efficient power supply was \$25 per unit more expensive which cost the customer \$40. The incremental cost has definitely come down. We only adopt the next level of efficiency if the cost is flat across generations. We have progressed to Gold so the cost must differential must be coming down.

***To what extent did the US economic downturn influence sales of desktop PCs in 2010? How have current economic conditions influenced sales of desktop PCs in 2011?***

- 2007 to 2008 refresh cycle went from 3 years to 4 years to 5 years. There just is not a compelling reason to buy new hardware. People are holding onto the hardware longer.
- Everybody hammered in 2008 and 2009 now more recently the school are having budget issues. But now it is not the economy but technology shift, lots of companies happy to stay on XP. Lots of switches from PCs to notebooks and mobile devices. People are doing their best to make their purchases last as long as possible
- In 2010 and 2011 it has picked up. In 2009 it was bad and sales were down, but not now. "The decline of the desktop is over rated".
- In some segments, yes.
- Yes because of the exposure to the government they are being told it is the worst it has ever been.

***Has the economy had any effect on the timing of desktop replacements (useful life)?***

- Me personally, no. All the data I see is always positive, always enticing customers to upgrade for a variety of reasons. Don't foresee any downturn.
- No, not at our company.
- Part of it is, do you really need a refresh every 4 years any more, probably not because software is not driving it and cloud computing is extending life. Governments are deploying more thin clients to cut costs. The impact has been for the last two year on desktop sales.
- People are making PCs useful for longer, it has definitely going up.
- We see replacement cycles extending, but it depends on the product. We definitely see product life extending, but there is always a need for a new tool as well.
- Yes, it has gone from 3 years to 5 years.

***What has been the trend for desktop PC replacements?***

- All in one units have become increasingly popular and traditional desktops are being replaced by this form factor. People want what they have at home for the office.
- Desktop sales are leveling off rather than shrinking. Maybe the future hold an erosion of the laptop and not the desktop PC.
- There are a lot of environments where a PC is the right tool for the job but there is a shift to a small form factor.