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NEEA Market Progress Evaluation Report #3: 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, the Northwest Energy Efficiency Alliance (NEEA) provides 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 third Market Progress Evaluation Report (MPER) on NEEA's 80 PLUS program. It updates the market progress indicators (MPIs) for the program and characterizes the personal computer (PC) market to assist NEEA in developing future plans for the program.

Market Progress

The 80 PLUS program has made strong progress in transforming the market for energy-efficient power supplies at the 80 PLUS Base (or equivalent) level. The EPA has credited NEEA and the 80 PLUS program with having a strong influence on the incorporation of 80 PLUS into the ENERGY STAR 4.0 specification, which has likely been the program's most significant direct influence to date on end-use customers' decisions to purchase energy-efficient power supplies. Another significant factor in market progress has been original equipment manufacturers' (OEMs) realization that efficient power supplies are higher quality and more reliable, which reduces their warranty costs.

80 PLUS has engaged the largest OEMs that produce commercial desktop PCs and has certified over 2,800 models of power supplies. More than 200 power supply manufacturers (PSMs) have certified 80 PLUS power supplies, and increased PSM competition has reduced incremental costs.

The market share of 80 PLUS was 0 percent in 2005, growing to at least 11 percent in 2008 (based on ENERGY STAR market share) to now stand at an estimated 37 percent of desktop PCs (including 80 PLUS or equivalent power supplies) sold in the U.S. in the first three quarters of 2010. The incorporation of 80 PLUS Bronze into the ENERGY STAR 5.0 specification has driven increased adoption of higher levels of 80 PLUS power supplies. Efficient power supplies will continue to transform the market, more through *greater penetration* of efficiencies in the lower 80-percent range than through significant *increases in the average efficiency* of those power supplies qualifying as "80 PLUS."

NEEA developed a total of 11 market progress indicators (MPIs) for the 80 PLUS program. The following summarizes progress in eight MPIs which are still key indicators of the success of the program.

- **Participation of Sponsors and Market Actors.** In 2010, there are five OEMs with certified units. PSMs with certified units rose from 19 in 2006 to 216 firms in 2010. Participating system integrators (SIs) dropped from 51 in 2008 to 37 participating SIs in 2010 as the program no longer incents non-ENERGY STAR (but still 80 PLUS) desktop PCs and servers; some of the smaller SIs cannot afford to produce ENERGY STAR certified equipment.

- **Availability of 80 PLUS Certified Models.** There has been tremendous growth in the availability of 80 PLUS certified models since program inception. The number of certified 80 PLUS power supplies grew from one in 2005 to more than 400 by 2007 and to more than 2,800 qualifying 80 PLUS power supply models in December 2010.

- **Inclusion of 80 PLUS in ENERGY STAR Specifications.** MPER #2 reported that in less than two years after the introduction of 80 PLUS, the ENERGY STAR 4.0 standard adopted 80 PLUS as part of its requirement; the EPA has credited NEEA and the 80 PLUS program with having a strong influence on that effort. Subsequently, after the introduction of the 80 PLUS Bronze, Silver, and Gold specifications, ENERGY STAR 5.0 adopted the Bronze level as its new threshold. The widespread acceptance of ENERGY STAR is allowing 80 PLUS to push higher efficiencies, resulting in a growing number of qualifying power supply models.

- **Commercial End-User Awareness of 80 PLUS.** MPER #1 reported that end-user awareness of and requests for 80 PLUS was just developing, and in MPER #2, it was increasing. Navigant's research shows that ENERGY STAR brand is far more recognizable to end-users than 80 PLUS. It is only some of the larger enterprise customers like universities and Fortune 500 companies that are more likely to request 80 PLUS. Overall, OEMs and SIs – not end-users – drive the market for energy efficient power supplies; consequently, OEMs and SIs see a need for enhanced customer education and possibly rebates for customers.

- **Decreasing Incremental Cost.** OEMs indicated that the incremental cost of an 80 PLUS power supply (estimated to be between $7 and $15 depending on the efficiency level) over a non-80 PLUS model was not a significant barrier to adoption, particularly on high-end machines. Interviewed OEMs described several non-energy benefits to 80 PLUS power supplies which help justify the additional cost, such as increased reliability, longer life, and reduced heat, which results in additional energy savings by reducing the need for air conditioning, particularly in data centers. Improving the reliability of the power supply also reduces warranty costs, which is a significant benefit to OEMs.

- **Sales of 80 PLUS PCs.** Power supplies in more than one in three desktop PCs are 80 PLUS certified or of equivalent efficiency. Sales of 80 PLUS certified (or equivalent) power supplies have been increasing over the past two to three years and are outpacing ENERGY STAR qualified desktop PCs and servers. This is because all ENERGY STAR qualified machines have an 80 PLUS certified or equivalent power supply but not all desktop PCs and servers using 80 PLUS certified power supplies are ENERGY STAR qualified. Most market actors expect general trends in 80 PLUS sales to continue.

Market Characterization

The PC market in the United States grew slowly during the 2008 – 2009 recession, but is starting to accelerate as companies upgrade aging stocks. Laptops represent an increasing share of the PC market, and now comprise more than 60 percent of all PC sales, while desktop PC sales remain relatively flat. However, desktops will remain a significant market. Market actors and industry analysts expect that a combination of the U.S. economic recovery, an increase in virtualization, cloud computing, and mobility will drive greater need for servers relative to desktops,

particularly in corporations. Power supply efficiencies continue to increase and tend to be higher for servers than for desktops.

Original equipment manufacturers (OEMs) are the greatest driver of energy-efficient power supplies in the market, strongly influencing both power supply manufacturers (PSMs) and commercial end-users. OEMs drive demand for 80 PLUS power supplies due to their recognition of the superior quality and increased reliability of these power supplies; PSMs manufacture the power supplies specified by OEMs. These PSMs then push system integrators (SIs) to adopt the same energy-efficient models that the PSMs are manufacturing for the OEMs. Commercial end-users have little direct influence on the efficiency of power supplies, and have little familiarity with the 80 PLUS label. However, their desire for the ENERGY STAR brand (which includes an 80 PLUS requirement) does influence OEMs' and SIs' decisions regarding the types of power supplies to include in their computers.

Recommendations

The market research findings discussed previously suggest a variety of new directions and program modifications that NEEA can adopt to further drive market transformation in the market for energy-efficient computer power supplies:

- **Promote 80 PLUS as a minimum standard.** A majority of PCs and servers still do not meet the 80 PLUS specifications. There does not appear to be any compelling reason *not* to use 80 PLUS or equivalent supplies since the incremental cost of achieving 80 percent power supply efficiencies is relatively low and the non-energy benefits appear to more than off-set the costs for many computer makers.

- **Incentives for higher levels of efficiencies.** As 80 PLUS Base becomes the *de facto* standard, the most cost-effective use of incentives is to encourage higher efficiency levels, with 80 PLUS Bronze at a minimum. NEEA may also wish to reconsider the decision to offer incentives only for ENERGY STAR qualified desktop PCs and servers and return to incenting any desktop PCs and servers with 80 PLUS power supplies, because changes in ENERGY STAR rules may lead to a drop in the availability of ENERGY STAR qualified machines.

- **Educate commercial end-users on:**

    - **The non-energy benefits of an 80 PLUS power supply.** NEEA can leverage the finding that end-users are already requesting ENERGY STAR-labeled machines by providing end-users with information and case studies about the non-energy benefits of utilizing an 80 PLUS power supply.

    - **Virtualization.** Although NEEA is not in the business of influencing customers' information technology decisions, the dissemination of information about virtualization's energy and functional benefits could indirectly result in higher average power supply efficiencies in the market by promoting increased (and more efficient) use of servers, which tend to have higher efficiency components including power supplies.

In addition to these program recommendations, Navigant recommends that NEEA update the list of MPIs and the program logic model to better reflect the program's current implementation strategy and goals, which have evolved since the program's inception in 2006.

1. INTRODUCTION

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

The primary purpose of this third MPER is to update the market progress indicators (MPIs) identified in the first two MPERs. 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 and servers in order to assist NEEA in developing future plans for the 80 PLUS program.

This market research report addresses the following topics:

1. **Market characterization:** recent trends and future outlook in the markets for commercial PCs and energy efficient power supplies;
2. **Market progress assessment:** The degree to which 80 PLUS has transformed the market for energy-efficient power supplies as measured by the MPIs;
3. **NEEA's Alliance Cost-Effectiveness (ACE) model:** an update of the ACE model assumptions based on findings from the market research; and
4. **Market intervention recommendations:** additional activities that can further drive market transformation in PC energy efficiency through increased use of efficient power supplies.

1.1 80 PLUS Program Overview

In 2002, the California Energy Commission, Pacific Gas & Electric Company, and the U.S. Environmental Protection Agency (EPA) commissioned Ecos Consulting and the Electric Power Research Institute to develop a power supply efficiency testing methodology. After this study, Ecos Consulting designed the 80 PLUS program to promote the use of energy-efficient power supplies in desktop PCs and servers. 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. Laptops are not covered by the 80 PLUS certification.[1]

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, and Platinum. These additional levels provided manufacturers with further opportunities to differentiate their products in the marketplace. NEEA worked closely with the EPA to incorporate the 80 percent efficient

[1] Energy efficiency has long been a higher priority in laptop design than desktop PC design, as manufacturers have sought to reduce component sizes and heat, and increase battery life as much as possible. Nearly three-quarters of laptops sold in 2009 met the ENERGY STAR 5.0 specification, indicating that the market for energy efficiency in laptops has effectively been transformed (ENERGY STAR 2010).

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.

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 now the 80 PLUS program offers incentives only for ENERGY STAR qualified desktop PCs and servers sold within the Northwest region.

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

80 PLUS Level	Minimum Efficiency for Desktops, Workstations, and Non-Redundant Servers	Minimum Efficiency for Redundant Servers	Year Introduced	ENERGY STAR Requirement
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

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

There are several prominent certifications and labels related to energy efficiency in PCs and servers (including power supplies) besides 80 PLUS. Table 2 summarizes these certifications, most notably ENERGY STAR, and their relationship to the 80 PLUS power supply specifications. Each certification, including 80 PLUS, specifies a minimum power supply efficiency. The three non-80 PLUS certifications (ENERGY STAR 5.0, Climate Savers, and EPEAT) each require a minimum efficiency of 85 percent, equivalent to the 80 PLUS Bronze classification.

Table 2. Major Energy Efficiency Certifications for PCs and Servers

	80 PLUS	ENERGY STAR 5.0	Climate Savers Computing Initiative	EPEAT
Products Certified	Power supplies for PCs and servers	Desktops, laptops, small-scale servers, workstations, thin clients, and displays	Desktops, laptops, thin clients, workstations and servers	Desktops, laptops, workstations and displays
Power Supply Efficiency Requirement* (Desktop PCs and servers only)	Five certified levels for desktop, workstation, and non-redundant server applications: – Base (80%) – Bronze (85%) – Silver (88%) – Gold (90%) – Platinum (92%) Four certified levels for redundant server applications: – Bronze (85%) – Silver (89%) – Gold (92%) – Platinum (94%)	Minimum of 85% efficiency (80 PLUS Bronze equivalent).	Minimum of 85% efficiency (80 PLUS Bronze equivalent). Additional tiers of certification for desktops, workstations, and thin clients: – Bronze (85%) – Silver (88%) – Gold (90%) And for volume servers: – Silver (89%) – Gold (92%) – Platinum (94%)	Minimum of 85% efficiency (80 PLUS Bronze equivalent).
Additional Requirements	None	Standby power requirements, power management software. Laptops must meet ENERGY STAR external power adapter standard.	All products must be ENERGY STAR qualified.	All products must be ENERGY STAR qualified. Other requirements involve environmentally sensitive materials selection, product longevity, design for end of life, corporate performance, and packaging.
Sponsoring Organization	Multiple utilities, government agencies, and energy efficiency organizations including NEEA (see Section 4.1)	U.S. Environmental Protection Agency (EPA)	Broad coalition including computer industry companies (e.g., Google, Dell, Intel), utilities (e.g., PG&E), non-profits (e.g., World Wildlife Fund) and government agencies (e.g., ENERGY STAR)	Green Electronics Council (a part of the International Sustainable Development Foundation)
Sources (Technical Specifications Website)	http://www.plugloadsolutions.com/80PlusPowerSupplies.aspx	http://www.energystar.gov/index.cfm?c=computers.pr_crit_computers	http://www.climatesaverscomputing.org/tech-specs	http://www.epeat.net/criteria.aspx

* 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.

1.2 80 PLUS Program Logic Model

Table 3 presents NEEA's logic model for the 80 PLUS program as presented in MPERs #1 and #2 to reflect NEEA's theory of change in the power supply market. The short- and long-term outcomes presented in the logic model formed the basis of the MPIs, which NEEA has tracked since MPER #1 and for which Section 4 of this report provides an update. See Section 4.8 for a review of progress toward expected outcomes.

Table 3. Program Logic Model from MPER #2

Situation *The context and need that gives rise to an initiative*	**Inputs** *The resources, contributions, & investments made in response to the situation*	**Activities** *What you do with your inputs (lead to outputs)*	**Outputs** *The desired outputs (tools, materials, plans, etc.) from your activities (lead to outcomes)*	**Outcomes**		**Impact** *Changes in the market resulting from the preceding outcomes*
				Short Term *The results and benefits*	**Longer Term** *The results and benefits*	
Barriers: - Desktop computer power supplies are treated as a commodity, differentiated by price instead of performance. - No supply of more efficient power supplies. - No testing protocol to verify power supply efficiency. - Likely cost differential between conventional and efficient power supplies. - Existing ENERGY STAR efficiency standard for power supplies sets a very low bar for industry. - Commercial sector computer purchasers are unaware of power supply energy use. **Opportunities:** - Power supplies that are at least 80% efficient can provide 82 kWh/yr of cost-effective savings. - Participate in a national initiative that can help influence an upgrade to the ENERGY STAR specification for desktop computers.	**Initiative Lead (Ecos Consulting) for** - Project administration - Marketing - Incentive processing and tracking **Budget for:** - Marketing - Incentives - Incentive administration - Evaluation	**Develop and implement marketing plan, including** - General outreach to media outlets serving OEMs, SIs, power supply manufacturers and prospective purchasers - Providing content for manufacturers' communication channels - Developing materials for outreach by regional utilities **Develop and manage national initiative beginning in August 2004, including** - Meet with OEMs and SIs to explain benefits of 80 PLUS - Recruit power supply manufacturers - Develop a test protocol for power supplies - Test and certify power supplies - Receive and pay invoices of participating computer manufacturers - Secure participation of at least one other utility or energy organizations in the initiative - Update information on the initiative website - Share production and sales data with EPA **Evaluate progress of initiative**	**Marketing** - Marketing plan - Website is active - Marketing collateral developed for manufacturers, purchasers and utilities **Initiative** - Power supply testing protocols are developed - $5 incentive is offered to help bridge price differential between conventional and 80 PLUS power supplies - At least two OEMs and SIs contacted to participate in initiative - Power supply manufacturers submit units for testing and approval - At least one additional potential initiative sponsor contacted - At least one power supply manufacturer contacted **ENERGY STAR** - Participate in public process for developing revised specification - Assess need for any additional support once specification goes into effect **Evaluation** - RFP for evaluation contractor - Select contractor - Conduct MPERs	**Marketing** - Marketing materials generate inquiries from: - Power supply manufacturers - OEMs and SIs - Electric utilities - Large consumers ***(awareness)*** - Website usage increases over time ***(awareness)*** **Initiative Management** - Contractor posts and maintains power supply testing protocol on website - Contractor reimburses OEMs and SIs $5 for each qualifying PC sold in NW ($10 for each desktop server) **Response from computer industry:** - At least one major desktop PC OEM participates ***(availability)*** - At least one more power supply manufacturer offers and supplies qualifying product ***(availability)*** - OEMs and SIs deliver sales of at least 70,000 qualifying units before end of 2005 ***(market share/penetration)*** - Participating OEMs and SIs receive $5 incentive ($10 for desktop servers) for each qualifying unit sold in NW - Buy-down spurs OEM and SI sales of qualifying PCs **Support from other interested parties:** - At least one other major utility or energy efficiency organization provides greater than $1 million in support ***(availability)*** **ENERGY STAR** - EPA includes at least an optional power supply in its proposed revision to ENERGY STAR for computers by early 2005 ***(awareness)*** EPA finalizes the revised standard, to take effect in early 2006 ***(market share/penetration)***	- 75% or higher market share of 80 PLUS equipped PCs by 2010 - Industry will continue to embrace ENERGY STAR as a significant marketing advantage	- All PCs meet ENERGY STAR specification - NEEA and/or utility support not needed

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 products most relevant to this research into three broad classes: desktop PCs, laptops, and servers. 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.

    - **Notebooks** (also commonly referred to as laptops) are traditional laptop PCs that are powerful enough for most computing needs; **mini-notebooks** are smaller computers that retain all or nearly all the computing power of their full-sized equivalents.

    - **Netbooks** are small notebook computers designed primarily to access the internet; they typically run the Windows operating system, but do not have the computing power of a notebook necessary for running complex applications.

- **Servers**, 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.

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

- **Tablets** are designed 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 these mobile operating systems are becoming more advanced. 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.

2. EVALUATION ACTIVITIES

The evaluation activities conducted for this third MPER included both primary and secondary research that provided a greater understanding of the 80 PLUS program and an update of the MPIs. Discussions with NEEA staff subsequent to the initial statement of work focused the research primarily on the *commercial* market for desktop PCs, laptop and servers. Evaluation activities began with secondary research on the commercial desktop PC and laptop markets. Navigant then conducted a review of program literature, including the ACE model, the logic model, and past MPERs for the 80 PLUS program. The team also contacted NEEA program staff and program implementers at Ecos Consulting for additional background on the program. The principal research activity consisted of interviews with relevant market actors including computer manufacturers (original equipment manufacturers, or OEMs), system integrators (SIs), power supply manufacturers (PSMs), and commercial end-users.

Table 4 summarizes the evaluation activities that have been conducted for the 80 PLUS program in the past two MPERs as well as in the current research effort summarized in this report.

Table 4. Overview of Historical Evaluation Activities

Evaluation Activity	MPER #1	MPER #2	MPER #3 (Current Research)
Secondary Research on PC and Server Market	✓	✓	✓
Review of Program Logic Model	✓	✓	✓
Review of Program ACE Model Assumptions	✓	✓	✓
Interviews with NEEA and 80 PLUS Program Staff	✓	✓	✓
Interviews with OEMs (participating & non-participating)	✓	✓	✓
Interviews with SIs (participating & non-participating)	✓	✓	✓
Interviews with PSMs (participating & non-participating)	✓	✓	✓
Interviews with Commercial End-Users		✓	✓
Interviews with EPA Staff	✓	✓	
Interviews with Program Sponsors (other than NEEA)	✓		

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

2.1 Secondary Research

Navigant documented the evolution of the 80 PLUS program and the PC and server markets 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 the emergence of the laptop as the dominant type of PC. Sources included:

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

- ENERGY STAR website

NEEA received a memorandum containing key findings on September 2, 2010 (included in Appendix D). The secondary research also informed the development of the interview guides and provided a useful reality check on interviewees' responses. Navigant conducted additional secondary research after submission of the memo to obtain the most up-to-date sales estimates after the major industry analysts (e.g., Gartner) released their third quarter 2010 reports.

2.2 Reviews of Program Literature, including ACE and Logic Models

Navigant reviewed 80 PLUS program literature with the intent of understanding the assumptions of the program's cost-effectiveness calculations and identifying critical market and program progress indicators to update through the market actor interviews. The reviewed documents included:

- Prior evaluations of 80 PLUS programs, including the two previous MPERs completed for NEEA[2] as well as an evaluation for Southern California Edison
- NEEA's ACE model
- The 80 PLUS program logic model presented as an appendix to MPER #2

Navigant highlighted key outcomes in a memo to NEEA on October 4, 2010 (attached in Appendix E).

2.3 Interviews with Program Stakeholders and Implementers

Navigant interviewed two 80 PLUS staff members, Ryan Rasmussen (Program Manager) and Jason Boehlke (Channel Manager) of Ecos Consulting, to better understand the mechanics of the 80 PLUS program and to obtain contact information for select computer OEMs, SIs, and PSMs.

Navigant also conducted an interview with Andy Ekman, former program manager of NEEA's 80 PLUS initiative, to gain a better understanding of NEEA's involvement with the 80 PLUS program. Both interviews provided valuable insights into the development of the interview guides for computer OEMs, SIs, PSMs, and commercial end-users.

2.4 Market Actor Interviews

The four primary market actors interviewed by Navigant are as follows:

- ***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.
- ***System Integrators (SIs):*** These companies purchase components from other manufacturers and assemble computers, typically for commercial applications. The IT

[2] Note that for brevity's sake throughout this report, the previous MPERs are referred to as "MPER #1" and "MPER #2." See the bibliography under "Quantec" for full citations of the two reports.

industry interchangeably refers to SIs as computer manufacturers, although they normally do not manufacture their own component parts.

- ***Power Supply Manufacturers (PSMs):*** These companies manufacture the power supplies for personal computers, servers, and other electronic equipment. The manufacturing facilities are typically based in Asia with U.S. sales and distribution offices.
- ***Commercial End-Users:*** These are customers who purchase computer products for commercial purposes.

The nuance between SIs and computer OEMs is subtle, and at least one system integrator reported that they no longer manufacture "white boxes" (PCs built from scratch with an unbranded "shell" and components from different manufacturers) and had changed their business model to be an OEM reseller. For the sample of OEMs, the research excluded from consideration any OEM, such as Toshiba, that did not produce commercial desktop computers.

2.4.1 Sample Design

Secondary research and discussions with NEEA and Ecos Consulting staff helped to define the universe of market actors from which researchers selected interviewees (Table 5). The 80 PLUS website identified participating computer OEMs, SIs, and PSMs. Navigant identified large commercial end-users through the web site www.jobbankusa.com, which lists the largest employers by state for the states of Washington, Oregon, Montana and Idaho.

Table 5. Sample Design Summary

	OEMs	SIs	PSMs	Commercial End-users
Goal for Completes (n)	5	8	8	10
Targeted Job Title/ Role	Product, Power , Compliance Manager	VP, GM, Project Manager	Owner, US Sales Rep, Engineer	CTO, IT Manager
Sample Frame/ Source	Ecos contacts, list of computer OEMs from www.findouter.com website	Ecos contacts, list of participating companies from 80 PLUS website	Ecos contacts, list of participating companies from 80 PLUS website	List of large NW companies from www.jobbankusa.com website
Ecos-provided contacts	Dell, HP, Lenovo, Apple	CTL, Equus, Nor-tech	Delta, Liteon, Acbel, Chicony Power, FSP, Sea Sonic	None

Source: Navigant

Note: NEEA and Navigant established the initial goal of 10 commercial end-users based on the assumption that NEEA would be able to provide end-user contacts appropriate for an unbiased sample.

2.4.2 Survey Design

Navigant commissioned National Research Center, Inc. (NRC) to consult on interview guide design and best practices in market research interviews, particularly with regard to contacting non-participants and eliciting useful information from interviewees. In order to account for the potential language barriers associated with PSMs based mainly in China, Navigant specifically designed the PSM interview guide with few open-ended questions and carefully phrased

questions to reduce potential confusion for non-native English speakers. Ultimately, Navigant administered an online survey among the PSMs.

The following table illustrates NEEA's key information needs by anticipated data source, as specified in the original statement of work. Navigant used this table in the development of interview guides for the three groups of key market actors: OEMs and SIs, PSMs, and commercial end-users. See Appendix B for interview guides.

Table 6. Information Needs by Source

Information Needs/Questions	Anticipated Sources of Information				
	Secondary Sources	Interviews with OEMs	Interviews with SI's	Interviews with PSMss	Interviews with commercial end-users
Current commercial market size for 80 PLUS, ENERGY STAR, and non-80 PLUS desktops and servers	x	x	x	x	
Sales trends regionally and nationally for 80 PLUS and ENERGY STAR	x	x	x	x	
Impact of the economy on sales of PCs and laptops over past 2-3 years	x	x	x	x	x
Sales trends regionally and nationally for PCs vs. laptops	x	x	x	x	
Trends in manufacturing of power supplies	x			x	
Anticipated sales of PCs and laptops in next 1-2 years	x	x	x	x	x
Number of units of ENERGY STAR 5.0 sold where incentives are not claimed		x	x		
Cost to manufacture an ENERGY STAR 5.0 PC vs. 80 PLUS vs. standard PC		x	x	x	
Factors influencing purchase decisions for PCs vs. laptops		x	x		x

Source: NEEA

2.4.3 Survey Methodology

Navigant employed several strategies to interview market actors. Interviewers made introductory phone calls and sent emails to introduce the objectives of the call to potential computer OEM, SI, and commercial end-user interviewees. The team called all contacts a minimum of five times and left a minimum of three voicemails, if needed.

Researchers utilized an online survey tool to administer the survey to participating PSMs, partially due to the anticipated language barrier. The success of this approach led the team to

develop an online version of the interview guide for participating SIs who proved difficult to contact via phone.

The commercial end-user group also proved to be difficult to contact, perhaps due to the fact that these end-users by definition are non-participants in the 80 PLUS program and, based on the OEM and end-user interviews completed, do not view themselves as program stakeholders. Additionally, the high stature of the individuals targeted for interviews (e.g., Chief Technology Officers, Information Technology Managers, etc.) make them relatively difficult to reach with a cold call.

Three major employers in the Pacific Northwest participated in interviews. After exhaustive attempts to secure additional end-user interviews, Navigant relied on OEMs and SIs' perspectives to complete the assessment of commercial end-users' 80 PLUS awareness and purchasing preferences.[3]

A total of 21 market actor interviews contributed to the research findings, as summarized in Table 7. The five OEMs accounted for more than 60 percent of PC sales in the United States during the first three quarters of 2010, based on data from Gartner (2010) and on Navigant's conservative assumptions of the market share of smaller OEMs for which Gartner did not report data.

Table 7. Final Sample Disposition

Market Actor Group	Goal for Completed Interviews/Surveys (n)	Completed Interviews/ Surveys (n)
OEMs	5	5
SIs	8	5
PSMs	8	8
Commercial End-Users	10	3

[3] Prior to the commencement of the research, both NEEA and Navigant anticipated that OEM and PSM interviews would provide the most useful data for the analysis. Interview findings confirmed this belief, as OEMs indicated that they, not commercial end-users, drove decision-making regarding the use of efficient power supplies. Among the three commercial end-users interviewed, none had any familiarity with 80 PLUS.

3. MARKET CHARACTERIZATION

This section presents specific findings characterizing the markets for PC, servers, and efficient power supplies, organized as follows:

- Section 3.1: PC and Server Markets
- Section 3.2: Energy-Efficient Power Supply Market

Both secondary and primary research contributed to Navigant's understanding of each topic area. The secondary research was the primary source for characterization of the overall PC and server markets, and the primary research provided the majority of data and insights on energy-efficient power supplies.

The findings presented in this section address specific information needs identified in NEEA's statement of work, including:

- Current commercial market size for desktops and servers, including ENERGY STAR, 80 PLUS, and non-80 PLUS models;
- Impact of the economy on sales of PCs and laptops over past two to three years;
- Sales trends regionally and nationally for PCs vs. laptops;
- Anticipated sales of PCs and laptops in next one to two years;
- Factors influencing purchase decisions for PCs vs. laptops.

Section 4 of this report presents findings related to the MPIs.

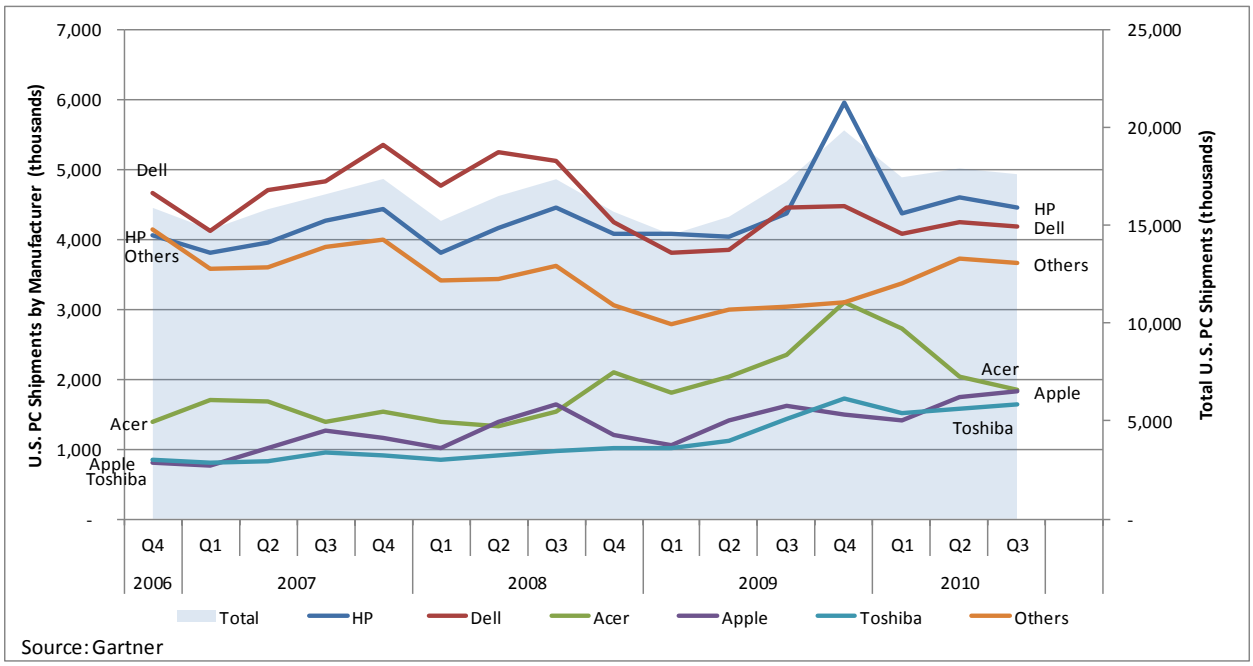
3.1 PC and Server Markets

This investigation of the markets for PCs, including both desktops and laptops, and servers in the United States is distinct from the discussion of efficient power supplies that follows in Section 3.2. The "PC market" refers to sales of computers and servers themselves, whereas the market for efficient power supplies refers to the adoption of power supplies exhibiting efficiencies that meet or exceed the 80 PLUS standard. When supporting assertions about trends in *PC sales*, this report references data on *PC shipments* since shipment data are more readily available and represent a reasonable proxy for sales.

3.1.1 Overall U.S. PC Market Trends

The U.S. PC market has recovered from the lows experienced in late 2008 and early 2009, but growth is relatively slow. In fact, Gartner's most recent estimates of U.S. PC shipments show year-over-year growth of just 2.2 percent for the third quarter (Gartner 2010), while IDC's estimates show a slightly higher 3.8 percent year-over-year growth for the same time period. (IDC 2010) As demonstrated in Figure 1, the major OEMs have jockeyed for market share position in the past two years, with HP emerging with a narrow lead over Dell, Acer gaining and then losing significant market share, and Apple and Toshiba gaining steadily on the top three manufacturers.

Figure 1. U.S. PC Shipments, 4th Quarter 2006 through 3rd Quarter 2010



Calendar years 2008 and 2009 brought two years of reduced IT spending due to economic uncertainties, with one OEM noting that many companies have been trying to extend the lifespan of their PC hardware by several years: "Corporations have gone from three year churn to a four-to-five year churn." But the corporate PC refresh cycle (companies updating stocks of PCs) may now be underway. One driver of the refresh cycle is the recent release of the Windows 7 operating system (Trefis Team 2010). According to Microsoft (as reported by Trefis Team), corporate PC sales grew 16 percent in the third quarter of 2010, compared to the same quarter the previous year. Further evidence that the corporate PC refresh cycle is underway in earnest is the major increase in sales that Lenovo experienced at the end of 2010, with a 69 percent improvement in unit sales from October to November; a major portion of Lenovo's PC product mix is the expensive, business-focused ThinkPad series (McIntyre 2010).

Apple is also gaining PC market share, with the popularity of iPods, iPhones, and iPads creating a "halo effect" around the Apple brand, leading to increased sales of Mac computers. Apple achieved a 10.6 percent share of the U.S. PC market in third quarter 2010, propelling it to become the third largest PC manufacturer in the U.S (IDC 2010). The average price of a Mac laptop has also dropped over the past three years, and the Trefis Team expects this downward trend to continue (Trefis Team 2010). IDC's estimate of Apple's year-over-year growth in the third quarter of 2010 is 24.1 percent in the U.S. market, compared to 3.8 percent overall PC sales growth (IDC 2010). Not only is Apple gaining overall market share, but it is seeing significant gains in desktop PC market share with a 70 percent year-over-year increase in desktop PC sales from the first quarter of 2009 to the first quarter of 2010 (Foresman 2010). This may be partially due to Apple gaining more acceptance in the corporate world; a recent survey of enterprise IT professionals found that Apple's share of enterprise systems is expected to grow from 3.3 percent of all systems in 2009 to 5.2 percent by 2011, an increase of 57 percent in two years (Chartier 2010).

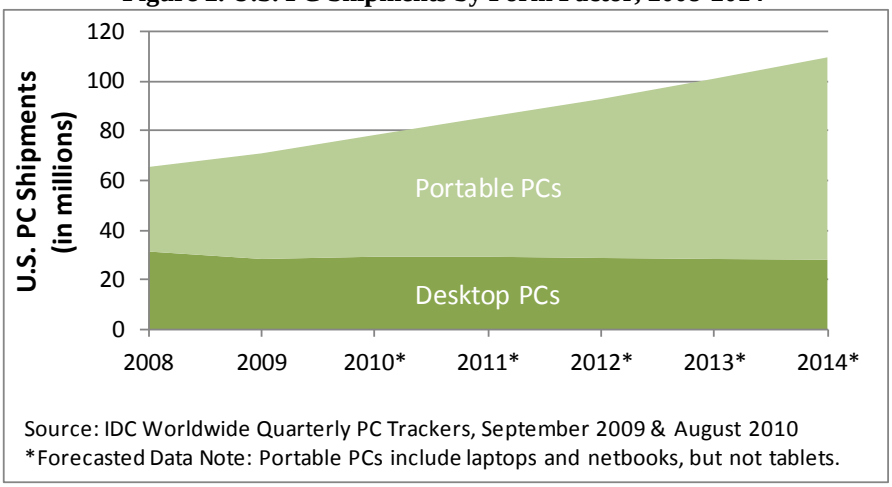
Worldwide, PC sales are growing more rapidly than in the United States, but not as briskly as previously projected. Gartner forecasts worldwide PC shipments to reach 352.4 million units in 2010, a 14.3 percent increase over 2009. The emerging markets, and not the US, are driving the majority of this growth. Gartner further expects that worldwide PC shipments in 2011 will reach 409 million units, a 15.9 percent increase over 2010. Both of these estimates are lower than Gartner's previous estimates of 17.9 percent growth in 2010 and 18.1 percent growth in 2011, due to expectations of weakened consumer demand attributed in part to growing interest in tablets such as the Apple iPad (Gartner 2010).

Finding #1*: *The PC market in the United States grew slowly due to the 2008-9 recession, but is starting to accelerate as companies upgrade aging stocks.

3.1.2 Sales Trends for Desktop PCs Compared to Laptops

Desktop PC sales have remained relatively flat, even as desktops' market share has declined steadily in recent years. The driver of this decline in market share is the steady growth in sales of laptops and other portable PCs since third quarter of 2008 (IDC 2010). Figure 2 illustrates the past and forecasted U.S. sales trends for desktop PCs and portable PCs through 2014. The data shows a slight increase in desktop PC sales from 2009 to 2010 (consistent with reports from interviewed OEMs) followed by minor decline in desktop PCs and significant growth in laptop and netbook[4] sales from 2011 through 2104 (IDC 2010).

Figure 2. U.S. PC Shipments by Form Factor, 2008-2014



Source: IDC Worldwide Quarterly PC Trackers, September 2009 & August 2010
*Forecasted Data Note: Portable PCs include laptops and netbooks, but not tablets.

Despite the current and projected dominance of laptops over PCs, recent trends suggest an uncertain market ahead. In particular:

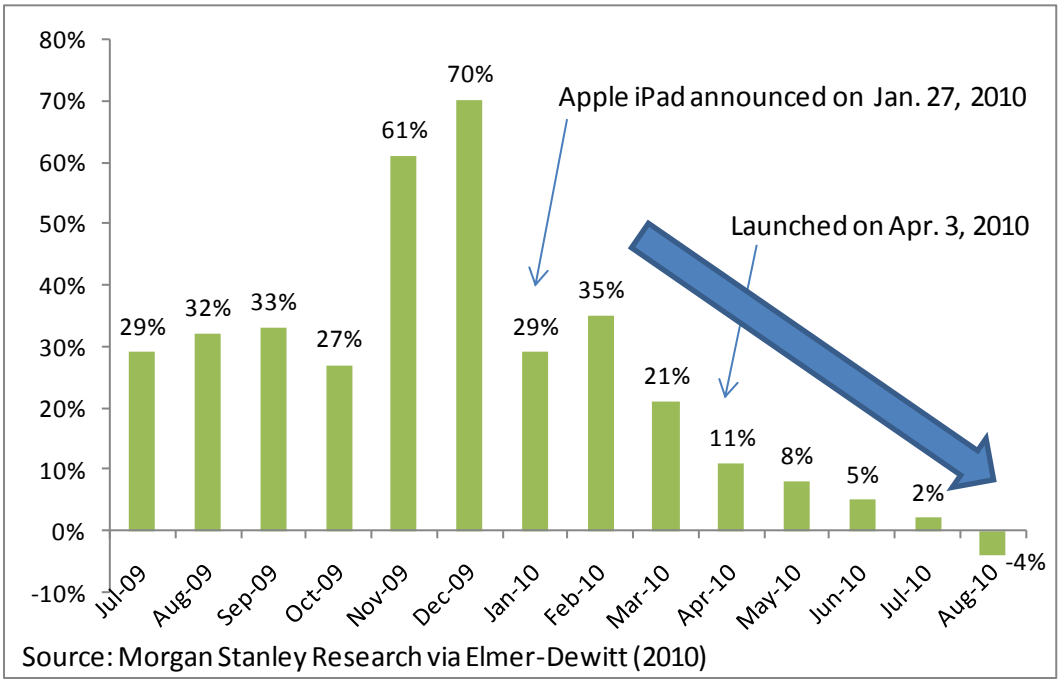
- **Major manufacturers report a recent increase in desktop PC sales.** Three of the interviewed OEMs and three of the interviewed SIs have actually observed growth in their desktop PC sales in recent quarters, most likely due to the corporate PC refresh cycle noted above as well as consumer preferences for the relatively lower priced

[4] Note that IDC does not currently include tablet computers in its forecasts for portable PC sales, although other analyst firms are starting to include them in similar estimates.

desktops during an economic decline.[5] One interviewee described seeing "a spike in desktop sales" with relative price cited as a possible driver. This is likely a short-term trend due to lingering effects of the economic recession.

- **U.S. laptop PC sales growth has slowed in 2010.** According to Morgan Stanley research (as reported by Elmer-DeWitt), growth in U.S. sales of laptop PCs slowed significantly in 2010, and sales actually declined in August 2010 in a year-over-year comparison. Industry analysts, most notably Elmer-Dewitt (2010) attributed this decline partially to the introduction of the Apple iPad on April 3, 2010 and pending releases of similar tablet computers (e.g., new models recently announced by Samsung, Dell, and others), as people are unlikely to purchase both a tablet and a laptop computer in the same month. Elmer-Dewitt referred to this effect as "tablet cannibalization." The decline in laptop sales growth can be observed in Figure 3, which notes that laptop sales growth began declining prior to the release of the iPad.

Figure 3. U.S. Retail Laptop Year-over-Year Unit Growth, July 2009-August 2010



Finding #2: *Sales of portable PCs are outpacing desktops, but desktops will remain a significant market.*

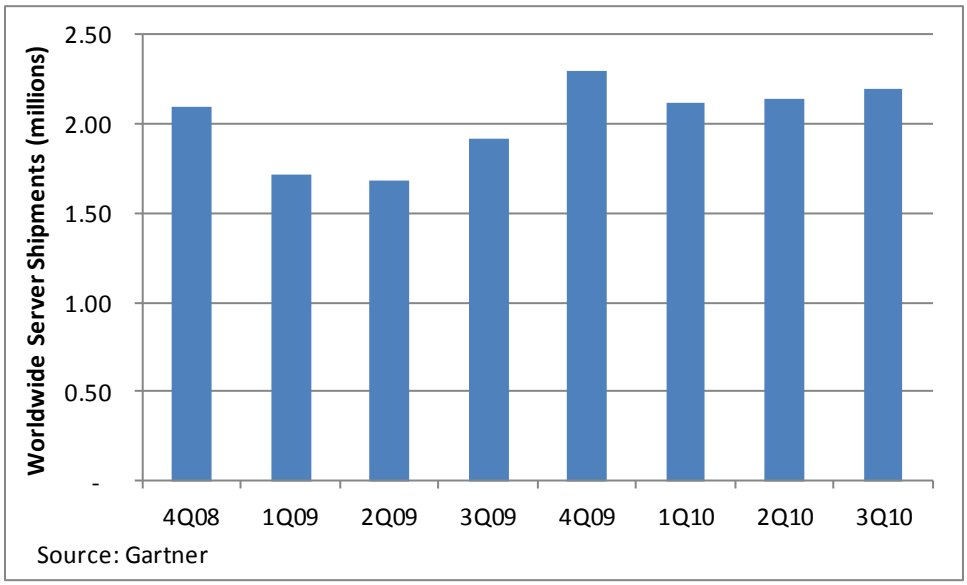
3.1.3 Server Sales Trends

Worldwide sales of servers are up significantly in 2010 over 2009 in year-over-year comparisons (Figure 4). Although unit sales figures are not available specifically for the U.S., Gartner attributes much of the growth to increased U.S. sales, and the interviewed OEMs indicated that their companies are seeing significant growth in U.S. server sales. During the economic

[5] See Appendix C-1 for full responses to the OEM/SI interview questions.

downturn, corporations delayed major IT infrastructure investments, and due to pent-up demand, as soon as the economic recovery began, U.S. server shipments increased dramatically. The trend toward desktop virtualization and cloud computing is also driving server sales, due to increased processing needs (Kovar 2010).

Figure 4. Worldwide Server Shipments, Q4 2008 through Q3 2010



Finding #3: *The U.S. economic recovery is driving increased server sales.*

3.1.4 Future Trends Expected to Impact PC Market

The major trends expected to influence the U.S. PC market in the next few years include virtualization, cloud services, and mobile computing. These concepts, defined below, could result in servers representing a greater share of the computer market in the coming years as well as a decline in the use of traditional desktop PCs in favor of laptops, tablets, and thin clients.

Virtualization is the concept that a person would not use an actual, physical computer but rather a keyboard and display that links through the internet or a network to a centralized processor. One OEM interviewed by Navigant plainly stated, "Virtualization will kill the desktop as we know it." In other words, in the future as envisioned by this OEM, individuals will no longer have powerful computers sitting on their desks; rather, they will use a stripped-down display and input device (referred to as a "thin client") as a window into a virtual computer that is likely located in an off-site data center. One physical server can host many virtual computers, and one physical server can actually host multiple virtual servers—for example, servers running different operating systems.

Cloud computing is closely connected to virtualization. The National Institute of Standards and Technology defines cloud computing as follows:

> *Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage,*

applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. (Mell and Grance 2009).

Cloud computing is a service model, whereas virtualization is a technology. Virtualization enhances cloud computing, but the two can exist independently. One basic example of cloud computing is Google Docs, in which a web-based service provides a capability which would normally be fulfilled by software hosted on an individual's computer (*e.g.,* word processing or spreadsheet analysis). Many of the interviewed market actors and industry experts cited in this report foresee much more advanced deployments of cloud computing, in which individuals can perform complex tasks relying solely on the computing resources of "the cloud", not their physical machine.

Mobility is another broad trend which virtualization and cloud computing may enhance. Mobility is the consumers' expectation of being able to do what they want to do, when and where they want to do it. In part, this expectation may derive from the rapid proliferation of smartphones and their evolving capabilities, in which an iPhone or Android device functions more like a computer than a phone. U.S. consumers are growing accustomed to having their phones perform basic computing tasks and act as a gateway to their networks and the internet, wherever they are currently located.

Tablet computers fill a gap between the smartphone and the laptop computer, combining extreme mobility and a much larger display than a smartphone with adequate computing power for most needs. Observations about the market for tablets, and especially Apple's role in the emergence of this market, including the following:

- The market response to the introduction of the iPad has surprised many industry analysts, particularly with regard to the quick adoption of the iPad by executives and salespeople in the corporate world. In November 2010, Gartner lowered its 2011 forecast of traditional PCs (desktops and laptop PCs) sold worldwide specifically because of the introduction of the tablet, estimating that up to 10 percent of PC sales could be displaced by tablets by 2014. Apple has already achieved more than 95 percent of the tablet market within six months of releasing the iPad (Electronista 2010).

- A December 2010 survey of IT buyers found that 14 percent of corporate IT buyers intend to buy tablets in the first quarter 2011, and four out of five of those buyers intend to buy the iPad. Although only seven percent of corporations currently provide their employees with tablet computers, that number rose one percent in the four months since an August 2010 survey. (Dalrymple 2010)

- Apple will soon be facing competition in the tablet market, particularly in the corporate world. Other manufacturers see an opportunity for tablet computers combined with virtualization, cloud computing, and a desktop docking station to eliminate the need for separate computers, desk phones, mobile phones, and presentation devices for employees. Cisco recently announced an Android-powered tablet computer called the Cius which will fill all those needs for under $1000 and which could significantly disrupt the status quo in corporate IT purchasing. A significant shift toward virtualization and cloud computing would likely drive increased investment in servers and data centers. Desktop PCs would be obsolete for corporations making use of virtualization (Greenberg 2010).

There are a number of benefits to the use of tablets or thin clients combined with virtualization that are attractive to corporations. Employees working on thin clients have significantly less downtime due to PC failures because thin clients are solid state and thus have no spinning disks (fewer moving parts), and since all user data is stored on the server, no data is lost if the thin client does fail. IT staff can focus their efforts on maintaining the servers rather than troubleshooting individual PCs; this can result in an estimated 40 percent reduction in IT labor costs. Virtualization also has significant energy impacts: thin clients use 88 percent less energy than desktop PCs (Wenzel 2010).

Finding #4: *Market actors and industry analysts expect that virtualization, cloud computing, and mobility will drive greater need for servers relative to desktops, particularly in corporations.*

3.2 Energy-Efficient Power Supply Market

This section provides a brief overview of the energy-efficient power supply market with a focus on market dynamics between the major market actor groups (OEMs, SIs, PSMs, end users, NEEA, and ENERGY STAR). The findings include a characterization of OEMs' relative contribution to the overall market for 80 PLUS or equivalent power supplies. (Section 4: Market Progress Assessment provides analysis of the evolution of the energy-efficient power supply market through comparisons of MPIs over time.)

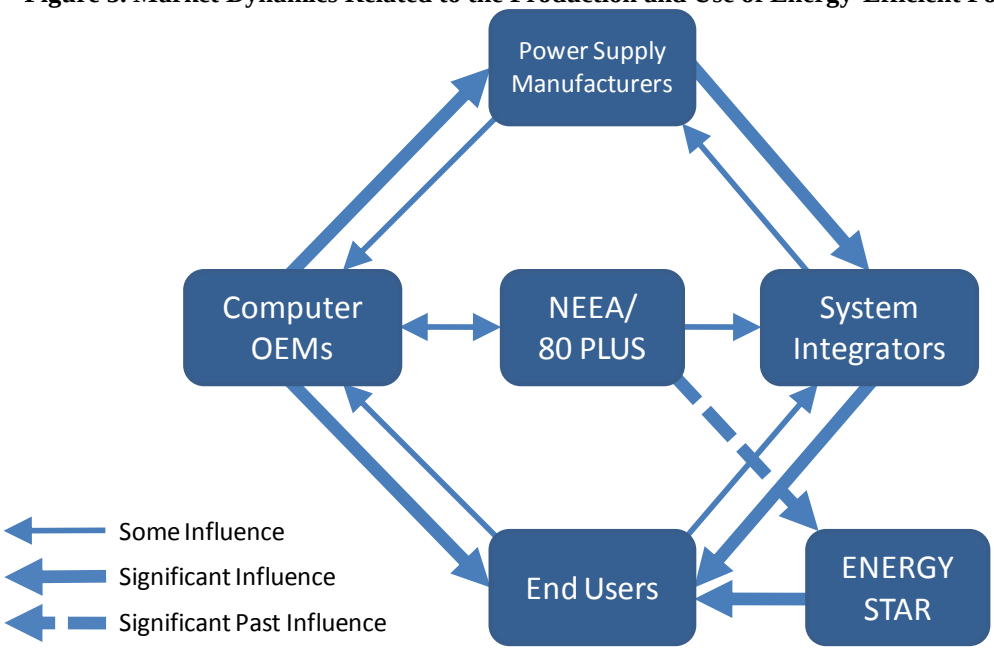
3.2.1 Energy-Efficient Power Supply Market Dynamics

The market for computer power supplies is comprised primarily of three sets of players: 1) PSMs, 2) computer makers, including OEMs and SIs, and 3) end-users. Figure 5 illustrates the major market dynamics of the market for energy-efficient power supplies as observed through Navigant's interviews and secondary research. The arrows denote the direction of market influences between the actors, and the thickness of the arrows represents the relative strength of that influence on the types of power supplies produced or used.

Navigant found that OEMs are the greatest driver of energy-efficient power supplies in the market, strongly influencing both PSMs and commercial end-users. SIs have a similar amount of influence on the commercial end-users that they serve, but SIs serve a relatively small share of the market and thus influence PSMs to a lesser degree than do OEMs. NEEA has an influence on OEMs and SIs due to the incentives provided for meeting 80 PLUS specifications. 80 PLUS works collaboratively with the OEMs to develop the technical specifications and consequently OEMs do influence the evolution of the program.

As illustrated in the diagram, end-users have little, if any, direct influence on the efficiency of power supplies. Commercial end-users do not appear to be familiar with the 80 PLUS label, although their desire for the ENERGY STAR brand (which includes an 80 PLUS requirement) does influence OEM and SI decisions regarding the types of power supplies to include in their computers. Note that the diagram displays influences on *decision-making* related to the manufacture and use of energy-efficient power supplies, not all possible interactions within a complex market. The absence of an arrow between NEEA/80 PLUS and PSMs indicates that the program does not directly influence PSMs in their choice of power supply efficiency; however, the program does interact with the PSMs by providing them with the 80 PLUS technical specifications and testing protocols.

Figure 5. Market Dynamics Related to the Production and Use of Energy-Efficient Power Supplies[6]



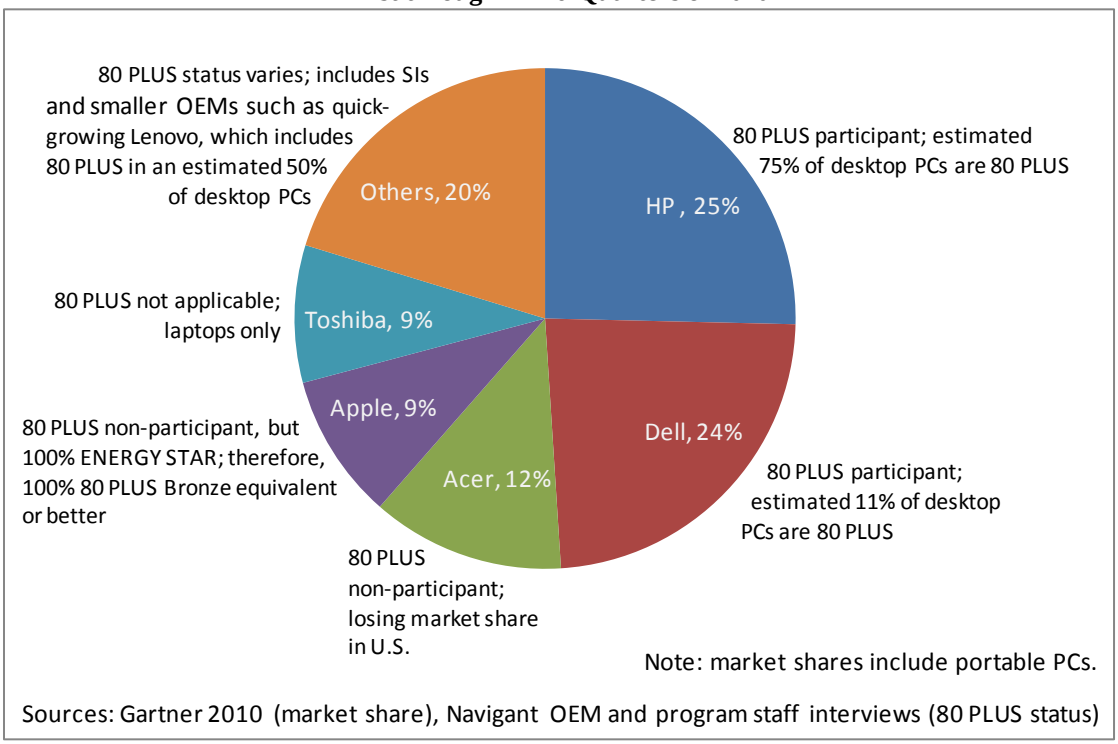
Source: Navigant.

3.2.2 Major OEMs' Use of Energy-Efficient Power Supplies

The following figure displays the major computer OEMs' share of the U.S. PC market in 2010 and their use of 80 PLUS (or equivalent) power supplies. This graphic illustrates the OEMs' commitment to energy-efficient power supplies in the context of their ability to impact the overall market. HP is a major market player, with a 25 percent share of the PC market and with an estimated 75 percent of HP's sales of desktop PC sales qualifying for 80 PLUS; thus, HP contributes significantly to the overall market share of 80 PLUS equivalent power supplies. Apple is a relatively small player, accounting for only nine percent of PCs sold; however, all of the company's PCs include an 80 PLUS Bronze equivalent power supply, so Apple also contributes greatly to the rise of 80 PLUS. Conversely, Dell sold nearly one quarter of the PCs sold in the U.S. in the first three quarters of 2010, but only 11 percent of the company's desktops included 80 PLUS power supplies, so they drive less of the 80 PLUS market activity than smaller Apple.

[6] Note that for purposes of simplicity, the inclusion of ENERGY STAR in this graphic was limited to its interactions with end users and the NEEA/80 PLUS program; this is not to imply that ENERGY STAR does not have interactions with other market actors, but those relationships were not a focus of this research.

Figure 6. U.S. PC Market Share for Major Manufacturers, with 80 PLUS Status, First through Third Quarters of 2010



3.3 Summary of Market Characterization Findings

The PC market in the United States continues to expand, despite a slowdown in growth during the recession in 2008 and 2009. Laptops represent an increasing share of the PC market, and now comprise more than 60 percent of all PC sales, while desktop PC sales remain relatively flat. In the long-term, trends toward virtualization, cloud computing, and mobility are expected to further increase the overall energy efficiency of commercial computing in the U.S. as thin clients and laptops are more energy-efficient than desktop PCs; these trends may also drive increased use of servers, which will account for a bigger portion of the potential energy savings for programs such as 80 PLUS going forward.

As part of its statement of work for this market research, NEEA requested that the research address specific areas of interest regarding commercial PC market size, sales trends, and other related market characterization topics. Table 8 provides a summary of findings for these key research topics related to market characterization. Analysis of additional topics requested by NEEA appear in Section 4.

Table 8. Summary of Key Information Needs/Research Questions Related to Market Characterization

Information Needs/Questions	High Level Findings
Current commercial market size for 80 PLUS, ENERGY STAR, and non-80 PLUS desktops and servers	The U.S. commercial desktop PC market, measured in 2009 sales, is approximately 17 million units. The total U.S. market for desktop PCs was approximately 28 million units, but commercial sales account for approximately 60 percent of the major OEMs' total PC sales, and that percentage may be higher for desktop PCs specifically. Data on server sales is more difficult to obtain as manufacturer sales are reported worldwide, not for the U.S. specifically.
Impact of the economy on sales of PCs and laptops over past 2-3 years	Although there were some quarters of declining sales in late 2008 and early 2009, the economic downturn mainly had the effect of slowing *growth* in the PC market over the past 2-3 years. Corporations did try to extend the life of their existing PCs and servers but corporate IT investment has rebounded in 2010.
Sales trends regionally and nationally for PCs vs. laptops	Desktop PCs will likely remain a sizeable market of approximately 25-27 million units sold in the U.S. per year, with a slight decrease in sales forecasted through 2014. Laptop sales have increased dramatically in recent years, a trend expected to continue.
Anticipated sales of PCs and laptops in next 1-2 years	Total U.S. PC sales projections are for approximately 90 million units in 2011 and 101 million units in 2012. Desktop PCs will account for roughly 29 percent and 26 percent of those sales, respectively.

Source: Navigant research and analysis

4. MARKET PROGRESS ASSESSMENT

The market progress assessment provides analysis of the evolution of the energy-efficient power supply market through comparisons of MPIs over time. This analysis is based on a combination of secondary and primary research conducted by Navigant, including interviews with major market actors (OEMs, SIs, PSMs, and commercial end-users). Secondary sources are cited within this section and in the bibliography in Appendix A, and the full results of all primary research can be found in Appendix C.

Navigant concludes that the 80 PLUS program has made strong progress in transforming the market for energy-efficient power supplies at the 80 PLUS Base (or equivalent) level. 80 PLUS has engaged the largest OEMs that produce commercial desktop PCs and certified over 2,800 models of power supplies that OEMs can choose from when specifying desktop PCs and servers. More than 200 PSMs have certified 80 PLUS power supplies, and increased PSM competition has reduced incremental costs.

The market share of 80 PLUS was 0 percent in 2005 (since there were no certified 80 PLUS models sold prior to 2005), growing to at least 11 percent in 2008 (based on ENERGY STAR market share). It now stands at an estimated 37 percent of desktop PCs (including 80 PLUS or equivalent power supplies) sold in the U.S. in the first three quarters of 2010. The incorporation of 80 PLUS Bronze into the ENERGY STAR 5.0 specification has driven increased adoption of higher levels of 80 PLUS power supplies. Research conducted for this study suggests that efficient power supplies will continue to transform the market, more through *greater penetration* of efficiencies in the lower 80-percent range than through significant *increases in the average efficiency* of those power supplies qualifying as "80 PLUS".

As the main focus of the 80 PLUS program is desktop PC power supplies, Navigant considers the percentage of all desktop PCs sold in the U.S. that incorporate 80 PLUS (or equivalent) power supplies to be the best indicator of market adoption and market transformation.[1] Additionally, there is available data on desktop PC sales whereas there is no available source that Navigant is aware of that tracks the number of power supply models and power supply units sold.

Table 9 provides updates for each of the eleven MPIs identified for the 80 PLUS program in previous MPERs, and directs the reader to the subsection of this report that presents the current findings relevant to that MPI.

[1] Navigant's use of desktop PC sales to estimate 80 PLUS market share also excludes a secondary market for 80 PLUS, the replacement power supply market; however, Navigant believes this is a very small market in comparison to the desktop PC market, and it is not a focus of the 80 PLUS program strategy. Interviewed OEMs, SIs, and PSMs indicated that 80 PLUS (or equivalent) market share is likely significantly higher for servers than for desktop PCs, but there is little publicly available market data about U.S. server sales and thus Navigant was unable to estimate 80 PLUS market share for server power supplies.

Table 9. 80 PLUS Program Market Progress Indicators

Market Progress Indicator	MPER #1	MPER #2	Current Status	Relevant Report Section
Number of 80 PLUS program sponsors	12	13	6	Section 4.1: Participation of Sponsors and Market Actors
Computer OEMs with certified units	0	2	5	
Participating SIs	10	51	37	
Power supply manufacturing firms with certified units	19	65	216	
Certified power supply units	35	403	2,857	Section 4.2: Availability of 80 PLUS Certified Models
Power supply units being tested for certification	20	50+	90+	
80 PLUS specification included in ENERGY STAR specifications	Pending	Effective July 2007	80 PLUS Bronze required for ENERGY STAR 5.0 certification	Section 4.3: Inclusion of 80 PLUS in ENERGY STAR Specifications
End-users aware of and request for 80 PLUS	Just developing	Increasing due to OEM marketing push	Limited awareness and only occasionally requested; ENERGY STAR brand more in demand	Section 4.4: End-User Awareness
Promotion of 80 PLUS by PSMs and SI's	Increasing	Increasing	OEMs drive demand for 80 PLUS although PSMs do market to SIs.	Section 4.5: Promotion of Efficient Power Supplies
Decreasing incremental cost	Decreasing from initial estimates; estimated by most market actors to be $10-$20	Slowly decreasing from initial estimates; estimated by most to be $15 or more	Continuing to decrease for OEMs with increased availability; estimated by most interviewed market actors to be between $7 and $22 depending on level of efficiency; PSM costs may be rising due to demand for higher levels of efficiency	Section 4.6: Incremental Costs of 80 PLUS Qualified Power Supplies
Sales of 80 PLUS PCs	Increasing, but below goals	Increasing, but below goals	Increasing over past 2-3 years; estimated 80 PLUS market share is 37% of all desktop PCs sold in first three quarters of 2010	Section 4.7: 80 PLUS Sales Trends and Market Share

Source: MPERs 1 and 2, Navigant research and analysis. See relevant subsections for specific sources for each MPI.

4.1 Participation of Sponsors and Market Actors

The 80 PLUS program (now referred to as the Plug Load Solutions program on the program website) currently has six sponsoring organizations and utilities: NEEA, Energy Trust of Oregon, Efficiency Vermont, New Jersey's Clean Energy Program[7], Xcel Energy, and Ontario Power Authority. According to interviews with Ecos Consulting staff, the number of program sponsors has fluctuated over time, particularly since utilities (in contrast to NEEA) are often more focused on near-term resource acquisition than market transformation, and thereby sign on for shorter periods of program sponsorship. Ecos has observed a recent resurgence in utility interest in promoting energy-efficient electronics such as desktop PCs, servers, and set-top boxes, and expects to see sponsorship levels rise again in the near future.

There are currently five OEMs and 37 SIs that include 80 PLUS-qualified power supplies in their desktop PCs and/or servers. These OEMs and SIs can obtain 80 PLUS certified power supplies from 216 PSMs who manufacture at least one 80 PLUS certified model. (See Section 4.2 for more discussion about the availability of 80 PLUS certified power supplies.)

Table 10. Market Progress Indicators: Participation

Market Progress Indicator	MPER #1 Findings	MPER #2 Findings	Current Status
Number of 80 PLUS program sponsors	12	13	6
Computer OEMs with certified units	0	2	5
Participating SIs	10	51	37
Power supply manufacturing firms with certified units	19	65	216

Source: MPERs 1 and 2, Navigant review of Plug Load Solutions website.

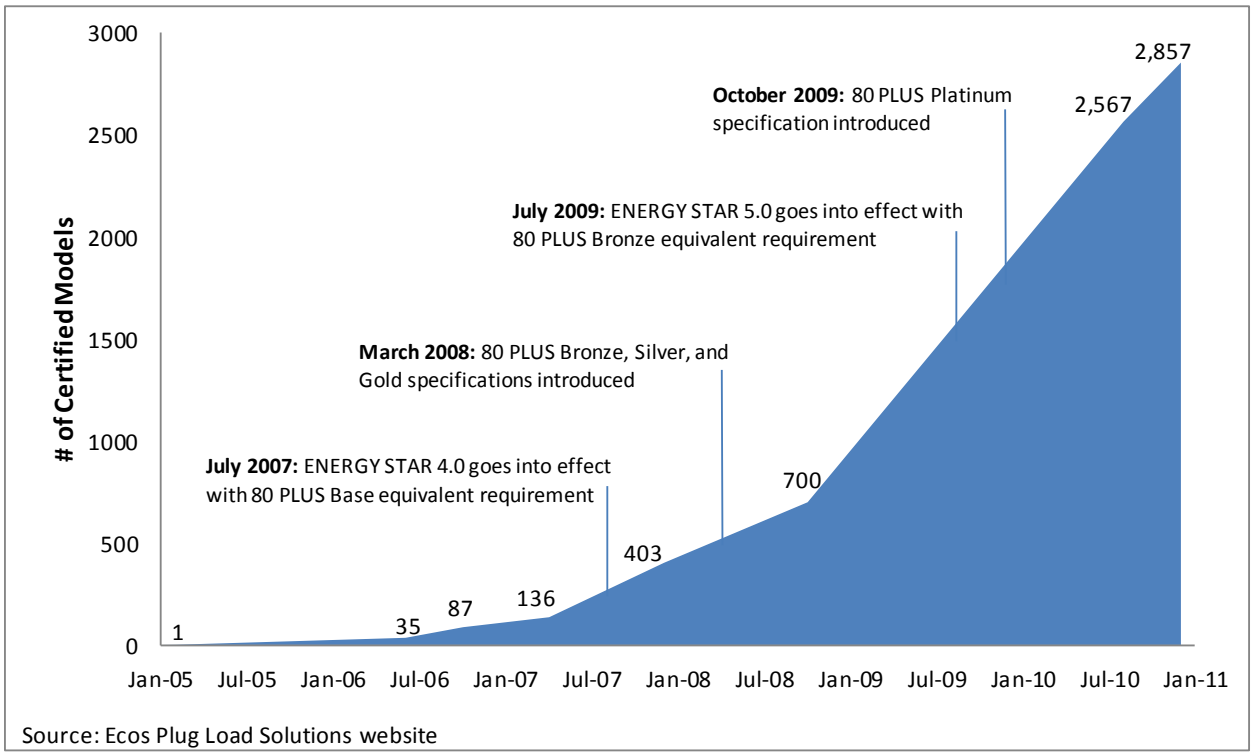
According to Ecos Consulting staff, the decline in the number of participating SIs observed in the preceding table is due to the evolution of the 80 PLUS program and the shift toward incenting ENERGY STAR (not just 80 PLUS) qualified products. The program no longer offers incentives for non-ENERGY STAR (but still 80 PLUS) desktop PCs and servers, and some of the smaller SIs cannot afford to produce ENERGY STAR certified equipment and thus have stopped participating in the program because they are not eligible for any incentives.

4.2 Availability of 80 PLUS Certified Models

When 80 PLUS began certifying power supplies in 2005, there was one certified power supply model. The number of certified 80 PLUS power supply options grew rapidly, to nearly 100 models within two years and to more than 400 by December 2007. As of December 2010, there were more than 2,800 qualifying 80 PLUS power supply models (Figure 7). Just in the four months that Navigant conducted its analysis and reporting, an additional 290 models became available.

[7] Note that the New Jersey program does not include desktop PCs or servers in its program, only ENERGY STAR televisions.

Figure 7. Number of Certified 80 PLUS Power Supply Models with Program Milestones



Finding #5: *The availability of certified 80 PLUS power supplies has grown significantly since 2005 (from one certified model in 2005 to more than 2,800 models in 2010).*

Table 11. Market Progress Indicators: Power Supply Availability

Market Progress Indicator	MPER #1 Findings	MPER #2 Findings	Current Status
Certified power supply units	35	403	2,857
Power supply units being tested for certification	20	50+	90+

Source: MPERs 1 and 2, Navigant review of Plug Load Solutions website.

4.3 Inclusion of 80 PLUS in ENERGY STAR Specifications

Less than two years after the introduction of 80 PLUS, the ENERGY STAR 4.0 standard adopted 80 PLUS as part of its requirement, and the EPA credits Ecos' research efforts as instrumental in that achievement (Quantec 2008). Subsequently, after the introduction of the 80 PLUS Bronze, Silver, and Gold specifications, ENERGY STAR 5.0 adopted the Bronze level as its new threshold.

The 80 PLUS certifications and ENERGY STAR specifications appear to be cross-promoting in a mutually reinforcing manner. It appears that as 80 PLUS is providing the standards for the ENERGY STAR brand, the widespread acceptance of ENERGY STAR is allowing 80 PLUS to push higher efficiencies, which results in a growing number of qualifying power supply models.

Table 12. Market Progress Indicators: ENERGY STAR

Market Progress Indicator	MPER #1 Findings	MPER #2 Findings	Current Status
80 PLUS specification included in ENERGY STAR specifications	Pending	Effective July 2007	80 PLUS Bronze required for ENERGY STAR 5.0 certification

Source: MPERs 1 and 2, Navigant review of ENERGY STAR website.

4.4 Commercial End-User Awareness of 80 PLUS

Among buyers of commercial desktop computers, the ENERGY STAR brand is more recognizable than the 80 PLUS brand. OEMs and SIs indicated that at least some of their customers recognize and request 80 PLUS qualified power supplies specifically when purchasing commercial desktop PCs, but the majority of interviewees indicated that customer more often request ENERGY STAR and that it is a more recognizable brand. [8] Although customers do not often request 80 PLUS explicitly, some of the larger computer OEMs reported that enterprise customers ultimately request 80 PLUS when they see it as a line item on a bid specification sheet under "energy efficiency". One interviewed OEM stated that certain groups of commercial consumers are more likely to request 80 PLUS, including universities, Fortune 500 companies, and PC buyers in large enterprises in general.

Interviews with three large end-users[9] in the Pacific Northwest indicated no familiarity with 80 PLUS at all.[10] Each of the three companies interviewed indicated that they had *never heard of an 80 PLUS qualified power supply or the 80 PLUS program.* However, the individuals interviewed had all heard of ENERGY STAR qualified PCs and requested this specification in the course of their company's desktop computer purchasing activities. When asked for factors influencing desktop purchasing decisions, one end-user stated plainly, "We look for the ENERGY STAR rating on desktop computers." OEM interview comments support his tendency, with one OEM surmising "Probably somewhere around 90 percent of our customers demand that our products be ENERGY STAR qualified, particularly enterprise customers."

End-users indicated that while energy efficiency is valued, features and reliability are more valued when specifying commercial desktop PCs. End-users further indicated that they would seriously consider energy efficiency only after a machine meets the performance demands of the user. Among the related comments from end-users were the following:

- "Energy efficiency it is important, but functionality is most important; energy efficiency is second after that."
- "Wouldn't say [energy efficiency] is top priority, but it does factor in."

[8] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.
[9] See Appendix C-3 for full results of end-user interviews, including verbatim responses.
[10] One possible explanation for the discrepancy between the end-users and the OEM perspective is that the interviewed OEM representatives may have a skewed view of how often 80 PLUS is specifically mentioned because of the nature of their role within the broader organization. Sales representatives may refer all customers who have questions about 80 PLUS or energy efficiency to the interviewees, since the interviewees are employees who focus on energy and sustainability issues. In other words, the interviewed OEM representatives may interact with only the most energy efficiency conscious PC purchasers.

Navigant concludes that OEMs and SIs—not end-users—drive the market for energy-efficient power supplies because they realize benefits of lower failure rates, lower warranty costs, and higher customer satisfaction with their products. However, consumer awareness of ENERGY STAR does indirectly drive some customer demand for 80 PLUS or equivalent power supplies.

Finding #6: *Commercial end-user awareness of 80 PLUS is limited, but the ENERGY STAR brand awareness creates demand for 80 PLUS specifications.*

Table 13. Market Progress Indicators: End-User Awareness

Market Progress Indicator	MPER #1 Findings	MPER #2 Findings	Current Status
End-users aware of and request for 80 PLUS	Just developing	Increasing due to OEM marketing push	Limited awareness and only occasionally requested; ENERGY STAR brand is more in demand

Source: MPERs 1 and 2, Navigant interviews with OEMs, SIs, and end-users.

4.5 Promotion of Efficient Power Supplies

The focus of the interviews conducted for this research centered on the market for PCs and servers and on the use of efficient power supplies. However, some respondents provided insights into their promotion of 80 PLUS or, more generally, into how continued transformation of the market for efficient power supplies might be fostered.

4.5.1 Promotion of 80 PLUS by OEMs, SIs, and PSMs

The interviewed OEMs strongly indicated that they drove the demand for 80 PLUS power supplies due to their recognition of the superior quality and increased reliability; they stated unequivocally that the PSMs manufacture the power supplies that they specify, not the other way around.[11] However, SIs indicated that PSMs do market 80 PLUS power supplies to them. OEMs may be influencing PSMs to start manufacturing more efficient power supplies, but then the PSMs push the SIs to adopt the same energy-efficient models that they are manufacturing for the OEMs. However, while participating OEMs and SIs may be increasingly adopting more efficient power supplies, the lack of end-user awareness of and demand for 80 PLUS may be limiting the total market share. OEMs and SIs alike believe that the 80 PLUS program could do more to educate end-use customers about the benefits of 80 PLUS.

Both OEMs and SIs indicated that providing customers with more information about the benefits and return on investment of energy efficiency would enhance sales of 80 PLUS certified power supplies, and that rebates paid to the customers rather than the manufacturers (or in addition) would also help. One interviewee said that "besides mandates", the biggest thing that would help achieve further market transformation for energy-efficient power supplies is "proof of return on investment." Another stated the need for "rebate programs available to customers and having resources available to customers [such as] consumer reports to promote highly efficient PCs."

The OEMs and SIs generally desire that consumers become more aware that an energy-efficient power supply not only saves energy, but is also simply a better, more reliable power supply. As

[11] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.

one interviewee said, "We need an awareness campaign. A bad power supply is the quickest way to break other components in your computer. Market the value of a good, cool high efficiency power supply to consumers."

Finding #7: *OEMs and SIs see a need for enhanced customer education and possibly rebates for customers.*

Table 14. Market Progress Indicators: Promotion

Market Progress Indicator	MPER #1 Findings	MPER #2 Findings	Current Status
Promotion of 80 PLUS by PSMs and SI's	Increasing	Increasing	OEMs drive demand for 80 PLUS although PSMs do market to SIs.

Source: MPERs 1 and 2, Navigant interviews with OEMs, SIs, PSMs, and end-users.

4.5.2 Future Actions to Promote Energy Efficient Power Supplies

Three of the interviewed OEMs and SIs indicated that a mandate (e.g., a federal efficiency standard) would be necessary to achieve 100 percent market share of 80 PLUS power supplies in the desktop PC market; among these OEMs, two indicated that 100 percent market share of 80 PLUS was an achievable near-term goal within their own product lines.[12] One respondent even proposed enacting "legislation to require a level of energy efficiency for specific types of computer equipment." The OEMs seem to believe that a mandate is needed to "bring up the rear" in terms of getting 80 PLUS into all desktop PCs. One indicated that "80 percent is a downgrade at this point", and several noted the low quality of non-80 PLUS power supplies in terms of reliability and noise.

However, two of the interviewed OEMs also noted complications in their efforts to comply with energy efficiency requirements. Potential roadblocks include the OEMs' international presence and the patchwork of different regulatory mandates (as well as voluntary certifications) that they have to meet in various countries. One respondent expressed a strong desire to see an international efficiency standard developed, stating, "What we're seeing now is that there's probably eight to ten emerging energy efficiency regulations that are currently ongoing on a global basis. Everyone has their own flavor on their energy efficiency requirements, and that poses an intriguing challenge to meet all those requirements. We are trying to convince the powers that be globally to harmonize on one specific standard." Another offered facetiously that desktop PCs would be covered with stickers "like a NASCAR car" if they included labels for every environmental certification.

Two OEMs also caution against pushing too hard for 80 PLUS Platinum or higher levels of efficiency, particularly for desktop PCs (as opposed to servers) which cannot provide for a sufficient return on investment from these higher levels of efficiency at current incremental costs. One OEM stated, "We are reaching the point of diminishing returns. Ninety percent average efficiency is a threshold to meet going forward, and we should declare victory at that point." Another stated, "Ninety-four percent is the maximum efficiency without some new unknown technology."

[12] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.

Finding #8: *Many OEMs support 80 percent as a mandated minimum efficiency standard, but also see barriers to higher standards.*

4.6 Incremental Costs of 80 PLUS Qualified Power Supplies

This section discusses the incremental costs of 80 PLUS qualified power supplies, with a focus on recent trends in incremental cost in Section 4.6.1 and a discussion of the non-energy benefits that increase the 80 PLUS value proposition and help OEMs justify the incremental cost in Section 4.6.2.

4.6.1 Trends in 80 PLUS Incremental Costs

Most of the interviewed OEMs indicated that the incremental cost of an 80 PLUS power supply over a non-80 PLUS model was not a significant barrier to adoption, particularly on high-end machines.[13] Low-end PCs are still using the low efficiency power supplies, primarily because it is important to some manufacturers to keep a $400 desktop in their product mix, and the incremental cost of integrating an 80 PLUS power supply would be more noticeable to commercial buyers at a $400 price point than for a $2000 high-end PC. Many of the interviewees could not estimate the incremental costs of an 80 PLUS power supply or only knew the incremental cost for one level of efficiency (*e.g.,* Base or Bronze). Based on the estimates that interviewees were able to provide, the incremental cost of an 80 PLUS power supply appears to be between $7 and $22 depending on the efficiency level (Table 15).

Table 15. Incremental Costs Observed by OEMs and SIs

80 PLUS Level	Incremental Cost Over Non-80 PLUS	Incremental Cost Over 80 PLUS Base
Base	$7	Not applicable
Bronze	$10	$4-6
Silver	N/A	$8-10
Gold	$22	N/A
Platinum	N/A	

Source: Navigant interviews of OEMs (n=2) and SIs (n=1)
N/A = estimate not available

Four of the interviewed OEMs and SIs noted that the increased availability of 80 PLUS models, with over 200 PSMs now offering certified models, has led to increased competition and thereby lowered costs. One suggested that costs had dropped because there are "more models and manufacturers to choose from." Another simply said, "Volume production always drops cost."

However, one system integrator noted that he did not expect 80 PLUS sales to increase beyond the current levels "unless PSMs experience a decrease in cost to produce this type of technology…. Should this occur," he continued, "our company will definitely take advantage of offering more energy-efficient products." It is likely that smaller SIs incur higher costs than the large OEMs which receive bulk discounts from the PSMs.

[13] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.

Contrary to what the OEMs and SIs reported, most PSMs indicated that the cost to produce an 80 PLUS power supply has gone up over the last two years.[14] Four PSMs said incremental costs had increased, one said that costs remained the same, and one said that incremental costs had decreased in the past two years. The increased costs that PSMs are experiencing may be due to OEMs shifting to higher levels of efficiency.

Finding #9: *The incremental costs of using 80 PLUS equivalent power supplies are not a significant deterrent to OEMs, especially for high-end products.*

Table 16. Market Progress Indicators: Incremental Costs

Market Progress Indicator	MPER #1 Findings	MPER #2 Findings	Current Status
Decreasing incremental cost	Decreasing from initial estimates; estimated by most market actors to be $10-$20	Slowly decreasing from initial estimates; estimated by most to be $15 or more	Continuing to decrease for OEMs with increased availability; estimated by most interviewed market actors to be between $7 and $22 depending on level of efficiency; PSM costs may be rising due to demand for higher levels of efficiency

Source: MPERs 1 and 2, Navigant interviews with OEMs, SIs, and PSMs.

4.6.2 Impact of Non-Energy Benefits on Value of 80 PLUS

Six out of ten interviewed OEMs and SIs described several additional benefits to 80 PLUS power supplies—beyond energy efficiency—which help justify the additional cost. [15] These include increased reliability, longer life, reduced noise, and reduced heat, which results in additional energy savings by reducing the need for air conditioning, particularly in data centers.

Improving the reliability of the power supply also reduces warranty costs, which is a significant benefit to OEMs. According to one OEM, the warranty cost can account for up to half of the upfront cost of a PC; in other words, the warranty costs as much as the hardware. One of the interviewed SIs stated, "A bad power supply is the quickest way to break other components in your computer." Several of the interviewees who focused on high-end PCs and servers had trouble estimating incremental costs over the non-80 PLUS power supplies because the non-80 PLUS power supplies are "junk" that they would not buy anyway.

Finding #10: *Non-energy benefits (e.g., reliability and reduced warranty costs) help OEMs justify the incremental cost of 80 PLUS.*

4.7 80 PLUS Sales Trends and Market Share

This section characterizes past and anticipated future trends related to 80 PLUS sales, as well as the estimated market share. Note that while market share is not explicitly an MPI, it is one of the logic model outcomes and an input to the ACE model, and Navigant recommends that market share be added as an MPI for future evaluation efforts. Section 4.7.1 presents 80 PLUS sales trends over the past two to three years as reported by OEMs, SIs, and PSMs. Section 4.7.2

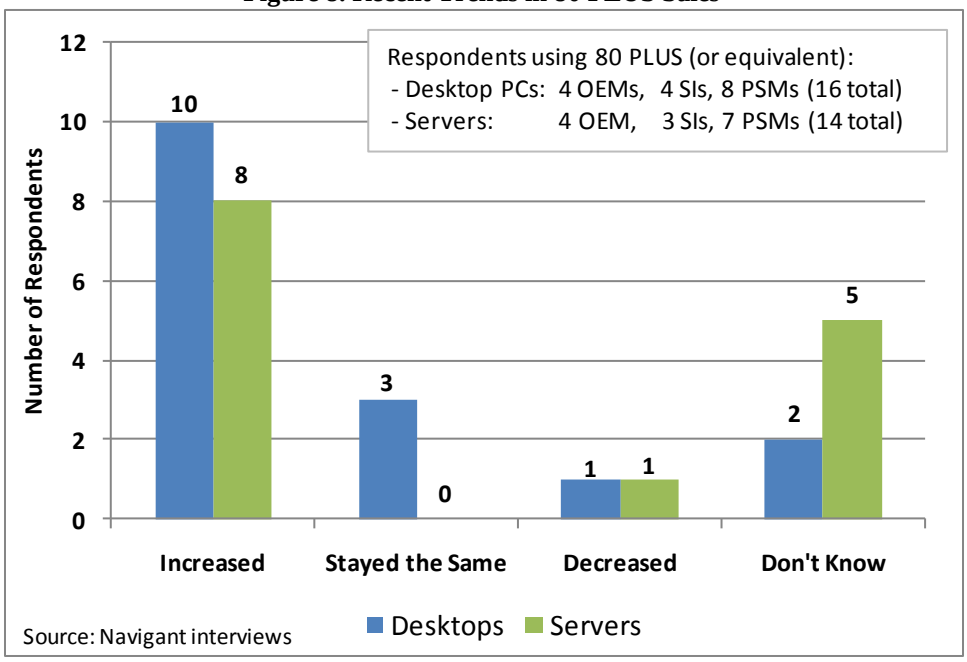
[14] See Appendix C-2 for full results of PSM interviews, including verbatim responses.
[15] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.

estimates the current market share of 80 PLUS as a percentage of U.S. desktop PC sales. Sections 4.7.3 and 4.7.4 discuss the efficiency levels of energy-efficient power supplies used in desktop PCs and servers, respectively. Finally, Section 4.7.5 discusses anticipated future trends in 80 PLUS sales.

4.7.1 80 PLUS Sales Trends over Past Two to Three Years

Incorporation of efficient power supplies into desktop PCs and servers has increased recently according to almost of the OEM, SI, and PSM interviewees.[16] Ten of the fourteen interviewed market actors who were able to estimate 80 PLUS sales trends indicated that sales of desktop computers with 80 PLUS or equivalent power supplies increased over the past two to three years, and only one reported a decrease in use of 80 PLUS.

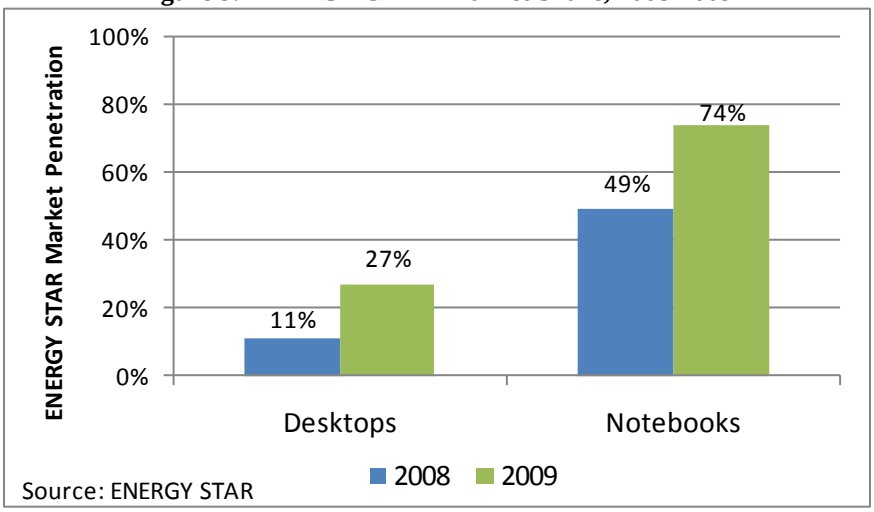
Figure 8. Recent Trends in 80 PLUS Sales



This trend is consistent with the expansion of computers branded with ENERGY STAR, which increased market share significantly between 2008 and 2009 for both desktop PCs and laptops. Market share for desktops more than doubled, to 27 percent in 2009, while the penetration of laptops increased by roughly half, to 74 percent (Figure 9).

[16] See Appendix C-1 for full results of OEM and SI interviews and Appendix C-2 for full results of PSM interviews.

Figure 9. ENERGY STAR Market Share, 2008-2009



Sales of 80 PLUS certified (or equivalent) power supplies are outpacing ENERGY STAR qualified desktop PCs and servers because all ENERGY STAR qualified machines have an 80 PLUS certified or equivalent power supply but not all desktop PCs and servers using 80 PLUS certified power supplies are ENERGY STAR qualified. One major computer OEM noted that they have their own line of energy-efficient machines that use 80 PLUS certified power supplies exclusively but are not ENERGY STAR qualified. According to this OEM, "The sale of 80 PLUS power supplies is going up [while] ENERGY STAR is leveling off." 80 PLUS is an easy sale compared to ENERGY STAR due to the high cost and relative complexity of the ENERGY STAR requirements.

Finding #11: *80 PLUS sales have increased over the past two to three years, likely growing by more than 100% between 2008 and 2009 based on the growth in penetration of ENERGY STAR-qualified desktops, which require 80 PLUS.*

Table 17. Market Progress Indicators: 80 PLUS Sales

Market Progress Indicator	MPER #1 Findings	MPER #2 Findings	Current Status
Sales of 80 PLUS PCs	Increasing, but below goals	Increasing, but below goals	Increasing over past 2-3 years

Source: MPERs 1 and 2, Navigant interviews with OEMs, SIs, and PSMs, ENERGY STAR (2010).

4.7.2 80 PLUS Market Share

A power supply may be certified as having an efficiency greater than 80 percent even without receiving the "80 PLUS" certification. For purposes of characterizing the market share of 80 PLUS power supplies, this report designates a power supply as "80 PLUS" if there is sufficient evidence that the efficiency is at least equivalent to an 80 PLUS-certified model. Navigant considered sufficient evidence to be an alternate certification, such as ENERGY STAR, or compelling secondary research or responses to interviews conducted for this research. As the main focus of the 80 PLUS program is desktop PC power supplies, Navigant considers the

percentage of all desktop PCs sold in the U.S. that incorporate 80 PLUS (or equivalent) power supplies to be the best indicator of market adoption and market transformation.[17]

Through the interviews, OEMs and SIs estimated the percentage of their desktop PCs sold that include an 80 PLUS or equivalent power supply.[18] Navigant then multiplied those figures by an estimated number of desktop PC sales for each manufacturer to arrive at an estimate of the number of 80 PLUS certified power supplies used in desktop PCs sold in the U.S. during the first three quarters of 2010. The analysis proceeded as follows:

- The number of desktop PC sales by manufacturer was based on each manufacturer's share of the PC market, the overall percentage of PCs that are desktops (37 percent in 2010, according to IDC), and the fact that the fifth largest OEM (Toshiba) does not manufacture any desktop PCs.

- Navigant assumed that each manufacturer (including those that fall into the "Others" category) has the same ratio of desktops to laptops for the purposes of this analysis, and the analysis assigned Lenovo a four percent share of the U.S. PC market, based on year-old Gartner estimates (Einhorn 2010).

- Each interviewee's 80 PLUS share of desktops was applied to their estimated U.S. desktop PC sales in 2010 (first through third quarter) to derive an estimate of more than seven million 80 PLUS units sold.

- Based on this analysis, **the weighted average market share of 80 PLUS in desktops sold in the U.S. in 2010 is roughly 37 percent of U.S. desktop PC sales.** This is reasonable in the context of EPA's estimate of a 27 percent market share of ENERGY STAR desktop PCs in 2009 (see above)—an estimate that accounts neither for 80 PLUS equivalent power supplies that are not ENERGY STAR labeled nor for any increase in market share achieved in 2010.

Table 18 presents 1) the detailed analysis and assumptions used to estimate 80 PLUS sales, 2) each manufacturer's share of 80 PLUS power supplies, and 3) the national 80 PLUS market share. By these estimates, HP accounts for more than half of the 80 PLUS equivalent power supplies sold in the U.S. in the first three quarters of 2010. Apple accounts for more than one-quarter, and Dell and Lenovo account for most of the remainder.

[17] Navigant's use of desktop PC sales to estimate 80 PLUS market share also excludes a secondary market for 80 PLUS, the replacement power supply market; however, Navigant believes this is a very small market in comparison to the desktop PC market, and it is not a focus of the 80 PLUS program strategy. Interviewed OEMs, SIs, and PSMs indicated that 80 PLUS (or equivalent) market share is likely significantly higher for servers than for desktop PCs, but there is little publicly available market data about U.S. server sales and thus Navigant was unable to estimate 80 PLUS market share for server power supplies.

[18] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.

Table 18. 80 PLUS Market Share Estimates for U.S. Desktop Sales, 2010 Quarters 1-3

	US PC Shipments (Q1-3 2010) (in thousands) (A)	% Desktops (B)	# Desktops (in thousands) (C)	Share of 80 PLUS Equivalent (%) (D)	# 80 PLUS Equivalent (in thousands) (E)	Market Share of 80 PLUS Equivalent (%)
HP	13,434	41%	5,508	75%	4,131	56%
Dell	12,507	41%	5,128	11%	564	8%
Acer	6,605	41%	2,708	0%	-	0%
Apple	4,979	41%	2,041	100%	2,041	28%
Toshiba	4,700	0%	-	0%	-	0%
Lenovo	2,118	41%	868	50%	434	6%
Others	8,614	41%	3,532	5%	177	2%
Total	**52,956**	**34%**	**19,785**	**37%**	**7,347**	**100%**
Source and Assumptions	*Gartner for market share for top 5 OEMs and overall market; Lenovo estimated to have 4% market share, remainder in Others.*	*IDC (37% overall); after setting Toshiba to zero, assumed others had the equal percentages of desktops to total 37% of all U.S. PC sales.*	*Calculated by multiplying PC shipments by % desktops (Col. A * B)*	*Secondary research and Navigant interviews with OEMs and SIs. "Others" conservatively assumed to be 5%. Total is weighted average based on OEM market share.*	*Calculated by multiplying # desktops by % 80 PLUS equivalent. (Col. C * D)*	*Calculated by dividing # 80 PLUS equivalent by total (Col E div Total Col E)*

Finding #12: *Power supplies in more than one in three desktop PCs are 80 PLUS certified or of equivalent efficiency.*

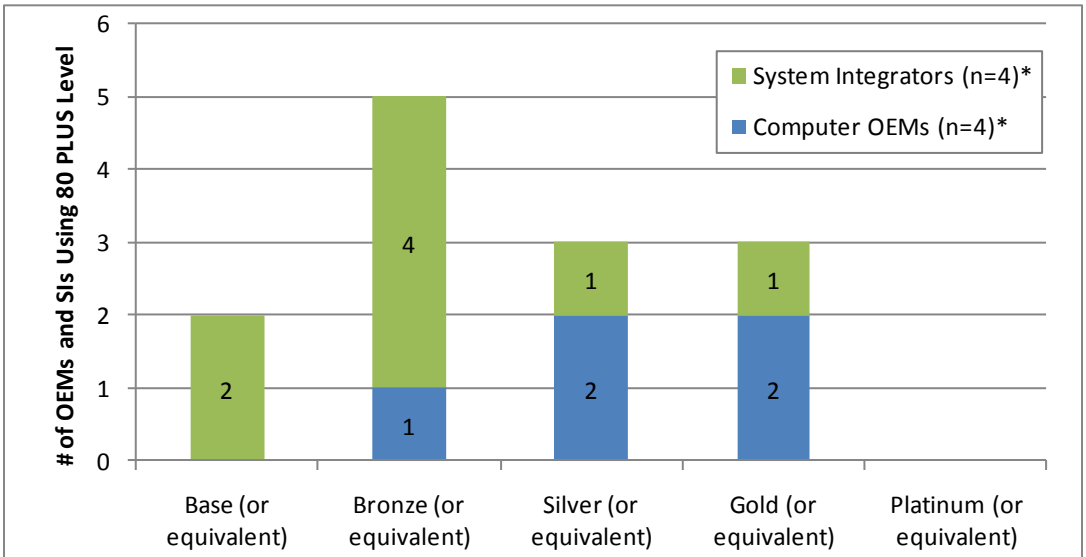
4.7.3 80 PLUS Levels in Use for Desktop PCs

Navigant found that a majority of the interviewed computer OEMs and SIs have moved beyond the 80 PLUS Base power supply and exclusively use higher levels in their desktop PCs.[19] The requirement of an 80 PLUS Bronze-equivalent power supply for ENERGY STAR 5.0 qualification has likely had a strong influence on the trend towards higher efficiency models. According to one of the OEMs interviewed by Navigant, "80 percent is a downgrade at this point."

Figure 10 summarizes the 80 PLUS levels in use in desktop PCs as reported by the interviewed OEMs and SIs. None of the interviewed OEMs use any 80 PLUS Base (or equivalent) power supplies. Although two of the interviewed SIs still use models at the 80 PLUS Base efficiency level, all SIs also use power supplies at the Bronze level or higher.

[19] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.

Figure 10. 80 PLUS Levels in Use for Desktop PCs by OEMs and SIs



*Includes all interviewees that use 80 PLUS or equivalent power supplies in desktop PCs. Totals add to more than the sample size due to some respondents indicating that they use more than one level of 80 PLUS power supply.

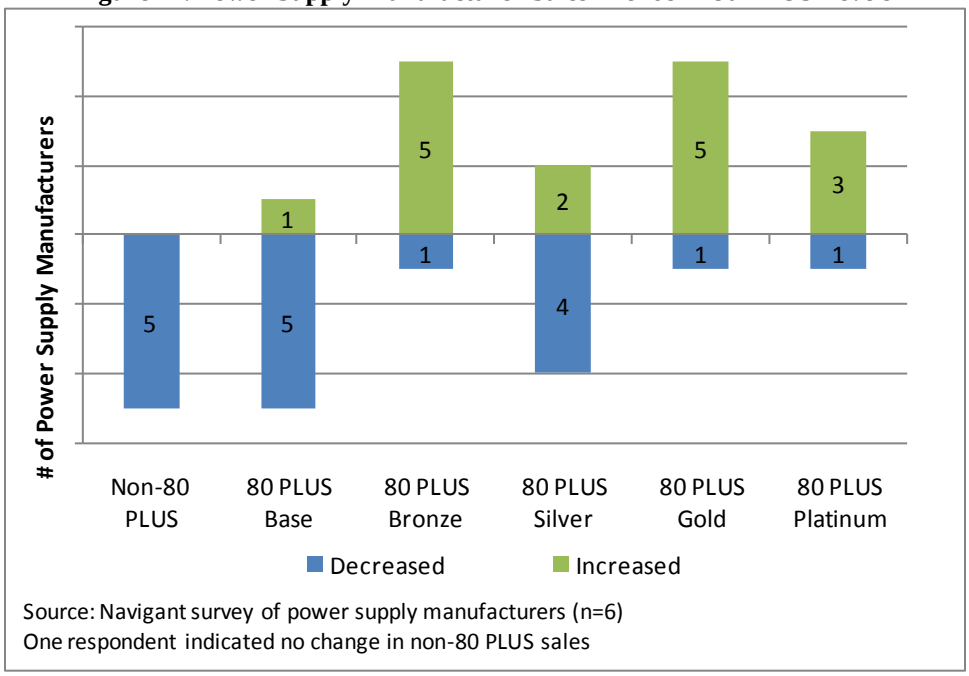
Source: Navigant interviews with market actors.

Despite the trend to move towards higher efficiency levels in desktop PC power supplies, not a single OEM or system integrator interviewed by Navigant incorporates the 80 PLUS Platinum level power supplies into their desktop PCs at this point. Two interviewees expressed concern that the return on investment of an 80 PLUS Platinum (92 percent efficient) power supply simply is not there in a desktop PC. One interviewee went so far as to say, "Ninety percent average efficiency is a threshold to meet going forward, and we should declare victory at that point".

PSMs also report similar trends in the use of the various 80 PLUS levels of efficiency.[20] As shown in Figure 11, all surveyed PSMs reported that sales of non-80 PLUS power supplies had either decreased or stayed the same over the last three years, and only one PSM indicated an increase in 80 PLUS Base level. Essentially, there is a move away from non-80 PLUS and 80 PLUS Base models, and an increase in production of power supplies at the Bronze and Gold levels.

[20] See Appendix C-2 for full results of PSM interviews, including verbatim responses.

Figure 11. Power Supply Manufacturer Sales Trends in 80 PLUS Levels



Finding #13: *Typical "80 PLUS" efficiencies are increasingly higher than the 80 percent threshold.*

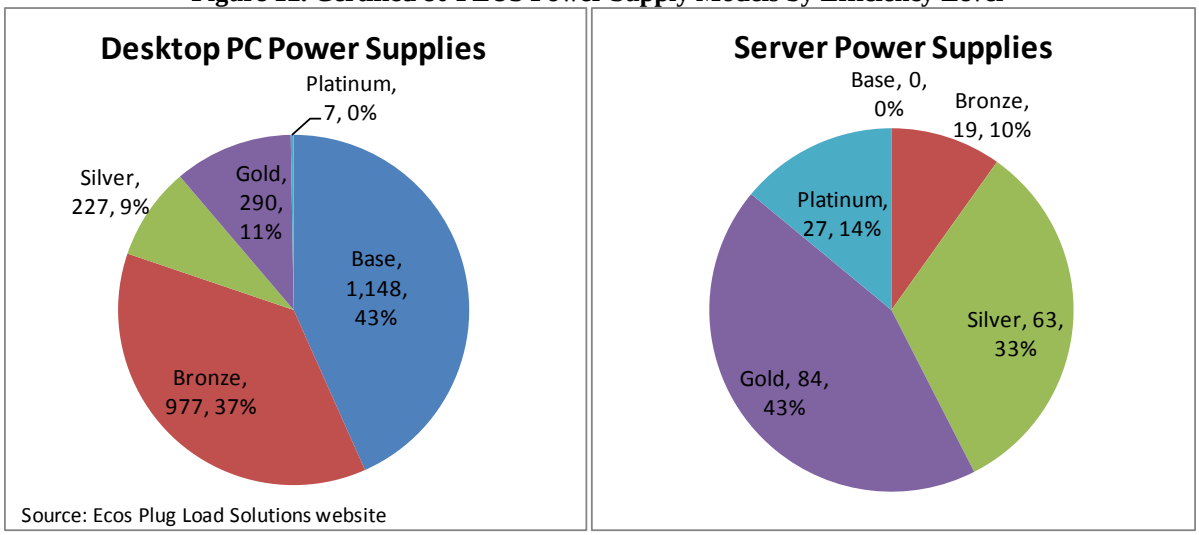
4.7.4 80 PLUS Levels in Use for Servers

The discussion in the previous finding noted that none of the nine OEMs or SI's interviewed used 80 PLUS Platinum power supplies for their desktop PCs.[21] Yet three of the PSMs indicated an increase in sales of Platinum-level power supplies. [22] A likely explanation for this apparent contradiction is that 80 PLUS Platinum is primarily used for servers, not PCs, since servers consume far more power than desktop PCs and the increased efficiency can provide significant cost savings.

Only seven (less than one percent) of the 80 PLUS-certified *desktop PC power supplies* are Platinum, compared to twenty-seven (14 percent) of the 80 PLUS-certified *server power supplies* are Platinum (Ecos 2010). As of December 2010, there were 2,843 power supplies models certified through the 80 PLUS program, manufactured by over 200 PSMs. The breakdown of 80 PLUS certified power supply models by efficiency level is displayed in , which demonstrates that the vast majority of certified power supplies for *desktop PCs* are 80 PLUS Base or Bronze, while the majority of certified power supplies for *servers* are Silver, Gold, or Platinum. These numbers represent the total number of available certified models at each efficiency level, not the actual sales; however, the figures may mirror the trend in sales as well.

[21] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.
[22] See Appendix C-2 for full results of PSM interviews, including verbatim responses.

Figure 12. Certified 80 PLUS Power Supply Models by Efficiency Level



Finding #14: *Power supply efficiencies tend to be higher for servers than for desktops.*

4.7.5 Future 80 PLUS Trends

All but one of the computer OEMs and SIs interviewed for this research and who currently participate in the 80 PLUS program believe the trend of integrating 80 PLUS certified power supplies into their desktop PC and server products will continue into the future.[23] Two OEMs and one SI interviewee cited a 100 percent certification rate as a corporate goal for the coming two to three years. This view of the market for 80 PLUS was also supported by PSMs.[24] Of the seven PSMs who commented on anticipated future trends of 80 PLUS power supplies, six said they expect these trends to continue.

The market share of 80 PLUS is expected to continue rising, but it is less clear whether the efficiency levels of those 80 PLUS power supplies will also continue to increase in the next revision to the ENERGY STAR requirements for desktop PCs. While the ENERGY STAR 6.0 specification is expected to require an 80 PLUS equivalent, EPA has not yet indicated whether the efficiency level will be increased above the current level of Bronze (85 percent efficiency).

The largest source of anxiety with the new ENERGY STAR 6.0 specifications expressed by four of the computer OEMs and SIs interviewed concerned not the level of 80 PLUS equivalent that will be required, but rather a shift to a third party verification system from the current self-certification system. Specific information about the new requirements is not currently available, but market actors noted the following concerns:

- ENERGY STAR is becoming overly complicated.
- Costs associated with lab certification could shift SIs to reseller business model.

[23] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.
[24] See Appendix C-2 for full results of PSM interviews, including verbatim responses.

- More stringent efficiency and testing requirements will result in fewer ENERGY STAR 6.0 PCs labeled.
- Corporate confidentiality issues interfere with third party certification of PCs.

One system integrator believed that an over-reaching 6.0 standard could erode the market share of ENERGY STAR labeled computers: "The big concern is with ENERGY STAR 6.0 because of lab certification," he explained. "We will see a shift to selling others' systems like Lenovo. ENERGY STAR certified machine sales could drop after a peak of 5.0. "

Finding #15: *Most market actors expect general trends in 80 PLUS sales to continue.*

4.8 Review of Logic Model Outcomes

The 80 PLUS program logic model outcomes have some variation from the MPIs (for instance, the MPIs do not include a target for 80 PLUS market share). After reviewing the program logic model, **Navigant recommends that NEEA update the 80 PLUS program logic model** to reflect the program's current implementation activities and past accomplishments and to set new progress indicators and targets for future program activities. Therefore, in addition to the MPIs summarized in the preceding sections, Navigant believes that it is important to include this separate chapter in MPER #3 for reviewing the logic model outcomes.

NEEA has already achieved and passed the milestones for many of the progress indicators specified in the logic model (which appeared in the first MPER and is at least five years old at the time of this report). Thus, NEEA should consider the program's current implementation strategies and identify achievable short- and long-term outcomes for the next 3-8 years. In particular, one major outstanding question that the logic model review calls attention to is: what is the program doing to increase demand for 80 PLUS power supplies among large commercial end-users? Table 19 summarizes the status of the expected short- and long-term outcomes specified in the program logic model based on the findings of the primary and secondary research.

Table 19. Status of 80 PLUS Program Logic Model Expected Outcomes

Expected Short-Term Outcomes	Status
Inquiries from PSMs, OEMs, SIs, electric utilities, and large consumers	*Partially achieved.* Significant number of OEMs, SIs, and PSMs are participating in the program. Inquiries from electric utilities not part of market research project. Large consumers do not appear to have significant awareness of 80 PLUS. See Sections 4.1 and 4.4 for relevant findings.
Increasing website traffic	*(Out of scope for market research)*
Accessible and up-to-date testing protocols available on website	*Achieved.* As of December 2010, the latest testing protocols dated 7/7/2010 are available on the Plug Loads Solution website.
Sales of at least 70,000 qualifying units before end of 2005	*Not achieved within specified timeline.* This sales goal and other metrics need revision/updating for the program going forward.
Participation from at least one major desktop PC OEM	*Achieved in 2007* with participation of HP and Dell, the two largest PC OEMs in the U.S. See Section 4.1 for relevant findings.
Buy-down spurs OEM and SI sales of qualifying PCs	Sales of qualifying PCs have increased, but linkage has not been established between the buy-down of 80 PLUS incremental costs and increased sales. See Sections **Error! Reference source not found.** and 4.7 for relevant findings.
Recruitment of at least one other major utility or energy efficiency organization to sponsor the program	*Achieved.* Program website lists six major energy efficiency organizations/utilities as sponsors: NEEA, Energy Trust of Oregon, Efficiency Vermont, New Jersey's Clean Energy Program, Xcel Energy, Ontario Power Authority. See Section 4.1 for relevant findings.
EPA includes power supply specifications in its revised ENERGY STAR standard for computers.	*Achieved in July 2007.* See Section 4.3 for relevant findings.
Expected Longer-Term Outcomes	**Status**
75% or higher market share of 80 PLUS-equipped PCs by 2010	*Not achieved.* Market share is estimated to be approximately 37% in 2010. See Section 4.7.2 for relevant findings.
Industry continuing to embrace ENERGY STAR as a competitive marketing advantage	*Achieved, with caveats.* End users have high familiarity with ENERGY STAR, but OEMs have significant concerns about ENERGY STAR's changing requirements for third party certification. See Sections 4.4 and 4.7.5 for relevant findings.

Source: NEEA 80 PLUS logic model (Expected Outcomes) and Navigant research (Status)

Navigant previously provided NEEA with a memorandum summarizing the preliminary review of the logic model and the ACE model (see Appendix E).

4.9 Other Findings on OEM and SI Participation in 80 PLUS Program

While the focus of this research was centered on the MPIs and logic model outcomes described in preceding sections, some OEM and SI interviewees also offered valuable insights into their decision to participate in the 80 PLUS program and the extent to which they submit incentive claims for qualifying product sales. This section presents those additional insights, which also relate to one of the market research questions presented in the next section.

The three participating OEMs believe that they submit claims for nearly all eligible sales in participating regions, although one interviewee noted that they had more difficulty tracking

Canadian sales.[25] Two of the five interviewed OEMs are non-participants, and therefore do not submit claims for 80 PLUS incentives. One of these non-participating OEMs indicated that his company based its decision not to participate in the program and claim incentives on two factors: a desire to protect their customer and sales data and the sense that energy efficiency is "the right thing to do" and something they want to do without the program.

Among SIs, one of the five interviewed SIs stated that they were a non-participant (despite being listed on the 80 PLUS website as a participant), and another does not claim any incentives because "our corporate responsibility directive considers providing 80 PLUS qualified systems as a necessary component of our corporate culture." Two others always submit incentive claims, and the fifth had previously done well with submitting all claims, but then lost the employee who was responsible for submitting claims and has not been able to keep up with the claims administration process since that time.

While the general consensus among the OEMs and SIs was that the 80 PLUS program is well administered and the incentive filing process is easy, one interviewee suggested that simple email alerts to participating OEMs and SIs if they missed a filing may help ensure that all qualifying sales are submitted for incentives. Several of the interviewed OEMs and SIs noted interesting uses for the incentives that they received from the 80 PLUS program, such as using the income to fund other environmental initiatives or directly passing the incentives back to the sales teams to reward them for selling PCs and servers with 80 PLUS certified power supplies.

4.10 Summary of Key Information Needs/Research Questions

As part of its statement of work, NEEA requested that the market research address specific areas of interest regarding the 80 PLUS program's progress, some of which are not specifically addressed by the MPIs. Table 20 provides a summary of findings for these key research topics related to market progress.

[25] See Appendix C-1 for full results of OEM and SI interviews, including verbatim responses.

Table 20. Summary of Key Information Needs/Research Questions Related to Market Progress Assessment

Information Needs/Questions	High Level Findings
Current commercial market size for 80 PLUS, ENERGY STAR, and non-80 PLUS desktops and servers	The ENERGY STAR market share for desktop PCs in 2009 was 27 percent according to EPA; this research estimates 80 PLUS (or equivalent) market share in 2010 at 37 percent. Although many interviewees were less knowledgeable about their companies' server sales (relative to PC sales), 80 PLUS market share for servers is likely significantly higher than for desktop PCs.
Sales trends regionally and nationally for 80 PLUS and ENERGY STAR	80 PLUS and ENERGY STAR have both seen significant growth in the past two to three years; both achieve greater market share on the coasts, but market actors are not able to provide more granular data on regional sales.
Trends in manufacturing of power supplies	PSMs report decreasing sales of non-80 PLUS and 80 PLUS Base power supplies and increasing sales of higher efficiency power supplies.
The number of units of ENERGY STAR 5.0 sold where incentives are not claimed	Nearly all qualifying PC sales by participating OEMs and SIs are claimed for incentives; however, non-participating Apple sells 100 percent ENERGY STAR 5.0 PCs, accounting for 5.5 million 80 PLUS equivalent PCs sold in 2009 for which incentives were not claimed.
The cost to manufacture an ENERGY STAR 5.0 PC vs. 80 PLUS vs. standard PC	Incremental costs were difficult for market actors to estimate, but OEMs report the incremental cost of an 80 PLUS power supply over a non-80 PLUS model to be between $7 and $22 depending on the efficiency level.
What are the factors influencing purchase decisions for PCs vs. laptops?	End-users are primarily seeking features, performance, and value; energy efficiency is a secondary concern but growing in importance. OEMs believe that 80 PLUS power supplies aid the performance of PCs and servers by improving reliability.

Source: Navigant research and analysis

5. REVIEW OF ACE MODEL ASSUMPTIONS

At the outset of this market research effort, Navigant conducted a review of NEEA's ACE model for the 80 PLUS program and submitted a memorandum summarizing the findings and recommendations resulting from that review. (See Appendix E for the memorandum, which also includes a discussion of the 80 PLUS logic model.) After completing the primary and secondary research described in the preceding sections, Navigant revisited the ACE model to determine if any changes were warranted based on the results of the research.

Navigant recommends that NEEA make the following adjustments to the ACE model:

- **Add additional tiers to reflect the different levels of 80 PLUS certification now available.** The current ACE model only calculates energy savings for two levels of efficiency: 80 PLUS Base and 80 PLUS Bronze/ENERGY STAR 5.0. Navigant found that most participating OEMs have shifted to using primarily 80 PLUS Silver and Gold power supplies in desktop PCs, which means that NEEA's ACE model may be underestimating energy savings from these more efficient power supplies.

- **Adjust 80 PLUS market share.** The ACE model forecasted 80 PLUS market share for 2010 to be 10.4 percent for Tier 1 (80 PLUS Base) and 5.4 percent for Tier 2 (ENERGY STAR 5.0) for a combined total of 15.8 percent. Navigant estimates the 80 PLUS market share to be approximately 37 percent of all desktop PCs sold in the U.S. during the first three quarters of 2010. The ENERGY STAR market share in 2009 was 27% of all desktop PCs sold, which is Navigant's recommended value for Tier 2 market share in 2010 (conservatively assuming that ENERGY STAR market share has held steady from 2009 to 2010). The Tier 1 estimate (the remainder of the 37% total market share estimated by Navigant) would remain at 10%.

- **Adjust Northwest share of total U.S. computer sales** to 4.24 percent based on latest U.S. Census population data; current estimate is 4.1 percent.

- **Update total 2010 U.S. computer sales** to 78.4 million units based on latest IDC estimates which include actual sales for first three quarters of 2010; ACE model currently forecasts 61.5 million computers sold in the U.S. in 2010, which is based on a 2009 IDC forecast.

- **Update laptop share of total U.S. computer sales** to 63 percent for 2010 based on latest IDC estimates; current ACE model estimate is 58 percent.

- **Revisit incremental cost of Tier 2 (Bronze)** based on findings in Section 4.3, and add incremental costs for 80 PLUS Silver and Gold (if the ACE model is modified to track each level of 80 PLUS separately). Due to the small sample size of market actors who were able to estimate incremental costs, Navigant recommends that NEEA make conservative adjustments to the incremental costs used in the ACE model.

Navigant did not find any compelling reason to modify the baseline market share assumptions that NEEA currently uses in the ACE model (approximately 10% in 2012 and 90% in 2018 for Tier 1 products).

6. CONCLUSIONS AND RECOMMENDATIONS

The market for commercial PCs and servers has continued to expand in recent years, particularly as the United States economy began to recover from the 2008-2009 recession. Alongside this market expansion, the efficiency of the computers sold has increased as well, owing in part to the introduction of the 80 PLUS power supply efficiency standard, which has become an integral part of the popular ENERGY STAR brand. Laptops have assumed a growing share of the market in recent years, leaving desktop PC sales to level off even as the overall PC market has grown.

The rise of laptops, which OEMs tend to design with higher efficiency components due to the demands of their mobile users, implies that the overall efficiency of PCs is increasing. At the same time, the continuing popularity—if not growth—of desktops suggests an opportunity for energy savings from additional improvements in the average efficiency of internal power supplies for desktop PCs. Similarly, the trend toward mobile computing and virtualization, powered by servers more than PCs, implies that efficient power supplies for servers will play a significant role in achieving additional energy savings from continuing efforts to promote the 80 PLUS specification.

These conclusions are from secondary research into the PC and server markets and from interviews with computer OEMs, SIs, PSMs, and commercial end-use customers. The broad objective of the research was to understand the trends, status, and dynamics of the market for energy-efficient power supplies in PCs and servers in order to assist NEEA's in developing future plans for the 80 PLUS program.

6.1 Conclusions

Major conclusions of this MPER coalesce around the two major market research efforts aimed at characterization of the PC and power supply markets and assessment of market transformation for efficient power supplies.

6.1.1 Characterization of the PC and Power Supply Markets

As discussed in Section 3.1, the recent economic downturn has slowed the growth of desktop PC, laptop, and server sales, but the market is slowly recovering. Leading the recovery are the sales of laptops and all types of portable computing devices, but the desktop PC remains a significant, if slightly decreasing, market segment and likely will continue to represent roughly one-third of all PC sales through 2014. Mobile computing and virtualization of desktop PCs, as well as cloud computing, will drive future trends in the market and may result in servers providing a greater share of computing power—and consuming a greater share of the electricity needed to power commercial computing.

The market for computer power supplies is comprised primarily of three sets of players: 1) manufacturers of power supplies, 2) their customers (i.e., computers manufacturers including OEMs and SIs), and 3) end users. OEMs exert the strongest influence on power supply efficiency, although the prominence of ENERGY STAR (which has adopted an 80 PLUS specification) means that end user preferences for the ENERGY STAR standard help to drive the penetration of 80 PLUS in the market.

6.1.2 Transformation of the Computer Power Supply Market

The 80 PLUS program has had a substantial effect on the market for energy-efficient power supplies for desktop PCs and servers and has made significant achievements related to nearly all MPIs. Ecos has credited NEEA with providing the early and sustained financial support that has made it possible for the 80 PLUS program to be continuously engaged in building relationships with industry groups and market actors, influence the development of ENERGY STAR specifications, and continually push the market toward ever-increasing levels of energy efficiency in power supplies.

- *Participation of Sponsors and Market Actors:* The 80 PLUS program has attracted the support of six sponsors and engaged five OEMs (including two that comprise more than 50% of U.S. PC sales), 37 SIs, and 216 PSMs in the manufacturing and sales of 80 PLUS qualified power supplies.

- *Availability of 80 PLUS Certified Models:* When 80 PLUS first hit the market in 2005, power supply efficiencies were commonly in the mid-60 percent range and there were few power supplies with efficiencies of 80 percent or greater, although comprehensive market data was not readily available at that time. Since that time, the number of certified 80 PLUS power supplies has grown to more than 2,800, with more than 90 additional models currently in testing.

- *ENERGY STAR Specification:* The current ENERGY STAR specification for desktop PCs requires the equivalent of 80 PLUS Bronze; EPA has credited NEEA and the 80 PLUS program with strongly influencing the inclusion of energy efficient power supplies in the ENERGY STAR specification.[26] The market share of ENERGY STAR desktop PCs grew from 11% in 2008 to 27% in 2009, providing a sizable market for 80 PLUS or equivalent power supplies.

- *Awareness and Promotion of 80 PLUS:* The one area in which the program has not demonstrated significant progress is end-user awareness of 80 PLUS power supplies. OEMs indicate that commercial end-users only occasionally request 80 PLUS power supplies. However, end-users are highly aware of ENERGY STAR, so the inclusion of the 80 PLUS Bronze standard in the ENERGY STAR specification has resulted in indirect end-user demand for 80 PLUS. Still, increased end-user awareness of the benefits of 80 PLUS (both energy and non-energy benefits) would likely lead to increased sales of 80 PLUS qualified desktop PCs and servers.

- *Incremental Costs:* Despite the incremental cost of manufacturing an 80 PLUS certified power supply, most OEMs and SIs do not find cost to be a barrier to adoption because non-energy benefits such as greater reliability, lower warranty costs, and overall customer satisfaction justify the additional cost. Incremental costs of 80 PLUS Base power supplies are decreasing somewhat due to increased availability and competition among PSMs, but as OEMs move to higher efficiency levels, they continue to see incremental costs associated with 80 PLUS power supplies.

[26] This finding was reported in MPER #2.

- *80 PLUS Sales:* Nearly all computer OEMs, SIs, and PSMs report growth in the market for efficient power supplies over the last three years, and these companies are adopting increasingly efficient models (e.g., 80 PLUS Gold instead of 80 PLUS Bronze). Roughly one-third of all desktop PC power supplies now meet or exceed the 80 PLUS specification. While Navigant considers this to be a significant market share, it should be noted that the logic model indicated that the program expected to reach 75% market share by 2010; this discrepancy may be due in part to the economic downturn which slowed overall computer sales and thus the turnover of older computers that do not meet 80 PLUS standards.

Note that some MPIs may no longer have a significant impact on the market progress; for instance, although the number of program sponsors has decreased since MPER #2, this does not appear to have had a detrimental effect because market share of 80 PLUS has continued to increase. The bullets listed above are focused on factors which demonstrate the extent to which the 80 PLUS program has transformed the market for energy-efficient power supplies. The next section on recommendations discusses areas in which the program can extend its influence and achieve further market transformation effects.

6.2 Recommendations

The success of 80 PLUS raises the question of how to best promote the continued, and increasing, efficiency of computer power supplies. Candidate policies include:

- **80 PLUS as a minimum standard.** While a market share of 37% percent is a significant accomplishment for the program, a majority of PCs and servers still do not meet the 80 PLUS specifications. The incremental cost of achieving 80 percent power supply efficiencies is relatively low and the non-energy benefits appear to more than offset the costs for many computer makers. As there do not appear to be any compelling reasons *not* to use 80 PLUS or equivalent power supplies, the time may be ripe for NEEA to promote 80 PLUS Base as a federal standard for minimum power supply efficiencies and to focus efforts on incenting power supplies that exceed the minimum 80 PLUS efficiency.

- **Incentives for higher levels of efficiencies.** If a greater share of computers could easily adopt the 80 PLUS standard, how efficient should they be? And how can NEEA help to promote industry practices to routinely *exceed* the 80 PLUS standard? An effective starting point may be to provide incentives only for power supplies that meet one of the higher 80 PLUS levels, such as Silver or Gold. As 80 PLUS Base becomes the *de facto* standard (and free ridership increases), the most cost-effective use of incentives is to encourage higher efficiency levels—80 PLUS Bronze at a minimum. Since ENERGY STAR already requires 80 PLUS Bronze, many computer makers are already targeting this level of efficiency. Thus, NEEA may achieve the best return on its investment by reserving incentives only for power supplies at the Silver level or higher.

- **End-user education.** In addition to standards and incentives, education is another vehicle for promoting efficient power supplies. The non-energy benefits are likely an influential driver of specification and purchasing decisions for OEM/SIs and end-users—but only for those who are aware of these benefits. It is not known how well-informed these two

market actor groups are regarding the non-energy benefits of efficient power supplies; but increasing the share of market actors who are knowledgeable and providing them with concrete information on specific financial and operational benefits could only serve to increase demand for—and ultimately the supply and sales of—efficient power supplies.

The market research findings discussed previously suggest a variety of new directions and program modifications that NEEA can adopt to further drive market transformation in the market for energy-efficient computer power supplies. *Recommended initiatives are as follows:*

1. **Promote 80 PLUS Base as a federal standard for power supply efficiency.** The majority of OEMs and SIs interviewed confirmed that they no longer use 80 PLUS Base level power supplies in their commercial desktop PCs, opting instead for 80 PLUS Bronze or higher levels when using 80 PLUS at all. With an 80 PLUS market share estimated at 37 percent, nearly two-thirds of the desktop PCs sold today do *not* have the equivalent of an 80 PLUS Base power supply built into them. Inclusion of the 80 PLUS Base specifications in federal regulations would require a relatively low-cost change in power supply production practices, and it would quickly produce significant energy savings. Just as NEMA Premium™ motor efficiencies, now a standard for many motors categories, were once a reach for motor manufacturers, 80 PLUS may now be sufficiently inexpensive and commonplace to justify inclusion of the related specifications in federal regulations.

2. **Provide incentives only for power supplies that exceed, not just meet, the 80 PLUS Bronze level.** Since ENERGY STAR already requires 80 PLUS Bronze, computer makers are rapidly adopting this level of efficiency. By making 80 PLUS Silver the threshold for incentives, NEEA would limit its support of free riders and would encourage computer makers to push the envelope of what is an affordable and beneficial investment in higher efficiency power supplies. This would necessitate a return to incenting based on 80 PLUS status rather than ENERGY STAR status, which may be a smart move for other reasons as well: upcoming changes in ENERGY STAR rules may lead to drop in the availability of ENERGY STAR qualified machines.

3. **Educate end-users on the non-energy benefits of an 80 PLUS power supply**. End-users already influence computer makers' decisions about sourcing power supplies by requesting ENERGY STAR-labeled machines. This influence could be stronger if NEEA provided commercial end use customers with information and case studies about the non-energy benefits of utilizing an 80 PLUS power supply, including quieter, cooler-operating power supplies that lower failure rates of internal desktop PC components and thus reduce warranty and repair costs.

4. **Promote virtualization through end-user education of both energy and functional benefits.** Virtualization of both desktops and servers has the potential to shift computer usage patterns and offer significant energy and cost savings. Although NEEA is not in the business of influencing customers' information technology decisions, the dissemination of information about virtualization's benefits could indirectly result in higher average power supply efficiencies in the market by promoting increased (and more efficient) use of servers, which tend to have higher efficiency components including power supplies.

APPENDICES

Appendix A: Bibliography

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Appendix B: Market Actor Interview Guides

Appendix B-1: Computer OEM/SI 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 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

Customer Awareness/Demand for 80 PLUS and ENERGY STAR PCs

1. What are the factors influencing commercial customers' purchase decisions for PCs?

   [WAIT FOR ANSWER THEN PROBE FOR SUCH THINGS AS INITIAL UPFRONT COST, LIFETIME COST OF OWNERSHIP, RELIABILITY, SAVINGS TO THE COMPANY? OR OTHER REASONS?]

   - Do these factors vary between desktop PCs and laptops?
   - What about servers?

     [Servers are a small part of the 80 PLUS market but we will probe for server responses throughout this guide]

   a. How important, if at all, is energy efficiency in commercial computer purchasing decisions?

2. What percent of the time do your company's commercial customers specifically request energy-efficient power supplies for desktop PCs?
   - What about servers?

     [PROBE FOR A PERCENTAGE OF CUSTOMERS IF POSSIBLE; APPROXIMATE PERCENTAGE IS OK]

3. In general, do you find that commercial customers who request energy-efficient power supplies identify particular programs or certifications?

   [IF YES PROBE FOR SPECIFICS]

a. How often, if ever, are 80 PLUS qualified PCs specifically requested?
   - How about ENERGY STAR 4.0 PCs?
   - How about ENERGY STAR 5.0 PCs?

   [PROBE FOR A PERCENTAGE OF EACH IF POSSIBLE, APPROXIMATE PERCENTAGE IS OK]

4. Do PSMs promote their 80 PLUS certified power supplies to your company? [PROBE FOR SPECIFIC TYPES OF PROMOTION]

PC Sales and Market Trends

[These questions cover unit sales and trends as a whole, not specifically 80 PLUS sales]

5. What has been the trend over the last 2 to 3 years for your company's sale of desktop PCs? [PROBE FOR INCREASE OR DECREASE AND TO WHAT DEGREE; APPROXIMATE PERCENTAGE IF POSSIBLE]
   - What about the trend for laptop sales?
   - What about the servers your company sells?

   a. Does your company expect these trends to continue for the next 1 to 2 years? [PROBE FOR PCS, LAPTOPS AND SERVERS.]

6. To what extent has the recent US economic downturn influenced the market for desktop PCs over the last 1 to 2 years?
   [This is an optional question already covered in the secondary research – see matrix]
   - How about on the market for laptops?
   - How about servers?

7. Does your company track sales of desktop PCs by customer type, for example commercial versus residential consumer?

   a. If so, what share are commercial sales versus consumer/residential sales?

   [PROBE FOR A PERCENTAGE OF EACH IF POSSIBLE; APPROXIMATE PERCENTAGE IS OK]

80 PLUS qualified PCs

[This section covers sales and trends of 80 PLUS qualified PCs and servers]

8. Does your company use 80 PLUS certified power supplies in the manufacture of its desktop PCs?
   - How about servers?

9. What has been the trend over the last 2 to 3 years for your company's sale of 80 PLUS qualified PCs?
   - What about the 80 PLUS qualified servers it sells?
     [PROBE FOR INCREASE OR DECREASE AND TO WHAT DEGREE; APPROXIMATE PERCENTAGE IF POSSIBLE]

   a. Do you expect these trends to continue for the next 1 to 2 years? (if the answer is no, probe to understand what the next 1 to 2 years' trends is expected to look like and the factors that contributed to such expected trends)
   [PROBE FOR PCS AND SERVERS.]

10. Can you describe any difference in national sales trends versus in the Northwest region specifically?
    [PROBE: DO YOUR SALES TO THE NORTHWEST HAVE A GREATER SHARE OF 80 PLUS QUALIFIED PCS AND SERVERS?]

ENERGY STAR qualified PCs and servers

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

11. Approximately what share of the desktop PCs your company sells are 80 PLUS qualified?
    - What about ENERGY STAR 4.0?
    - What about ENERGY STAR 5.0?

    a. Does your company anticipate any changes to this share in the next 1 to 2 years?

    [PROBE TO UNDERSTAND WHAT CHANGES ARE ANTICIPATED, IF ANY]

    [PROBE FOR FUTURE SHARE OF 80 PLUS, ENERGY STAR 4.0 AND 5.0]

    b. Does your company foresee any erosion of the PC market by laptops or vice-versa, or will there be no erosion of one over the other?

    [PROBE FOR AN EXPLANATION]

12. Are you aware that 80 PLUS now certifies different levels of efficiency in power supplies (i.e., 80 PLUS base, bronze, silver, gold, and platinum)? (If the answer is no skip the remaining part of the question) Which types are most common in your commercial PC product mix?
    [PROBE FOR A PERCENTAGE OF EACH IF POSSIBLE; APPROXIMATE PERCENTAGE IS OK]
    - What about in servers?

13. Does your company always claim the incentives available for the sale of 80 PLUS qualified PCs and servers?
    [PROBE FOR PERCENTAGE OF SALES OF ENERGY STAR CERTIFIED PC AND SERVER SALES WHERE 80 PLUS INCENTIVES ARE NOT CLAIMED]

    a. What would need to change regarding the incentives program for you to submit more claims?

Incremental Costs

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

14. Has the incremental cost of an 80 PLUS certified power supply changed over the last two years?
    [PROBE FOR INCREASED, DECREASED OR REMAINED THE SAME AS WELL AS DOLLAR AMOUNT OR PERCENT CHANGE]

    a. What factors have influenced this change?

15. We spoke earlier about the different levels of 80 PLUS power supply certifications. Can you give an approximate incremental manufacturing cost in $US for each of these levels?

    [PROBE FOR INCREMENTAL COST OF EACH LEVEL OVER A NON-80 PLUS MODEL – IF A DOLLAR FIGURE IS GIVEN ASK SOMETHING LIKE "WHAT PERCENTAGE INCREASE DOES THE ADDITIONAL $5 (USE AMOUNT INTERVIEWEE GIVES) FOR A BRONZE 80 PLUS POWER

SUPPLY REPRESENT?" PERCENTAGE INCREMENTAL COST IS ACCEPTABLE IF THEY CANNOT PROVIDE RESPONSE IN DOLLARS]

80 PLUS Base	____$
80 PLUS Bronze	____$
80 PLUS Silver	____$
80 PLUS Gold	____$
80 PLUS Platinum	____$

Looking Forward

[This section is a wrap up section time permitting as it is not linked to our metrics]

16. What do you think energy efficiency advocates, regulators, or others can do to increase the use of energy-efficient power supplies?
    a. What is a realistic goal in the next three years for the share of power supplies that are 80 PLUS certified?
17. What are the barriers to full adoption of 80 PLUS certified power supplies in the future?
18. Do you have any other comments on the market for energy-efficient power supplies that you would like to share?

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 B-2: Power Supply Manufacturer Survey

Name:
Company:
Title:
What is your role at the company?

1. How has the recent US economic downturn influenced your company's sales of power supplies over the last 1 to 2 years?

	Increased Sales	Decreased Sales	No Influence
Desktop PCs	☐	☐	☐
Servers	☐	☐	☐

Optional Comment:

2. In the next 1 to 2 years, does your company expect the number of power supplies manufactured for the following to increase, decrease, or remain the same?

	Increase	Decrease	Remain the Same
Desktop PCs	☐	☐	☐
Servers	☐	☐	☐

Optional Comment:

3. Over the past 3 years, what is the general trend in your company's sale of power supplies?

☐ Increased
☐ Decreased
☐ Remained the Same

Optional Comment:

4. Over the past 3 years, what is the trend in your company's sales of power supplies for the following:

	Increased	Decreased	Remained the same
Desktop PCs	☐	☐	☐
Servers	☐	☐	☐

5. If sales have increased or decreased, approximately what percentage does this change represent?

Desktop PCs (% change):
Servers (% change):

6. Does your company expect these trends to continue for the next 1 to 2 years?

	Yes	No
Desktop PCs	☐	☐
Servers	☐	☐

7. What are the key factors that make you believe that the trends will continue?

Desktop PCs:
Servers:

8. Does your company manufacture 80 PLUS certified power supplies for desktop PCs and servers?

☐ Yes - both desktop PCs and servers
☐ Yes - desktops, but not servers
☐ Yes - servers, but not desktops
☐ No - neither desktops nor servers

Optional Comment:

9. What has been the trend over the last 2 to 3 years for your company's sales of 80 PLUS certified power supplies for the following:

	Increased	Decreased	Remained the same
Desktop PCs	☐	☐	☐
Servers	☐	☐	☐

Optional Comment:

10. If increasing or decreasing, approximately what percentage does this change represent?

Desktop PCs (% change):
Servers (% change):

11 . Do you expect these trends to continue for the next 1 to 2 years?

	Yes	No
Desktop PCs	☐	☐
Servers	☐	☐

12. What are the key factors that make you believe that the trends will continue for the next 1 to 2 years?

Desktop PCs:
Servers:

13. Approximately what percent of your company's power supply sales for desktop PCs in 2009 were:

Non-80 PLUS (%):
80 PLUS Base (%):
80 PLUS Bronze (%):
80 PLUS Silver (%):
80 PLUS Gold (%):
80 PLUS Platinum (%):
Unknown (%):

14. Approximately what percent of your company's power supply sales for servers in 2009 were:

Non-80 PLUS (%):
80 PLUS Base (%):
80 PLUS Bronze (%):
80 PLUS Silver (%):
80 PLUS Gold (%):
80 PLUS Platinum (%):
Unknown (%):

15. Over the past 3 years, what is the trend in your company's sales of the following power supplies:

	Increased	Decreased	Remained the Same
Non-80 PLUS	☐	☐	☐
80 PLUS Base	☐	☐	☐
80 PLUS Bronze	☐	☐	☐
80 PLUS Silver	☐	☐	☐
80 PLUS Gold	☐	☐	☐
80 PLUS Platinum	☐	☐	☐
Unknown	☐	☐	☐

16. What are the key factors driving changes in your 80 PLUS qualified power supply sales?

[Open ended question]

17. How has the incremental cost of an 80 PLUS certified power supply changed over the last two years?

☐ Increased
☐ Decreased
☐ Remained the Same

Optional Comment:

18. What is the additional cost over a non-80 PLUS power supply (in rough $US) to manufacture an:

80 PLUS Base ($):
80 PLUS Bronze ($):
80 PLUS Silver ($):
80 PLUS Gold ($):
80 PLUS Platinum ($):

19. Do you have any other comments on the market for energy-efficient power supplies that you'd like to share?

Appendix B-3: End-User Interview Guide

Hi, my name is _____ with Navigant Consulting. We are not selling anything, but rather we are conducting research to understand the decision-making process of key people like yourself when it comes to corporate purchase of desktop PCs and laptops 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 have selected your company because we feel you are a good representative of desktop computer purchasers in the Pacific Northwest. 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 purchase 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

Customer Awareness/Demand for 80 PLUS and ENERGY STAR PCs

1. What are the factors influencing your company's purchase decisions for desktop PCs?

   [WAIT FOR ANSWER THEN PROBE FOR SUCH THINGS AS INITIAL UPFRONT COST, LIFETIME COST OF OWNERSHIP, RELIABILITY, SAVINGS TO THE COMPANY? OR OTHER REASONS?]

   - Do these factors vary between desktop PCs and laptops?
   - What about servers?

   a. How important, if at all, is energy efficiency in your company's computer purchasing decisions?

   b. How would you know if a desktop PC is energy efficient?
      - What about a laptop?
      - What about a server?

2. Are you aware of the 80 PLUS performance specification for power supplies in desktop PCs?

   [THE 80 PLUS PROGRAM INDICATES A POWER SUPPLY SHOULD PROVIDE AT LEAST 80% EFFICIENCY OUTPUT RATE WITH STABILITY DURING 20%, 50% AND 100% LOADING FOR THE BASE MODEL, WITH EACH SUCCESSIVE MODEL, BRONZE, SILVER, ETC. HAVING GREATER LEVELS OF EFFICIENCY]

- What about servers?

a. If yes, how did you become aware of this performance specification?

[Servers are a small part of the 80 PLUS market but we will probe for server responses throughout this guide]

3. Are you aware of the ENERGY STAR qualification for desktop PCs?

   [POWER CONSERVATION REQUIREMENTS SET FORTH BY THE ENVIRONMENTAL PROTECTION AGENCY OF THE U.S. GOVERNMENT. IN ORDER TO DISPLAY THE ENERGY STAR LOGO, DEVICES (PCS, MONITORS, PRINTERS, ETC.) MUST USE LESS THAN 30 WATTS OF POWER WHEN INACTIVE & HAVE AN 85% EFFICIENT POWER SUPPLY (80 PLUS SILVER)]

   [PROBE FOR DIFFERENCES BETWEEN ENERGY STAR 4.0 AND 5.0]

   a. If yes, how did you become aware of this performance specification?

      - What about servers?

4. Does your company request or require 80 PLUS qualified desktop PCs from its vendors in the normal course of computer purchases? [IF YES, PROBE FOR DETAILS LIKE, THE REASONS FOR DOING SO, THE GOALS OF THE REQUIRING THESE PURCHASES, ETC.]

   - What about servers?

   a. What about ENERGY STAR qualified desktop PCs?

      [PROBE FOR DIFFERENCES BETWEEN ENERGY STAR 4.0 AND 5.0]

      - What about servers?

PC and Laptop Sales and Market Trends

[These questions cover unit sales and trends as a whole, not specifically 80 PLUS sales]

Instruction to Interviewers: Inform the respondent that the next series of questions will be about unit sales and trends as a whole, not specifically 80 PLUS sales.

5. What has been the sales trend over the last 2 to 3 years for your company's purchase of desktop PCs? [PROBE FOR INCREASE OR DECREASE AND TO WHAT DEGREE; APPROXIMATE PERCENTAGE IF POSSIBLE]

   a. By what percentage would you say that the purchase of desktop PCs has changed (decreased/increased) over the last 2 to 3 years?

      - What about the trend for laptop purchases? [PROBE FOR SPECIFIC PERCENTAGE CHANGE]
      - What about the trend for servers your company purchases? [PROBE FOR SPECIFIC PERCENTAGE CHANGE]

   b. What are the main causes of the changes (decrease/increase) in the purchase of desktop PCs?

      - What about laptops?
      - What about servers?

c. Does your company expect these trends to continue for the next 1 to 2 years?

[PROBE FOR PCS, LAPTOPS AND SERVERS.]

d. Does your company foresee any erosion of its desktop PC purchases by laptops or vice-versa, or will there be no erosion of one over the other?

[PROBE FOR AN EXPLANATION]

6. Has the recent US economic downturn influenced your company's purchase of desktop PCs over the last 1 to 2 years? If so, how? (probe)
[This is an optional question already covered in the secondary research – see matrix]

- How about the purchase of laptops?
- How about servers?

7. Does your company have locations outside of the Pacific Northwest region of the United States? If no, skip part a of this question.

a. Can you describe any difference in your company's national desktop PC buying trends versus in the Northwest region specifically?

[PROBE: DO YOUR PURCHASES IN THE NORTHWEST HAVE A GREATER SHARE OF 80 PLUS QUALIFIED PCS AND SERVERS?]

ENERGY STAR and 80 PLUS qualified PCs and servers

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

Instruction to Interviewers: Inform the respondent that the next series of questions will be about PCs and servers that are 80 PLUS qualified or ENERGY STAR.

8. Approximately what share of the desktop PCs your company buys are 80 PLUS qualified?

- What about ENERGY STAR?

[PROBE FOR DIFFERENCES BETWEEN ENERGY STAR 4.0 AND 5.0]

b. Does your company anticipate any changes to this share in the next 1 to 2 years? [PROBE TO UNDERSTAND WHAT CHANGES ARE ANTICIPATED, IF ANY]

[PROBE FOR FUTURE SHARE OF 80 PLUS, ENERGY STAR 4.0 AND 5.0]

Incremental Costs

9. Are you aware of any incremental costs associated with the purchase of 80 PLUS qualified desktop computers? [IF YES, PROBE FOR DETAILS, EXAMPLES, ETC.]

- What about servers?

10. Are you aware of any incremental costs associated with the purchase of ENERGY STAR certified desktop computers? [IF YES, PROBE FOR DETAILS, EXAMPLES, ETC.]

- What about servers?

11. Is your company willing to pay more for an 80 PLUS qualified desktop computer?
    a. Roughly how much more in $US per unit is your company willing to pay?
12. Is your company willing to pay more for an ENERGY STAR qualified desktop computer?

    [PROBE FOR DIFFERENCES BETWEEN ENERGY STAR 4.0 AND 5.0]

    a. Roughly how much more in $US per unit is your company willing to pay?

Looking Forward

13. What do you think would encourage your company to increase the use of energy-efficient power supplies?
14. What do you think energy efficiency advocates, regulators, or others can do to increase the use of energy-efficient power supplies?
15. Do you have any other comments on the market for energy-efficient power supplies that you would like to share?

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 Results

Appendix C-1: Computer OEM/SI Interview Results

1. What are the factors influencing commercial customers' purchase decisions for PCs?

[Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
	#	%	#	%
Battery life	1	20%	0	0%
Energy efficiency/savings	3	60%	2	40%
ENERGY STAR certification	3	60%	0	0%
Environmental concerns	2	40%	0	0%
EPEAT certification	1	20%	0	0%
Features	1	20%	0	0%
Form factor	0	0%	1	20%
Low noise	0	0%	1	20%
Performance	0	0%	2	40%
Price/cost	1	20%	3	60%
Product aesthetics	0	0%	1	20%
Product quality	0	0%	1	20%
Reliability	1	20%	2	40%
Security	1	20%	0	0%
Warranty cost	1	20%	0	0%
Total	5	100%	5	100%

*Respondents can provide more than one response, so percentages may not sum to 100%.

OEM Verbatim Responses:

- A lot of it is based on ENERGY STAR and EPEAT registered, servers - n/a getting out of servers
- A majority of time working environmental stuff is ENERGY STAR validation, public sector requests ENERGY STAR, Disney for instance is very environmentally focused
- Don't sell traditional desktops - the reason folks go with us is desktop management business. Lots of failure in desktops and [our products] eliminate failure, virtualized desktops. Saves many, many hours in maintenance. Soft factors are power (huge) go from 100-200 watts to 4 watts on average, one customer documented 130k in utility costs per year. 22 year failure rate. 10-12 hour life on laptops.
- First and foremost, commercial customers demand that products are ENERGY STAR qualified. The customers are more knowledgeable and some of the environmental attributes being energy efficiency of IT equipment. There's enough info from the web and emerging sustainability programs, they are looking to reduce their energy footprint and one of the easiest ways to do that is to buy more efficient electronics. Most recognized is ENERGY STAR. Looking at product carbon footprint (end-to-end lifecycle analysis that covers how the materials are sourced) all the way to the usage and the biggest

SI Verbatim Responses:

- Energy savings is a big concern, more people cognizant of it. Used 80 PLUS to separate themselves.
- Price
- Price, perception of reliability, form factor, performance
- Primarily reliability, lots need the assurance that system won't go down or be replaced quickly, second is low hassle, don't need support, just want system to work correctly
- Some of the factors

contributor is energy and then the recyclability at the end of life. We get those end-to-end questions all the time. • Number 1 is warranty cost. Warranty cost is as much as pc cost - upfront cost. Public purchases are influenced by perverse incentives. Large enterprise is feature driven, spec driven for large fleets, Sarbanes Oxley security, etc. Manageability of fleet. Costs around pcs, efficiency, software into and onto pc. "How much energy does this thing burn?" Looking to make PC sip energy when they are off and be efficient when in use.	include power efficiency, low noise, product performance, product aesthetics, product quality, and cost.

1. Do these factors vary between desktop PCs, laptops, and servers?

	OEMs		SIs	
Laptops	**#**	**%**	**#**	**%**
Yes	1	20%	2	40%
No	3	60%	2	40%
Don't Know	1	20%	1	20%
Total	5	100%	5	100%

	OEMs		SIs	
Servers	**#**	**%**	**#**	**%**
Yes	2	40%	3	60%
No	2	40%	2	40%
Don't Know	1	20%	0	0%
Total	5	100%	5	100%

OEM Verbatim Responses:

- Doesn't matter - education and government RFQs all ask for EPEAT and ENERGY STAR
- Energy efficiency is important across the board - we are keenly sensitive to that. 5-6 years ago, price and performance were the two most critical buying criteria, and now energy efficiency has creeped up very near the top of the purchasing decision tree. It comes down to how many kW you can save in the year.
- Not familiar for requirements of notebooks, doesn't know anything about servers, has tool for carbon calculator for products up to three years old to show $ and footprint, return on investment (ROI) calculator shows the difference to customers
- Our solution is 100% dependent on servers - absolutely continue power story into data center. We defined servers as most eco-friendly - power, cooling and performance and space in datacenter - we wins with this definition. Total cost of server is big metric. SWAP - space wattage and performance. Our products come in laptop format but they are just virtualized laptops going back to server
- Yes, laptop conversation is never about efficiency of laptop. $4 for a [laptop we produce] per year in energy, $7 maxed. Desktops are 30 - 100$ per year. Features y axis x axis is cost. Implicitly assumed that you can run all of the software needed. 9 different operating systems on servers 2 on a pc - really 1 windows on a pc. Many different versions of server operating systems is most important factor - does your server deliver the capabilities you are

SI Verbatim Responses:

- Form factor has more influence in laptops and perception of reliability in servers.
- No, it's hard to say - not many commercial laptops sold, niche is desktop. Definitely true that stability and reliability are most important - true with server even more than desktop
- There is a major shift to mobile devices fundamental shift industry wide for flexibility. Creating content is PCs niche, viewing content is mobile, energy savings is a big discussion with servers - very critical

looking for, then cost. Energy cost is $100's per year so energy costs are a big factor. Redundancy is important so there are multiple power supplies. Servers sit in the revenue stream of organizations - production servers. Least visibility into efficiency because they are so necessary, can't fail. Lower used servers place a higher value on efficiency low activity on all the time.

90+ power supplies in these.
- These factors do not vary between PCs, laptops or servers.

1a. How important, if at all, is energy efficiency in commercial computer purchasing decisions? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
	#	%	#	%
Very important	2	40%	1	20%
Important	3	60%	1	20%
Not important	0	0%	3	60%
Total	5	100%	5	100%

OEM Verbatim Responses:
- Boiler plate at this point
- Facilities departments pay the bill Information Technology departments spend the money. Large enterprise is now mitigating their energy usage due to cost and availability
- Very high
- Very important - I get energy consumption questions all the time. Probably answered half a dozen or a dozen in the last week alone.

SI Verbatim Responses:
- At this time, we have seen that overall clientele do not consider energy efficiency as a factor. Larger clientele that operate data centers are more concerned as energy wastes affects their bottom line profits directly.
- Critical
- Heard it once or twice, but not often, fraction of a percent of people inquiring, secondary concern, nice if you can get it
- Important for public sector clients
- Somewhat
- Very little

2. What percent of the time do your company's commercial customers specifically request energy-efficient power supplies for desktop PCs? What about servers?

	OEMs		SIs	
Desktop PCs	#	%	#	%
0%	0	0%	2	40%
20%	1	20%	0	0%
50%	0	0%	2	40%
80%	1	20%	0	0%
90%	1	20%	0	0%
100%	0	0%	1	20%
No response	2	40%	0	0%
Total	5	100%	5	100%

Servers	OEMs		SIs	
	#	%	#	%
0%	0	0%	2	40%
40%	0	0%	1	20%
50%	0	0%	1	20%
90%	2	40%	0	0%
No response	3	60%	1	20%
Total	5	100%	5	100%

OEM Verbatim Responses:

- 80% of time. 90% servers
- Don't get specific requests just whole PC needs to be ENERGY STAR. All PCs are ENERGY STAR rated - 100% desktop are ENERGY STAR. Small enclosure designs make light, efficient power supplies necessary
- Equivalent to ENERGY STAR = 18%. We use 80 plus as a distinguishing point - two new 2700 power supplies on website are at platinum. ENERGY STAR doesn't help us out, only power supply uses energy. Efficiency is really energy in not ENERGY STAR rating. Ratcheting up power supply efficiency because that saves energy. 94% is max efficiency without some new unknown technology.
- Not necessarily power supplies, but ENERGY STAR - conservatively 30-40% of time
- Power supplies in general - one of our primary objectives is to qualify as many of our products to ENERGY STAR and the base requirement is 85% for desktop computers and notebooks - we try to stay ahead of the curve, and most of ours are somewhere between 88 to 90% in anticipation of more stringent ENERGY STAR requirements. We won't have any lag time or dead period where our products don't meet EStar requirements. We get the requests in two ways - probably somewhere in the 90th percentile of our customers demand that our products be EStar qualified, particularly enterprise customers. We also participate in the Climate Savers program and the basis of that program is also power supply efficiency. They are up at 85% at bronze level. Most of our products are bronze or silver. Climate Savers and 80 PLUS have the same rating system - we currently participating in the 80 PLUS program as well and probably over the last 8 to 9 months we have been qualifying all our power supplies. It's voluntary, it's an expense to do that, but it's something they ask for specifically.

SI Verbatim Responses:

- 1% or less for desktops - 1% also on servers - we tend to sell just a couple servers rather than many servers
- It is a line item when purchasing (always) - expected to have energy efficient power supplies. Don't even ask but puts in an 80 PLUS power supply, reliability is better and better experience. Rebates were a great incentive to get into 80 PLUS program. Sales reps were awarded rebates dollars as a sales incentive.

3. In general, do you find that commercial customers who request energy-efficient power supplies identify particular programs or certifications?

	OEMs		SIs	
	#	%	#	%
Yes – 80 PLUS and ENERGY STAR	2	40%	3	60%
Yes – 80 PLUS only	0	0%	0	0%
Yes – ENERGY STAR only	2	40%	0	0%
No, they don't request specific programs/certifications	1	20%	2	40%
Total	5	100%	5	100%

OEM Verbatim Responses:

- Definitely EPEAT and ENERGY STAR. Initially VA Tech University requested 80 PLUS specifically. "80% is a downgrade at this point."
- East and west coast it is 80 PLUS, middle asks how do you know it is efficient and we tell them about 80 PLUS and ENERGY STAR. Central United States just has not been brought up to speed on ENERGY STAR and 80 PLUS. I point people to 80 plus website.
- ENERGY STAR
- No. Our products are ENERGY STAR rated but customers don't care
- The big ones are ENERGY STAR, 80 PLUS, and Climate Savers computing initiative. Climate Smart is the one covers data centers. Started as a collaboration between Google and Intel, maybe 3-4 years ago.

SI Verbatim Responses:

- 80 PLUS, ENERGY STAR
- It is usually in bid requirements generally call out equally 80 PLUS and ENERGY STAR 50/50 split. No ENERGY STAR 4.0 any more
- Not sure that I would say yes, some recognize 80 PLUS but energy efficient is buzz word

3a. How often, if ever, are 80 PLUS qualified PCs specifically requested? What about ENERGY STAR 5.0?

	OEMs		SIs	
80 PLUS	#	%	#	%
0%	2	40%	1	20%
20%			1	20%
30%			1	20%
40%	1	20%		
50%			2	40%
No Response	2	40%		
Total	5	100%	5	100%

ENERGY STAR 5.0	OEMs		SIs	
	#	%	#	%
0%	1	20%	1	20%
30%			1	20%
50%			2	40%
100%	2	40%		
No Response	2	40%	1	20%
Total	5	100%	5	100%

OEM Verbatim Responses:

- 80 plus has only been around 3 years maybe…so they are still in the process of getting some notoriety and making a name for themselves. And it depends on the customer - large enterprise customers who have people who work specifically on their sustainability all are pretty much familiar with these programs. Maybe 35-40% of the market. They'll have multiple criteria in a big package and you'll want to be able check off as many boxes as possible. Everyone asks for ENERGY STAR - it's a base requirement. Some people do associate 80 PLUS with the ENERGY STAR.
- 80 PLUS was not specifically talked about when it was only one level, now that there is gold it is back in environmental messaging, people don't know the difference between ENERGY STAR and 80 PLUS - just know they want an energy efficient power supply. ENERGY STAR over 80 PLUS, ENERGY STAR is very consumer oriented.
- Frequently with fortune 500 companies, less so with fortune 1000 companies. Public procurement, university and city government, Poland and Brazil request 80 PLUS. Federal government customers request ENERGY STAR and EPEAT. We would like 80 PLUS to be accredited whether ISO or not. Likes that it is an independent third party and utilities trust them. Utilities are our biggest customer, not ENERGY STAR. No one buys to ENERGY STAR 4.0 no one asks for level specifically.
- Nobody has ever requested ENERGY STAR or 80 PLUS
- Typically all are requested to be ENERGY STAR

SI Verbatim Responses:

- ENERGY STAR is a more universally known brand than 80 PLUS. General customer knowledge is ENERGY STAR, PC buyer knows 80 PLUS
- Never 80 PLUS, ENERGY STAR is a more identifiable brand. Don't know breakdown of commercial vs. business - do lots of website sales and promote 80 PLUS and ENERGY STAR. Many customers probably answer their own questions about power usage

4. Do power supply manufacturers promote their 80 PLUS certified power supplies to your company?

	OEMs		SIs	
	#	%	#	%
Yes	0	0%	3	60%
No	5	100%	2	40%
Total	5	100%	5	100%

OEM Verbatim Responses:

- No - we have more than one vendor. We give them testing standards to make things, don't buy off-the-shelf supplies. At the end of the day we specify the power supply.

SI Verbatim Responses:

- Definitely. Pretty constant with Seasonic. Save $10-$15 to go to cheap power supply. Don't fail like non-80 PLUS power supplies.

- No, they pretty much build what you specify. The average energy efficiency of a desktop was 70% going down before ENERGY STAR 4. Millions of power supplies were being produced with no real energy criteria, basically built on cost. It was a real jolt for the industry. The transition was quite an adjustment for everyone but prices came down.
- Power supply manufacturers execute our designs
- We drive this. "Power supply manufacturers would quote 1950s technology!"
- Direct selling
- Power supply manufacturers do not promote their 80 PLUS power supplies to our company. But, we can locate typically within their respective websites if needed.
- Sales people do, but we make very deliberate purchases. 95% go out with same power supply, all certified by 80 PLUS - they don't advertise this to them anymore.

5. What has been the trend over the last 2 to 3 years for your company's sale of desktop PCs? [Open ended question – response categories assigned by interviewer based on verbatim responses]

Desktop PC Sales Trends	OEMs		SIs	
	#	%	#	%
Increased significantly	2	40%		
Increased	1	20%	3	60%
Stayed the same	1	20%	1	20%
Decreased	1	20%		
Decreased significantly	0	0%	1	20%
Total	5	100%	5	100%

Desktop PC Sales Percentage Change	OEMs		SIs	
	#	%	#	%
-30%	0	0%	1	20%
0%	1	20%	1	20%
+10%	0	0%	1	20%
+40%	0	0%	1	20%
+100%	1	20%	0	0%
+30% over last three quarters	1	20%	0	0%
Don't Know	2	40%	1	20%
Total	5	100%	5	100%

OEM Verbatim Responses:

- Desktops have been level or declining, laptops continue to rise. People like handheld devices. Desktops will not be as voluminous.
- All official numbers are at Gartner but could say every year since 2004 growth in the virtualized PC sales has doubled
- Overall up in volume but notebooks and tablets up more as a percentage of sales moving to more mobile, desktops not growing
- Up every year, growing in a declining market. This year we blew it out of water, IDC had to change numbers average is 1-2% growth but this

SI Verbatim Responses:

- Definitely flat at best
- Last couple of years seen pretty consistent growth bit of a dip in 08 & 09 but more like a plateau for them, overall sales increasing mostly desktops. 40% since 2008, 2008 was bottom of dip though. 10-15 % vs. 2007. We

year it is higher • We've seen quite a spike in desktop sales, and I'm not sure what the reason has been for that - one may be price, and also the energy efficiency and features have improved. 2-3 years ago, sales were pretty flat, but now the last 3 quarters has seen maybe a 30% spike in sales.	don't compete on $400 systems

5. What has been the trend over the last 2 to 3 years for your company's sale of laptops? What about servers? [Open ended question – response categories assigned by interviewer based on verbatim responses]

Laptops	OEMs		SIs	
	#	%	#	%
Increased significantly	0	0%	1	20%
Increased	3	60%	1	20%
Stayed the same	1	20%	1	20%
Decreased	0	0%	1	20%
Don't Know	1	20%	1	20%
Total	5	100%	5	100%

Laptops Percentage Change	OEMs		SIs	
	#	%	#	%
+30%	0	0%	1	20%
Don't Know	5	100%	4	80%
Total	5	100%	5	100%

Servers	OEMs		SIs	
	#	%	#	%
Increased significantly	1	20%	0	0%
Increased	1	20%	5	100%
Don't Know	3	60%	0	0%
Total	5	100%	5	100%

Servers Percentage Change	OEMs		SIs	
	#	%	#	%
+30%	0	0%	1	20%
+60%	0	0%	1	20%
Don't Know	5	100%	3	40%
Total	5	100%	5	100%

OEM Verbatim Responses:

- Don't know year over year
- Laptop sales continue to increase and server sales year over year are always higher. Server architecture over last three years has improved efficiency greatly. Blade servers now have platinum power supplies in them. The gamble is that customers are going to adopt high efficient power supplies – we will only get platinum power supplies for future power supplies in servers. We sell more servers year over year - 2014 all health records will be digital. 13% per year smart grid. Lots more mobile devises and a lot more servers.
- Laptops are the same. Server sales moving differently because of a recent acquisition. Moving away from volume sales into [redacted brand name] database servers all inclusive in a rack. Can't make these new servers fast enough.
- Our bread and butter has been notebook sales for a number of years - we sell millions - both consumer and commercial. That's the highest volume. Workspace in the average office is decreasing so that's trending toward laptops. We're just getting our feet with servers, and we're in the entry level market for those. 1u, 2u, rack mount systems, and also desktop format. We expect hopefully that our market share will grow over time.
- Up and continue, smaller lighter more efficient

SI Verbatim Responses:

- Laptops is greatly increasing now 50/50 split. Solid server, most growth is in servers, make lots of money on servers
- Stayed the same, shrunk as a percentage of business, sales numbers are the same

5a. Does your company expect these trends to continue for the next 1 to 2 years?

	OEMs		SIs	
Desktop PCs	**#**	**%**	**#**	**%**
Yes	5	100%	4	80%
No	0	0%	1	20%
Total	5	100%	5	100%

	OEMs		SIs	
Laptops	**#**	**%**	**#**	**%**
Yes	4	80%	3	60%
No	0	0%	1	20%
Don't Know	1	20%	1	20%
Total	5	100%	5	100%

	OEMs		SIs	
Servers	**#**	**%**	**#**	**%**
Yes	2	40%	5	100%
No	0	0%	0	0%
Don't Know	3	60%	0	0%
Total	5	100%	5	100%

OEM Verbatim Responses:

- We hope that servers will grow over time. Added

SI Verbatim Responses:

- 1-2 years would like to see consistent strength in

servers in the last year and half. Probably out of my area of expertise. Not sure what the market intelligence is. I'm certain the market will continue to thrive for the laptop business, and server business is thriving.
- Yes - healthcare, smart grid and mobility/cloud computing will drive laptop and server sales. Desktops are becoming more of niche markets, i.e. gaming, Photoshop, etc. Yes - trends continue due to smart grid, healthcare…
- Yes - we would hope so
- Yes. [Redacted brand name] and [Redacted brand name] servers are the new virtualization servers we have. [Redacted brand name] partnership with [Redacted brand name] to put them into the cloud. These are the most energy efficient servers on market.

desktops and servers increase. In 10 years desktops will decline
- no, virtualization will kill the desktop as we know it
- Totally. Desktop mobile cat's is out of bag, now companies buying notebooks, tablets, netbooks, iPads, iPhones and smartphones
- Yes, we expect these trends to continue. One reason is due to price pressure by larger PC manufacturers. The trend has been moving PCs towards a sort of devalued commodity of which our company has decided to not pursue. For servers, there is a significant interest in what we do. We differentiate ourselves by offering flexibility and world-class OEM/ODM capability.
- Yes. Competitive landscape

6. To what extent has the recent US economic downturn influenced the market for desktop PCs, laptops, and servers over the last 1 to 2 years? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
Desktop PCs	**#**	**%**	**#**	**%**
Increased sales somewhat	1	20%	0	0%
Minimal influence	1	20%	1	20%
Decreased sales somewhat	2	40%	1	20%
Decreased sales significantly	0	0%	1	20%
Don’t know/not applicable	1	20%	2	40%
Total	5	100%	5	100%

	OEMs		SIs	
Laptops	**#**	**%**	**#**	**%**
Minimal influence	2	40%	0	0%
Decreased sales somewhat	2	40%	1	20%
Don’t know/not applicable	1	20%	4	80%
Total	5	100%	5	100%

	OEMs		SIs	
Servers	**#**	**%**	**#**	**%**
Minimal influence	1	20%	1	20%
Decreased sales somewhat	2	40%	2	40%
Don’t know/not applicable	2	40%	2	40%
Total	5	100%	5	100%

OEM Verbatim Responses:

- For us it is hard to tell because we are picking up market share, price point is high
- Influenced our market in two ways. People look to us to save money - they are interested in the technology because of the down economy. But… lots of deals went away because of economy, not a loss but just an evaporated deal
- It wasn't necessarily volume part that was the hardest; was memory cost increases, budgets got smaller
- People are holding on to systems longer. Energy consumption is invisible at this point. The smart grid should reveal this to people. Pc will be used to process their smart grid data. Corporations have gone from 3 year churn to 4-5 year churn.
- We get business results on a quarterly basis and we have been outperforming in the US and international markets. Upward trends in our desktop sales.

SI Verbatim Responses:

- Customers are choosing configurations with lower ASPs, so units have increased while revenue is challenged
- Definitely causing people to be price sensitive, longer service life
- Hit low end of market really hard, high end business systems still needed high end hardware but limped along on old beater a little longer

7. Does your company track sales of desktop PCs by customer type, for example commercial versus residential consumer?

	OEMs		SIs	
	#	%	#	%
Yes	5	100%	3	60%
No	0	0%	2	40%
Total	5	100%	5	100%

	OEMs		SIs	
% Commercial	#	%	#	%
30%	0	0%	1	20%
50%	1	20%	0	0%
70%	2	40%	0	0%
90%	0	0%	1	20%
100%	1	20%	1	20%
Don't know	1	20%	0	0%
Not tracked	0	0%	2	40%
Total	5	100%	5	100%

OEM Verbatim Responses:

- No residential customers- largest customer is the federal government. Our servers are most secure in the world - classified networks everywhere.
- Education, government, all same product. Lots of commercial buyers buy from the store but this is a small portion of overall sales - mostly residential sales. Trying to be more enterprise friendly
- Track it separately then split it further between business like healthcare, education, etc. - split 50-50% but varies by quarter
- We do - we have two market segments: commercial customers that only buy our [redacted] brand and we also have consumer customers who have [redacted] brand that make into the commercial sector as well.
- Yes. Do not know share off top of head. We shoot for 50-50 split but consumer base is more like 30% residential and 70% commercial

SI Verbatim Responses:

- 50% education, k-12 and universities, government 15%, commercial 15%, reseller 20% to non-educational and & residential (10% each)
- commercial = 15%, public sector = 85%
- N/A
- No - guess would be 30% commercial is stab in the dark
- We do not track by customer type.

8. Does your company use 80 PLUS certified power supplies in the manufacture of its desktop PCs and servers?

	OEMs		SIs	
Desktop PCs	**#**	**%**	**#**	**%**
Yes	3	60%	4	80%
No – but meets technical specification	1	20%	1	20%
Don't know	1	20%	0	0%
Total	5	100%	5	100%

	OEMs		SIs	
Servers	**#**	**%**	**#**	**%**
Yes	2	40%	3	60%
No	0	0%	2	40%
Don't know	3	60%	0	0%
Total	5	100%	5	100%

OEM Verbatim Responses:

- I don't know. Our company claims to have energy efficient power supplies but I do not believe they are 80 PLUS certified
- No, but they meet the technical requirement
- Yes for desktops and workstation, not sure for servers. Most servers need to work 24/7 and they need to run cool, quiet - I think power supply efficiency has been in the 88-90% range for a while - those types of attributes have been in servers longer than desktops.
- Yes. Servers are more a la cart - servers we're looking at 80 PLUS

SI Verbatim Responses:

- No - neither desktop PCs nor servers
- Yes - 80 PLUS used in both desktop PCs and servers
- Yes - desktop PCs only, not servers
- Yes. 99.5% have 80 PLUS. Decision to make quiet computers this lends to 80 PLUS, high end power supply with low heat fit 80 PLUS. Servers - Yes, but not only like in desktops

9. What has been the trend over the last 2 to 3 years for your company's sale of 80 PLUS qualified desktop PCs? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
Desktop PCs	**#**	**%**	**#**	**%**
Increased	2	50%	2	50%
Stayed the same	1	25%	2	50%
Don't Know	1	25%	0	0%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs.

OEM Verbatim Responses:

- Doesn't measure it other than for Ecos, more measure for ENERGY STAR
- Going up. Trying to reach 90%. Levels recently all were 84-85% before, now all are 88-89% efficiency
- Sale of 80 PLUS power supplies is going up. ENERGY STAR is leveling off. 80 PLUS is an easy sale. ENERGY STAR brand is harder to sell and cost and complexity is high. 80 PLUS is very straight forward ENERGY STAR is complicated.
- We only started certifying our power supplies to 80 PLUS last year - when the ENERGY STAR requirement changed, they started asking about 80 PLUS and so we saw that the additional costs of 80 PLUS certification is worth it. There's no category of our computers that you can't specify to be 80 PLUS.

SI Verbatim Responses:

- Due to the poor economic situation, clients (of all sizes) have begun requesting more efficient power supplies to save on operating costs.
- Majority of sales are 80 PLUS - 80% or more have 80 PLUS
- Yes, should get better, power factor should move to gold and platinum

9. What has been the trend over the last 2 to 3 years for your company's sale of 80 PLUS qualified servers? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
Servers	**#**	**%**	**#**	**%**
Increased	1	50%	3	100%
Don't Know	1	50%	0	0%
Total*	2	100%	3	100%

*Includes any respondent that sells 80 PLUS certified or equivalent servers.

OEM Verbatim Responses:

- n/a
- No measure - few servers have 80 PLUS
- Not sure - our servers team is based in China.
- Trending up also.

SI Verbatim Responses:

- Same for servers
- Servers tend to be ventilated server rooms with integrated power supplies, if they have a modulated power supply then they use 80% - 80% 80 PLUS

9a. Do you expect these trends to continue for the next 1 to 2 years?

	OEMs		SIs	
	#	%	#	%
Yes	3	75%	4	100%
Don't Know	1	25%	0	0%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

OEM Verbatim Responses:

- Our plans are to certify all our power supplies to the 80 PLUS protocol. We post that information on our website and position it as a very important attribute.
- Reaching point of diminishing returns on efficiency - 90% average efficiency is a threshold to meet going forward "declare victory at that point", that said still looking at other technology that doesn't grow size or double cost

SI Verbatim Responses:

- Yes eventually 100%

10. Can you describe any difference in national sales trends versus in the Northwest region specifically? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
	#	%	#	%
All products have 80 PLUS, therefore no regional variations	1	25%	1	25%
No regional variations based on available data	1	25%	0	0%
Do not have regional sales data/can't comment	2	50%	3	75%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

OEM Verbatim Responses:

- I'm sure there are some stats somewhere but not tracked. East and West coasts purchase more of our products
- It appears to be fairly uniform. We see multinational companies with presences across the US.
- No we track sales only to the level of North America and not finer
- The lens is viewed by business stack, not region. West coast and Northwest regions parallel each other and these trends migrate east.
- The only thing I can say is that most of participating utilities are in NW but cannot speculate on sales

SI Verbatim Responses:

- Can't really break it down that way
- Insufficient data to answer
- No, all power supplies are 80 PLUS

11. Approximately what share of the desktop PCs and servers your company sells are 80 PLUS qualified?

	OEMs		SIs	
Desktop PCs	**#**	**%**	**#**	**%**
6%	0	0%	1	25%
11%	1	25%	0	0%
50%	1	25%	0	0%
60%	0	0%	1	25%
75%	1	25%	0	0%
80%	0	0%	1	25%
99.5%	0	0%	1	25%
100%	1	25%	0	0%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs.

	OEMs		SIs	
Servers	**#**	**%**	**#**	**%**
30%			1	33%
90%	1	50%		
Don't Know	1	50%	2	67%
Total*	2	100%	3	100%

*Includes any respondent that sells 80 PLUS certified or equivalent servers.

OEM Verbatim Responses:

- 100%. Applying energy efficiency requirements to all devices, chargers, external power supplies, etc. displays 88-89% efficient displays. Right thing to do just do it
- Desktop pcs and workstations - bet 10-12% servers are 90%.
- Her mix was 75% 80 PLUS (45% of business) mainstream products 50-50 (35% of business), remainder is non-80 PLUS. ENERGY STAR goes down a tad bit from 80 PLUS numbers, good reasons to do an energy efficient power supply but not always ENERGY STAR - 5-10% less ENERGY STAR
- None
- Right now probably about 50%. A few months ago it was about 44%, and I would say it's at least 50% and going up. When we source power supplies, we buy thousands of them at a time, and for a while we work off our existing supplies.

SI Verbatim Responses:

- 30% servers
- 99.5% 80 PLUS, don't know ENERGY STAR

11. What share of the desktop PCs your company sells are ENERGY STAR 5.0 qualified?

	OEMs		SIs	
Desktop PCs	**#**	**%**	**#**	**%**
0%	0	0%	1	25%
50%	1	25%	1	25%
60%	0	0%	1	25%
68%	1	25%	0	0%
100%	1	25%	0	0%
Don't know	1	25%	1	25%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs.

OEM Verbatim Responses:

- 100% of [product name] are. All [product name] are ENERGY STAR 5.0 category A, EPEAT silver. Device is 98% recyclable. [product name] does not have an internal power supply only external.
- Less - we have a product line which is 80 PLUS but not ENERGY STAR, no one buys 4.0 ENERGY STAR. ENERGY STAR is down. ENERGY STAR program is a politically driven program. Lots in industry not real happy with ENERGY STAR. Top tier distinction is frustrating. Seriously concerned at the viability of program going forward.
- Once ENERGY STAR standard is changed it is ENERGY 5.0 or bust, 4.0 goes away
- Probably at that 50% level. We have some customers that buy just on price and performance. Gartner has done a similar study. Pretty much the industry average.

SI Verbatim Responses:

- 50% rebate for ENERGY STAR so that is trending up, all 5.0 now
- 99.5% 80 PLUS, don't know ENERGY STAR. Extra level of complexity to get $2 ENERGY STAR rebate - doesn't have independent ENERGY STAR compliant info

11a. Does your company anticipate any changes to this share in the next 1 to 2 years? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
	#	**%**	**#**	**%**
No change anticipated to 80 PLUS or ENERGY STAR share	2	40%	1	20%
ENERGY STAR share *may* drop with new requirements	3	60%	1	20%
80 PLUS share *may* increase if costs drop	0	0%	1	20%
Don't Know/Not Applicable	0	0%	2	40%
Total	5	100%	5	100%

OEM Verbatim Responses:

- 80 PLUS up and ENERGY STAR down as ENERGY STAR is getting more complicated, 80 PLUS is superior to ENERGY STAR. The Electric Power Research Institute (EPRI) understands watts, etc. ENERGY STAR staff are not engineers.
- Depends on how this newly implemented program they have goes across. It's been a voluntary program, and we've been able to self-certify our products. Starting in January, it's third-party

SI Verbatim Responses:

- 100% 80 PLUS but big concerns with ENERGY STAR 6.0 because of lab certification, will see a shift to selling others systems like ours. ENERGY STAR certified machine sales could drop after a peak of 5.0
- We do not anticipate changes unless

certification. Now it's gonna cost companies to be ENERGY STAR certified. Customers will still demand it, so it'll be interesting to see what the industry goes through.
- Major concern with ENERGY STAR is requirements with features that can't be revealed with new levels (company confidentiality issues). If everything goes well continue at 100%. High quality displays i.e. require more power so if displays are in new ENERGY STAR 6.0 specification it could bump them out
- No - key tenet is power friendly
- No. The EPA doesn't want more that 25% of shipments to be ENERGY STAR 6.0, when technology catches up EPA makes it harder

power supply manufacturers experience a decrease in cost to produce this type of technology. Should the costs to manufacture energy efficient power supplies decrease, there should be additional & improved product offerings from those manufacturers. Should this occur, our company will definitely take advantage of offering more energy efficient products.

11b. Does your company foresee any erosion of the PC market by laptops or vice-versa, or will there be no erosion of one over the other? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
	#	%	#	%
No erosion anticipated	2	40%	0	0%
Desktop PC market will be eroded by laptops	2	40%	3	75%
Desktop PC market will be eroded by virtualization	1	20%	0	0%
Don't Know	0	0%	1	25%
Total*	5	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs.

OEM Verbatim Responses:
- Desktops will hang on. There was a period in the past that it was significantly eroded. Now we have a desktop computer with a footprint that's not much bigger than the laptop, just not mobile. We've conquered those hurdles and maintained hurdles.
- IDC predicted notebooks taking over but year over year we prove that wrong - past experience would say no
- Virtualization will erode traditional desktop - we hope to erode the traditional PC market
- Yeah definitely
- Yes, people like portability and cloud computing will help with performance issues

SI Verbatim Responses:
- Long term yes, laptops will erode PC sales. Once upon a time video games and editing machines needed to be desktops, now you can get by- niches still require desktops, lots of people make buying decisions on what they could possibly do so desktops are still relevant, 5-10 years you will see lots of mobile devises
- We do foresee an erosion of the PC market by laptops. Today's and near future laptops possess significant processing power, storage and memory capacity/performance, and improved graphic/video capability. These factors contribute to many companies and individuals choosing to replace their PC with a more mobile solution.
- Yes, will continue to see it. Don't claim tier one notebook sales only own brand. Just started claiming monitors

12. Are you aware that 80 PLUS now certifies different levels of efficiency in power supplies (i.e., 80 PLUS base, bronze, silver, gold, and platinum? Which types are most common in your commercial PC product mix?

	OEMs		SIs	
	#	%	#	%
Yes	4	100%	4	100%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

	OEMs		SIs	
Levels Most Commonly in Use*	#	%	#	%
Base	0	0%	2	50%
Bronze	1	25%	4	100%
Silver	2	50%	1	25%
Gold	2	50%	1	25%
Platinum	0	0%	0	0%
Total*	4	100%	4	100%

* Respondents can indicate more than one level of 80 PLUS in use, so responses do not add to 100%.
**Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs.

OEM Verbatim Responses:

- Primarily bronze and silver levels. Not sure if we have a gold level one certified.
- We use 80 PLUS qualified power supplies to differentiate our levels of product. I.e. high end [redacted brand name] servers have gold power supplies while the [different model of same brand] servers have a silver power supply. Only using gold, no bronze or silver left, soon will have platinum
- Yes - silver to gold range. High in the silver just miss gold lots of time apply 80 PLUS requirements to 100v in Japan

SI Verbatim Responses:

- Most common are bronze (30%) and base (40%), same with servers, others are miscellaneous categories
- Yes - mainly bronze 80% 10% gold 10% silver

13. Does your company always claim the incentives available for the sale of 80 PLUS qualified PCs and servers?

	OEMs		SIs	
	#	%	#	%
Yes	2	67%	2	50%
No	1	33%	2	50%
Total*	3	100%	4	100%

*Includes any participating respondent that sells 80 PLUS certified desktop PCs and/or servers.

OEM Verbatim Responses:

- Any time we can – [name redacted] in San Francisco represents them with PG&E, etc. We send data to [name redacted] and Ecos.
- n/a. No systems and policy with zip code requirements of customers.

SI Verbatim Responses:

- Always
- Never
- No, wish we did - lost

Collecting money for something we are doing anyway
- Not a participant
- The basis of the program is that once a month I provide our IT folks with a listing of all the qualified products and I get a query that's generated to data mine all the sales in all the targeted states and I provide that info to Ecos. The rebate money is used to further the other environmental programs we have.
- Yes, only as good as their reports but try to always claim incentives. Can't capture customer created SKUs, capturing Canada is hard

employee handling it and ball got dropped but plan on redeeming again, goal is to always redeem.

13a. What would need to change regarding the incentives program for you to submit more claims? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
	#	%	#	%
No changes needed	2	40%	2	40%
Expand program to more regions	1	20%	1	20%
Send email reminders to submit missing claims	0	0%	1	20%
Give rebates directly to customers, not OEM/SI	1	20%	0	0%
Not applicable/non-participant with no suggestions	1	20%	1	20%
Total	5	100%	5	100%

OEM Verbatim Responses:
- Ecos side - nothing. Internally reporting isn't perfect, we just don't have the time, rebates have actually gone up substantially since I got there
- Logistics of data collection at zip code level. How do you cash check, etc. - roll back into process??? Would suggest faster pick up of energy efficient incentives to customer directly, not OEM. Let Ecos know models that qualify and give customer a $20 rebate for buying it regionally. Great incentive to choose higher energy efficiency. Take rebate at retail outlet
- More programs would mean more incentives claimed. West coast has best programs.
- Not a participant

SI Verbatim Responses:
- Nothing will need to change as our corporate responsibility directive considers providing 80 PLUS qualified systems as a necessary component of our corporate culture.
- Only paid on certain zip codes would like to see that grow thinks it is a great program win/win
- Roadblocks and challenges getting systems set up and configured initially - no complaints after set up. Maybe some notification of no claim received - send me an email when I don't claim

14. Has the incremental cost of an 80 PLUS certified power supply changed over the last two years?

	OEMs		SIs	
	#	%	#	%
Increased	1	25%	0	0%
Stayed the same	1	25%	1	25%
Decreased	2	50%	2	50%
Don't Know	0	0%	1	25%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

OEM Verbatim Responses:

- Any time you do a step up in efficiency, there's an initial cost associated with that. It's much less now than that initial bump with ENERGY STAR 4. When Climate Savers started, they provided a roadmap of what efficiency levels had to be over a timeline and we started planning for those incremental steps. The initial feedback from our suppliers was that those expenses would be significant, but the expenses haven't been as bad as they/we thought. They are bidding not just for our company but for the market. Early on they said incremental costs of $8-10 to go to 80%, then to 85% it went to $4, now we're looking at maybe $4. It depends on how many you buy.
- Never really had non-80 PLUS power supplies , costs have not gone up that much - efficiency up and cost level. Our power supplies cost lots more, the delta is pretty significant. Don't know actual dollar amounts.
- Up
- Yes, cost is mitigating but cost will never be what old power supply was. Volume is driver. Gold is $15 more, base is $7 more. Target efficiency or rating base on flagship product or not, etc.

SI Verbatim Responses:

- If anything it has gone down, difficult to get initially, more choice and rebates help.
- Seen no price change this year, does not have data back farther than that. Have had a fixed cost for a long time
- Stayed the same, maybe a $2 decrease

14a. What factors have influenced this change? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
	#	%	#	%
No change	1	25%	1	25%
Volume production/economies of scale	2	50%	0	0%
Increased PSM competition	1	25%	1	25%
Don't Know	0	0%	2	50%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

OEM Verbatim Responses:

- Guess - from a supply chain standpoint it is because of increased use across all OEMs, more available on more products
- Not sure, certain amount of awareness of competitive advantage. Power supply manufacturers like working with us because we essentially fund R&D of efficient power supplies, leveraging best practices across all lines - longer life better reliability quieter
- Volume production always drops cost.

SI Verbatim Responses:

- More models and manufacturers to choose from

15. Can you give an approximate incremental manufacturing cost in $US for each of these levels?

	OEMs		SIs	
Base	**#**	**%**	**#**	**%**
$7	1	25%	0	0%
Don't Know/Confidential	3	75%	4	100%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

	OEMs		SIs	
Bronze	**#**	**%**	**#**	**%**
$4-6	1	25%	0	0%
$10	0	0%	1	25%
Don't Know/Confidential	3	75%	3	75%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

	OEMs		SIs	
Silver	**#**	**%**	**#**	**%**
$8-10	1	25%	0	0%
Don't Know/Confidential	3	75%	4	100%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

	OEMs		SIs	
Gold	**#**	**%**	**#**	**%**
$22	1	25%	0	0%
Don't Know/Confidential	3	75%	4	100%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

	OEMs		SIs	
Platinum	**#**	**%**	**#**	**%**
Don't Know/Confidential	4	100%	4	100%
Total*	4	100%	4	100%

*Includes any respondent that sells 80 PLUS certified or equivalent desktop PCs and/or servers.

OEM Verbatim Responses:

- Confidential
- Going to bronze was $4-6 range - going from 80 to 85% in a 12

SI Verbatim Responses:

- Apples and oranges question to him- hard to compare to a high end non-80 PLUS power supply, compared to a

month window. We've had longer time to go from 85% to 88% and there was no specific push other than customers wanting it.
- No - too many other factors
- The cost of a base 80 PLUS unit over a 67% efficient model is $7 (base) an 80 PLUS gold unit would be an additional $15. Do not know other levels off the top of head.

$30 junk power supply as it is much more costly, not aware of extra cost exist due to purchase for other reasons
- No, $10 about

16. What do you think energy efficiency advocates, regulators, or others can do to increase the use of energy-efficient power supplies? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
Actions*	**#**	**%**	**#**	**%**
Consumer education	2	40%	2	40%
Government mandate/efficiency standard	1	20%	2	40%
Create simplified, internationally standardized certifications/requirements	2	40%	0	0%
Consumer rebates	1	20%	0	0%
Promote energy savings benefits of virtualization	1	20%	0	0%
Don't know	0	0%	1	20%
Total	5	100%	5	100%

*Respondents can provide more than one response, so percentages may not sum to 100%.

OEM Verbatim Responses:
- Biggest thing beside a mandate is proof of return on investment (ROI), education of ROI, no point if costs don't come down
- Making rebate programs available to customers. Top tier ENERGY STAR ratings will have pressure on energy efficiency - we like this. Having resources available to customers, consumer reports, etc. to promote highly efficient PCs, good better, best. If no incentive in the United States then there could be a US only version of a power supply that is base level. Disincentive to this is bar too high from ENERGY STAR then they could cause overall pickup of energy efficient power supplies to drop
- PCs are VERY configurable systems not like a fridge or stove. 1000's of SKUs for a single product. A label for PCs does not work for PCs or servers. We are burdening systems with costs to verify numbers we already know. Use internet to show energy consumption as the system is configured. Regulators want a sticker which does not make it a better box. Labeling adds cost and doesn't deliver superior performance or energy savings. Mexico requires energy consumption to be marked on PCs but this is impossible for PCs. 300 eco labels worldwide - our PC would look like a NASCAR if we labeled everything.
- Switch to our technology! - tongue in cheek - promote virtualization technology, promote ROI of virtualization
- What we're seeing now is that there are probably 8-10 emerging EE regulations that are currently ongoing on a global basis. EU has an ERP going. Upcoming changes in China and Japan.

SI Verbatim Responses:
- Education, promote ENERGY STAR part of it get customers to request ENERGY STAR power supplies
- Enact legislation to require a level of energy efficiency for specific types of computer equipment. This would be similar to the auto industry with various EPA regulations and NLEV type programs. In addition, from our understanding, power supply manufacturers cannot take advantage of incentives as most power supplies are produced outside of the United States.
- Mandate
- Solar is buttressed by state subsidy's but doesn't think power supply industry needs that - biggest obstacle they have is marketing, ENERGY STAR is recognizable, underwriters lab are more recognizable - awareness campaign. Bad power supply is the quickest way to break other components in

Everyone has their own flavor on their EE requirements. That poses an intriguing challenge to meet all those requirements. We are trying to convince the powers that be globally to harmonize on one specific standard.

your computer. Market the value of a good cool high efficiency power supply to consumers

16a. What is a realistic goal in the next three years for the share of power supplies that are 80 PLUS certified?

	OEMs		SIs	
	#	%	#	%
35%	0	0%	1	20%
50%	0	0%	1	20%
80%	0	0%	1	20%
100%	2	40%	1	20%
Don't know	3	60%	1	20%
Total	5	100%	5	100%

OEM Verbatim Responses:

- Base level & bronze - 100% European and Australian governments are setting up regulations to force this.
- Don't know depends on cost and deltas. ENERGY STAR 6.0 could change a lot as well, doesn't think it will go down - same or up
- Goal is 100% for us.

SI Verbatim Responses:

- Don't know current share - just needs to increase. Trend will go more 80 PLUS, push back will be the cheap PC seller

17. What are the barriers to full adoption of 80 PLUS certified power supplies in the future? [Open ended question – response categories assigned by interviewer based on verbatim responses]

	OEMs		SIs	
	#	%	#	%
No barriers	1	20%	0	0%
Cost (general)	2	40%	4	80%
Cost (only for low-end machines)	1	20%	1	20%
Don't know	1	20%	0	0%
Total	5	100%	5	100%

OEM Verbatim Responses:

- Barriers - none. If 80 PLUS (Ecos) could become an External Power Supply (EPS) verification point they would then be a one stop shop and it would be easier for us to get all PC's certified.
- Cost - cheaper units are always a factor
- Cost. But again, given that the market has continually moved in that direction, I don't really see that as an obstacle, and we've seen great strides from our suppliers in terms of being able to provide what we need.
- Don't know
- Most other companies we are competing with are in low end

SI Verbatim Responses:

- Cost
- Costs
- No, other than typical business cycles. If the cost of 80 PLUS power supplies could be equal to non-80 PLUS power supplies it would be helpful. Non energy efficient power supply is $20
- Only on low end - purely expense driven - maybe cheapo power

market - low cost machines don't promote energy efficient power supplies	supplies need to be 80 PLUS certified as well, price point needs to drop

18. Do you have any other comments on the market for energy-efficient power supplies that you would like to share?

OEM Verbatim Responses:	*SI Verbatim Responses:*
• I consider the 80 PLUS program an example of excellence, and I am delighted to encourage the program. • In general the organizations focused on energy efficiency should go out of their way to find companies doing this and promote this, agencies should highlight highly efficient products, consumer rebates, nation, not regional campaigns • Word on market is 90% gold is about the top efficiency because cost of platinum has a negative effect on ROI, pay lots more for 90+% for the savings	• Not at this time

Appendix C-2: Power Supply Manufacturer Survey Results

1. How has the recent US economic downturn influenced your company's sales of power supplies over the last 1 to 2 years?

Desktop PCs	Frequency	Percent
No Influence	2	25.0%
Decreased Sales	5	62.5%
Don't Know	1	12.5%
Total	8	100.0%

Servers	Frequency	Percent
Increased Sales	1	12.5%
No Influence	1	12.5%
Decreased Sales	3	37.%
Don't Know	3	37.5%
Total	8	100.0%

Optional Comments:

- Sales decreased 2 years ago, and increased 1 year ago.
- We don't enter US retail market.

2. In the next 1 to 2 years, does your company expect the number of power supplies manufactured for the following to increase, decrease, or remain the same?

Desktop PCs	Frequency	Percent
Increase	5	62.5%
Decrease	3	37.5%
Total	8	100.0%

Servers	Frequency	Percent
Increase	5	62.5%
Decrease	1	12.5%
Don't Know	2	25%
Total	8	100.0%

3. Over the past 3 years, what is the trend in your company's sales of power supplies? (all types)

	Frequency	Percent
Increased	5	62.5%
Decreased	3	37.5%
Total	8	100.0%

4. Over the past 3 years, what is the trend in your company's sales of power supplies specifically for the following?

Desktop PCs	Frequency	Percent
Increased	5	62.5%
Decreased	2	37.5%
Don't Know	1	12.5%
Total	8	100.0%

Servers	Frequency	Percent
Increased	4	50.0%
Decreased	1	12.5%
Don't Know	3	37.%
Total	8	100.0%

5. If sales have increased or decreased, approximately what percentage does this change represent?

Desktop PCs	Frequency	Percent
-10%	1	12.5%
+5%	1	12.5%
+20%	1	12.5%
Don't Know	5	37.5%
Total	8	100.0%

Servers	Frequency	Percent
5%	1	12.5%
Don't Know	7	87.5%
Total	8	100.0%

6. Does your company expect these trends to continue for the next 1 to 2 years?

Desktop PCs	Frequency	Percent
Yes	6	75.0%
Don't Know	2	25.0%
Total	8	100.0%

Servers	Frequency	Percent
Yes	4	50.0%
Don't Know	4	50.0%
Total	8	100.0%

7. What are the key factors that make you believe that the trends will continue?

Open-Ended Responses:

Desktop PCs

- Customer demand and economy improvement
- Notebook sales increases
- Right product, right strategy
- Windows OS upgrade

Servers

- Cloud computing
- Customer demand and economy improvement

8. Does your company manufacture 80 PLUS certified power supplies for desktop PCs and servers?

	Frequency	Percent
Yes – both desktop PCs and servers	7	87.5%
Yes – desktops, but not servers	1	12.5%
Total	8	100.0%

9. What has been the trend over the last 2 to 3 years for your company's sales of 80 PLUS certified power supplies for the following:

Desktop PCs	Frequency	Percent
Increased	6	75.0%
Decreased	1	12.5%
Don't Know	1	12.5%
Total	8	100.0%

Servers	Frequency	Percent
Increased	4	57.1%
Decreased	1	14.3%
Don't Know	2	28.6%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

10. If increasing or decreasing, approximately what percentage does this change represent?

Desktop PCs	Frequency	Percent
+5%	2	25.0%
+20%	1	12.5%
Don't Know	5	62.5%
Total	8	100.0%

Servers	Frequency	Percent
+5%	1	14.3%
Don't Know	6	85.7%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

11. Do you expect these trends to continue for the next 1 to 2 years?

Desktop PCs	Frequency	Percent
Yes	6	75.0%
No	1	12.5%
Don't Know	1	12.5%
Total	8	100.0%

Servers	Frequency	Percent
Yes	5	71.4%
Don't Know	2	28.6%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

12. What are the key factors that make you believe that the trends will continue for the next 1 to 2 years?

Open-Ended Responses:

Desktop PCs

- Customer demand for green energy.
- Green products required from people.
- People are well educated with EPA power.

Servers

- Customer demand for green energy.
- Green products required from people.

13a. Approximately what percent of your company's power supply sales for desktop PCs in 2009 were: Non-80 PLUS (%)

	Frequency	Percent
35%	1	12.5%
Don't Know	7	87.5%
Total	8	100.0%

13b. Approximately what percent of your company's power supply sales for desktop PCs in 2009 were: 80 PLUS Base (%)

	Frequency	Percent
5%	1	12.5%
20%	1	12.5%
Don't Know	6	75.0%
Total	8	100.0%

13c. Approximately what percent of your company's power supply sales for desktop PCs in 2009 were: 80 PLUS Bronze (%)

	Frequency	Percent
54%	1	12.5%
80%	1	12.5%
Don't Know	6	75.0%
Total	8	100.0%

13d. Approximately what percent of your company's power supply sales for desktop PCs in 2009 were: 80 PLUS Silver (%)

	Frequency	Percent
2%	1	12.5%
Don't Know	7	87.5%
Total	8	100.0%

13e. Approximately what percent of your company's power supply sales for desktop PCs in 2009 were: 80 PLUS Gold (%)

	Frequency	Percent
5%	1	12.5%
Don't Know	7	87.5%
Total	8	100.0%

13f. Approximately what percent of your company's power supply sales for desktop PCs in 2009 were: 80 PLUS Platinum (%)

	Frequency	Percent
Don't Know	8	100.0%
Total	8	100.0%

13g. Approximately what percent of your company's power supply sales for desktop PCs in 2009 were: Unknown (%)

	Frequency	Percent
Don't Know	8	100.0%
Total	8	100.0%

14a. Approximately what percent of your company's power supply sales for servers in 2009 were: Non-80 PLUS(%)

	Frequency	Percent
Don't Know	7	100.0%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

14b. Approximately what percent of your company's power supply sales for servers in 2009 were: 80 PLUS Base (%)

	Frequency	Percent
Don't Know	7	100.0%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

14c. Approximately what percent of your company's power supply sales for servers in 2009 were: 80 PLUS Bronze (%)

	Frequency	Percent
Don't Know	7	100.0%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

14d. Approximately what percent of your company's power supply sales for servers in 2009 were: 80 PLUS Silver (%)

	Frequency	Percent
Don't Know	7	100.0%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

14e. Approximately what percent of your company's power supply sales for servers in 2009 were: 80 PLUS Gold (%)

	Frequency	Percent
Don't Know	7	100.0%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

14f. Approximately what percent of your company's power supply sales for servers in 2009 were: 80 PLUS Platinum (%)

	Frequency	Percent
Don't Know	7	100.0%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

14g. Approximately what percent of your company's power supply sales for servers in 2009 were: Unknown (%)

	Frequency	Percent*
Don't Know	7	100.0%
Total*	7	100.0%

* Includes all respondents who manufacture 80 PLUS certified power supplies for servers.

15a. Over the past 3 years, what is the trend in your company's sales of the following power supplies: Non-80 PLUS

	Frequency	Percent
Remained the Same	1	12.5%
Decreased	5	62.5%
Don’t Know	2	25.0%
Total	8	100%

15b. Over the past 3 years, what is the trend in your company's sales of the following power supplies: 80 PLUS Base

	Frequency	Percent
Increased	1	12.5%
Decreased	5	62.5%
Don’t Know	2	25.0%
Total	8	100%

15c. Over the past 3 years, what is the trend in your company's sales of the following power supplies: 80 PLUS Bronze

	Frequency	Percent
Increased	5	62.5%
Decreased	1	12.5%
Don’t Know	2	25.0%
Total	8	100%

15d. Over the past 3 years, what is the trend in your company's sales of the following power supplies: 80 PLUS Silver

	Frequency	Percent
Increased	2	25.0%
Decreased	4	50.0%
Don’t Know	2	25.0%
Total	8	100%

15e. Over the past 3 years, what is the trend in your company's sales of the following power supplies: 80PLUS Gold

	Frequency	Percent
Increased	5	62.5%
Decreased	1	12.5%
Don’t Know	2	25.0%
Total	8	100%

15f. Over the past 3 years, what is the trend in your company's sales of the following power supplies: 80 PLUS Platinum

	Frequency	Percent
Increased	3	37.5%
Decreased	1	12.5%
Don't Know	4	50.0%
Total	8	100%

15g. Over the past 3 years, what is the trend in your company's sales of the following power supplies: Unknown

	Frequency	Percent
Increased	1	12.5%
Don't Know	7	87.5%
Total	8	100%

16. What are the key factors driving changes in your 80 PLUS qualified power supply sales?

Open-Ended Responses:

- Customer requirement
- EPA power can save user's money, protect the globe
- Market trend

17. How has the incremental cost of an 80 PLUS certified power supply changed over the last two years?

	Frequency	Percent
Increased	4	50.0%
Remained the Same	1	12.5%
Decreased	1	12.5%
Don't Know	2	25.0%
Total	8	100%

Optional Comment:

- Decreased a little.

18a. What is the additional cost over a non-80 PLUS power supply (in rough $US) to manufacture an: 80 PLUS Base ($)

	Frequency	Percent
$17	1	12.5%
Don't Know	7	87.5%
Total	8	100%

18b. What is the additional cost over a non-80 PLUS power supply (in rough $US) to manufacture an: 80 PLUS Bronze ($)

	Frequency	Percent
$57	1	12.5%
Don't Know	7	87.5%
Total	8	100%

18c. What is the additional cost over a non-80 PLUS power supply (in rough $US) to manufacture an: 80 PLUS Silver ($)

	Frequency	Percent
$115	1	12.5%
Don't Know	7	87.5%
Total	8	100%

18d. What is the additional cost over a non-80 PLUS power supply (in rough $US) to manufacture an: 80 PLUS Gold ($)

	Frequency	Percent
$15	1	12.5%
$273	1	12.5%
Don't Know	6	75.0%
Total	8	100%

18e. What is the additional cost over a non-80 PLUS power supply (in rough $US) to manufacture an: 80 PLUS Platinum ($)

	Frequency	Percent
Don't Know	8	100.0%
Total	8	100%

19. Do you have any other comments on the market for energy-efficient power supplies that you'd like to share?

Open-Ended Responses:

- Only have one ECOS qualification company is not enough, more competition is necessary.

Appendix C-3: End-User Interview Results

1. What are the factors influencing your company's purchase decisions for desktop PCs? Do these factors vary between desktop PCs and laptops? What about servers?

Verbatim Responses:

- Aging hardware - cycle things out and increase horsepower. More of a trend to move to laptops, increase in laptops over last several years. Move to more destops to virtual desktops and get rid of desktops all together. Driver again is growth in applications and demand of computing power - virtualized 80% of servers they have, still have a lot of servers.
- Functionality in the sense of what that piece of equipment supposed to do, also form factor - space is a premium, laptops for execs because of mobility. Ghosts in the organization i.e. type of software loaded on pc then create a footprint with all apps, load all security, anti virus, network access. Everything applies to laptops unless work is performed outside hosp. Servers are a little different - dictated by vendor overlaid by software. Virtualizing servers across hospital. Can now get three to four application on one server rather than multiples - reduces hardware cost, power, A/C, all types of things.
- Look for the ENERGY STAR rating on desktop computers, fall into 2 categories day to day and workstations (CAD) tend to aim for middle of road on standard, good processor for word, email, memory for efficient running. Has initiative with big fix so machines sitting for more that 20 minutes go to sleep. Just started this initiative this summer. Plan to expand it to turn off at night. On the laptops they make sure power supplies are efficient HPs with smart adapters, so power adapter automatically turns its self down. Looks for ENERGY STAR machines for laptops and monitors.

1a. How important, if at all, is energy efficiency in your company's computer purchasing decisions?

[Open ended question – response categories assigned by interviewer based on verbatim responses]

	#
Somewhat important	3
Total	3

Verbatim Responses:

- Everything we buy is ENERGY STAR rated and has been that way for several years - mandated or not, it makes sense.
- It is important, but functionality is most important, 2nd after that - in a green movement at hospital = lower cost of usage. They look at efficiency of laptops - overheating is a big problem - energy consumption = heat, heat is bad, look to keep things cool.
- Wouldn't say it is top priority but does factor in - top is correct chip set and memory.

1b. How would you know if a desktop PC is energy efficient? What about a laptop? What about a server?

Verbatim Responses:

- Trusting what everyone tells them but have done some internal testing, found out newer models are better desktops kept for 4 years and laptops for 3 years. Have a sustainability group but don't know how much measurement goes on.
- We compare it to other desktop PCs. Have some large form factor PCs but they are rare. Small PCs can now do the same thing. Logical to move from large to small. Same for laptops and servers. Paper is inefficient to the hospital - people are not enthralled because of green movement but because of cost. Constantly looking at heating and cooling, planning out years into the future, have a 5 yr plan. Energy efficiency comes up all the time - even talk with software app vendors to find out why apps are so heavy on CPU use and thus energy hogs. Standard QA process is energy efficiency.
- We do not have the tools, not monitoring. Assumption is old equals less efficient, with laptops that is not the case. They have extensive instrumentation of data servers and monitor power loss in their servers and optimize servers, not with desktops and laptops.

2. Are you aware of the 80 PLUS performance specification for power supplies in desktop PCs? What about servers?

	#
No	3
Total	3

2a. If yes, how did you become aware of this performance specification?

	#
Not applicable	3
Total	3

3. Are you aware of the ENERGY STAR qualification for desktop PCs? What about servers?

	#
Yes	3
Total	3

Verbatim Responses:

- Yes - that it is there, not aware of details, none for servers.

3a. If yes, how did you become aware of this performance specification?

Verbatim Responses:

- Can't recall - has been there so long I forget.
- HP and Lenovo are our vendors and meet with us several times a year and they told us about ENERGY STAR
- That's an interesting story - advising a bunch of folks putting together programs for seniors, energy costs also going up, heating oil is due to go way up average home square footage going way up so keeping house hot or cold is going to get really expensive - as part of this I researched ENERGY STAR programs. Talk to aarp - about cutting energy use.

4. Does your company request or require 80 PLUS qualified desktop PCs from its vendors in the normal course of computer purchases? What about servers?

	#
No – not aware of 80 PLUS	3
Total	3

4a. What about ENERGY STAR qualified desktop PCs? What about servers?

Desktop PCs	#
Yes	2
No	1
Total	3

Servers	#
Yes	1
No	1
Don't know	1
Total	3

Verbatim Responses:

- I think we say it is a preferred option - if looking at two vendors, ENERGY STAR is a good thing. But apps drive final purchase. Same for servers.
- Yes we do - I am sure they do for servers as well.

5. What has been the sales trend over the last 2 to 3 years for your company's purchase of desktop PCs? What about the trend for laptop purchases? What about the trend for servers your company purchases?

Desktop PCs	#
Decreased	3
Total	3

Laptops	#
Increased	3
Total	3

Servers	#
Decreased	2
Don't know	1
Total	3

Verbatim Responses:

- In the sense that going away from paper it is the same or increased now going mobile recently like laptops and tablets and finally Androids and iPods. Look at person and spec solution for individual person - looking for wearable pc. Constantly in the mode of smart technology in healthcare. Looking to wireless. Looking at new tablets for mobility, a couple of physicians are using iPod technology, constantly looking at new ways. Virtualization in servers looking at power usage, lots of servers and lots of heat. Cooler datacenter = less money on AC. Have a mandate to run leaner every year without decrease in performance
- The number is going down. In 2000 we were 60% desktop and now 70% notebooks, more "on the move types" of people in the company.
- Trending down, moving towards laptops, can't give numbers. Laptops up 10%, went through a virtualization so servers are larger but fewer, don't know number off top of head for server reduction.

5a. By what percentage would you say that the purchase of desktop PCs has changed (decreased/increased) over the last 2 to 3 years? What about laptops? What about servers?

Desktop PCs	#
Don't know	3
Total	3

Laptops	#
+10%	1
Don't know	2
Total	3

Servers	#
Don't know	3
Total	3

5b. What are the main causes of the changes (decrease/increase) in the purchase of desktop PCs? What about laptops? What about servers?

Verbatim Responses:

- Mobility, virtualization of servers, driver is cost in datacenters easier to maintain and operate 100 servers vs. 600. Space, financial for servers.
- Mobility, laptops now run more and more apps.
- With a mobile workforce it is expected that you are "on" more often - global company.

5c. Does your company expect these trends to continue for the next 1 to 2 years?

	#
Yes	3
Total	3

Verbatim Responses:

- Yes definitely - probably more mobile and on all the time - looking at iPad and iPhones always connected.

5d. Does your company foresee any erosion of its desktop PC purchases by laptops or vice-versa, or will there be no erosion of one over the other?

	#
Yes – fewer desktops	3
Total	3

Verbatim Responses:

- Yes - end computing, thin client use for warehouses, temp offices, training, dummy terminals going back to a server somewhere else.
- Yes - going to laptops and tablets
- Yes desktops going down

6. Has the recent US economic downturn influenced your company's purchase of desktop PCs over the last 1 to 2 years? If so, how? How about the purchase of laptops? How about servers?

Desktops	#
Yes	1
No	2
Total	3

Laptops	#
Yes	2
No	1
Total	3

Servers	#
No	1
Don't know	2
Total	3

Verbatim Responses:

- Huge, everybody looking at hospitals as a major source of power usage. Users request more stuff on same environment. Feds come in and tell hospitals to be paperless, online. Laptops in the sense it focuses the interest on laptops, sharper pencil in process of specing hardware - must operate more efficiently in the future.
- Not a bit - Tight to begin with. Might have kept more folks from going to laptops. No effect on servers.

7. Does your company have locations outside of the Pacific Northwest region of the United States?

	#
Yes	3
Total	3

7a. Can you describe any difference in your company's national desktop PC buying trends versus in the Northwest region specifically?

Verbatim Responses:

- Actually no - we buy global consumption models only. Have different models of tablets and CAD stations.
- Can't speak for them, reflective of other sites - all comes back to heat.
- Not aware of any differences.

8. Approximately what share of the desktop PCs your company buys are 80 PLUS qualified?

80 PLUS	#
Don't Know	3
Total	3

8a. What about ENERGY STAR?

ENERGY STAR	#
100%	2
Don't Know	1
Total	3

Verbatim Responses:

- Called two weeks too soon, doing an inventory now.
- 100% as far as I am aware

8b. Does your company anticipate any changes to this share in the next 1 to 2 years?

	#
Yes	1
No	2
Total	3

Verbatim Responses:

- Trying to do changes reasonably, not dictatorily, moving toward ENERGY STAR but budget driven process. would like to swap out everything but can't.
- No - we plan to stay with ENERGY STAR as long as we can.

9. Are you aware of any incremental costs associated with the purchase of 80 PLUS qualified desktop computers?

	#
Not applicable – not aware of 80 PLUS	3
Total	3

9a. What about servers?

	#
Not applicable – not aware of 80 PLUS	3
Total	3

10. Are you aware of any incremental costs associated with the purchase of ENERGY STAR certified desktop computers?

	#
Yes	1
Don't know	2
Total	3

Verbatim Responses:

- Goes thru to total cost of ownership, upfront cost is offset by energy savings, yes there are costs but we look at ROI, not 1st cost. ROI is 6 mo right now.
- I'm not aware of anything directly attributable.
- No, not aware but have never looked.

10a. What about servers?

	#
Yes	1
Don't know	2
Total	3

11. Is your company willing to pay more for an 80 PLULS qualified desktop computer?

	#
Not applicable – not aware of 80 PLUS	3
Total	3

11a. Roughly how much more in $US per unit is your company willing to pay?

	#
Not applicable – not aware of 80 PLUS	3
Total	3

12. Is your company willing to pay more for an ENERGY STAR qualified desktop computer?

	#
Yes	3
Total	3

Verbatim Responses:

- I would say yes, but how much is more is always a question.
- Obviously yes - we do it. Still has to be a fit for the application.
- Probably some - no sense of $.

12a. Roughly how much more in $US per unit is your company willing to pay?

	#
Don't know	3
Total	3

Verbatim Responses:

- 5% is no problem, above 15% requires lots of justifying.

13. What do you think would encourage your company to increase the use of energy-efficient power supplies?

Verbatim Responses:

- Already at 100%.
- Cost and knowledge - vendor could sell us on it. Choose models globally, would have a hard time if it did not work globally.
- Something to offset costs. What? Meaningful use program from feds gets us a rebate.

14. What do you think energy efficiency advocates, regulators, or others can do to increase the use of energy-efficient power supplies?

Verbatim Responses:

- Don't think so - knowledge is best, price next and then globally.
- Move rebates downstream.
- Work with vendors and manufacturers to only offer those guidelines - let consumers know what is good and what is not, marketing and education.

15. Do you have any other comments on the market for energy-efficient power supplies that you would like to share?

Verbatim Responses:

- The one thing I am finding interesting is lack of water in western US. Climate change is making this worse - is someone looking at water propagation more energy efficient?

Appendix D: Secondary Research Memo

To: Rita Siong (NEEA)
From: Greg Ekrem and Stuart Schare
Date: August 19, 2010 (revised September 02, 2010)
Re: Task 2 Key Findings and Recommendations of Secondary Research

This memorandum describes key findings and recommendations resulting from Navigant Consulting's secondary research into NEEA's 80 PLUS initiative.

Navigant Consulting reviewed the following documents in the course of its secondary research:

- The 2006 Market Progress Evaluation Report (MPER) prepared by Quantec;
- The 2008 Market Progress Evaluation Report (MPER) prepared by Quantec;
- The program's logic model included in both MPERs;[27]
- NEEA's Alliance Cost Effectiveness (ACE) model;[28]
- The interview completed in the Spring of 2010 with NEEA's 80 PLUS program manager Andy Ekman;
- The interview completed in the Spring of 2010 with the 80 PLUS program administrator Ryan Rasmussen of Ecos Consulting; and
- The Southern California Edison 2004-2005 80 PLUS program evaluation.[29]

Overview

Navigant's secondary research into the commercial PC market concluded the following:

- The PC market is rebounding off of historically low shipments in 2008; however, the growth trend through 2014 is primarily in the portable PC market. IDC Worldwide Quarterly PC Tracker forecasts that shipments of desktop PCs will decline from 27.1 million units in 2010 to 25.5 million units in 2014. During the same time period, IDC Worldwide Quarterly forecasts that portable PC sales will increase from 52.8 million units in 2010 to 95.8 million units in 2014.[30]
- The domestic PC market is still dominated by HP, Dell, Acer, Apple, and Toshiba, which make up roughly 80 percent of the market share.[31]
- Secondary research suggests that the adoption of the 80 PLUS power supply has been slower than anticipated, but has gained acceptance rapidly recently.
- The program has seen the number of unique certified power supply units in production swell in numbers from just 403 in December 2007 to 2,567 today. This growth is aided by the inclusion of 80 PLUS in the ENERGY STAR 4.0 requirements and the

[27] Review of the logic model will be documented in a separate memo to NEEA.

[28] Review of NEEA's ACE model will be documented in a separate memo to NEEA.

[29] The 80 Plus evaluation was part of the IDEEA Constituent Program Evaluations, led by Quantec, LLC and completed in 2008.

[30] IDC Worldwide Quarterly PC Tracker, June 2010.

[31] IDC Worldwide Quarterly PC Tracker, July 14, 2010.

differentiation of Bronze, Silver, Gold, and Platinum 80 PLUS standards to distinguish higher levels of efficiency.[32]

MPER review

The remaining barriers and challenges identified in the second MPER relate to five key concerns:

- The incremental cost of 80 PLUS power supplies continues to be higher than anticipated despite more power supply models available to the market.
- The rebate amounts are relatively small as compared with the actual incremental cost of an 80 PLUS power supply.
- Demand from end users still needs to be more pronounced.
- Disclosure of proprietary sales information may still pose a barrier to entry to new program participants.
- The market for desktops is decreasing while the market for laptops is increasing. This threatens to undermine the potential market for 80 PLUS power supplies.

80 PLUS project manager and program administrator interviews

In addition to the mechanics and background of the 80 PLUS program, interviews with both the 80 PLUS project manager and program administrator highlighted several interesting facets of the program.

- Although the 80 PLUS program is defined as a commercial program, there is a high likelihood that 80 PLUS power supplies have entered the residential market as well.
- NEEA believes that at least 90 percent of participating vendors are reporting sales to Ecos.
- Regional tracking of 80 PLUS units can be difficult, however. Ecos believes that it tracks nearly 100 percent of units shipped, but unknowns include institutional buyers who buy into one zip code but distribute their PCs across multiple zip codes, non-participating System Integrators, and nonparticipating computer original equipment manufacturers (OEMs) such as Apple.
- The 80 PLUS program saw a boost as a result of 80 PLUS certified power supplies being a requirement for ENERGY STAR 4.0 certification in 2007.
- The 80 PLUS certification further expanded with the partnership with Climate Smart. Current certified power supplies include Bronze, Silver, Gold, and Platinum, each with higher efficiencies.
- NEEA is viewed as a critical sponsor and is generally credited with creating the stability required to recruit partners into the program.

[32] 80 PLUS website (www.80plus.org).

Review of Southern California Edison's 80 PLUS program

Navigant's review of the Southern California Edison 2004-2005 Innovative Designs for

Energy Efficiency Activities (IDEEA) Constituent Program Evaluations document prepared in 2008 concluded that while adoption of 80 PLUS power supplies has been slower than projected, efforts to increase power supply manufacturer and computer OEM participation in the program have been successful. Continued impediments to market transformation include:

- The incremental cost of 80 PLUS power supplies;
- Limited efforts to educate and increase product demand by average commercial consumers; and
- Inconsistent promotion of the 80 PLUS program.

Recommendations

Navigant's next step in the market research plan is to complete the review of the logic and ACE model, draft survey instruments and conduct interviews with market actors. Based on the secondary research outlined above, Navigant will focus questioning on four main areas (in addition to addressing specific items contained in the Statement of Work):

- Sales and market trends, specifically sales in the Northwest when possible, including questioning on the current incentive structure as well as purchases by the business sector;
- Incremental costs of the 80 PLUS power supply;
- End-user performance and demand, including product awareness; and
- The process of specifying and buying PCs from both a manufacturing and consumer point of view.

Appendix E: ACE and Logic Models Review Memo

To: **Rita Siong (NEEA)**
From: **Jane Hummer, Greg Ekrem, and Stuart Schare**
Date: **September 29, 2010 (revised October 4, 2010)**
Re: **Task 3 Key Findings and Recommendations of ACE and Logic Models Review**

This memorandum describes key findings and recommendations resulting from Navigant's review of the ACE and logic models for NEEA's 80 PLUS initiative. Navigant reviewed the 80 PLUS initiative's ACE and logic models with the specific objectives of:

- Identifying any discrepancies between the logic model and current program implementation (as understood by Navigant based on the results of the secondary research and program staff interviews conducted in Task 2).
- Assessing the validity of the program logic, i.e., the logical linkages between program inputs, outputs, and short- and long-term outcomes.
- Understanding the energy savings and cost-effectiveness calculations used in the ACE model.
- Identifying program performance indicators and ACE model inputs that may need updating through primary or secondary research.

1. Program Logic Model

Navigant's review of the program logic model included in MPERs #2 concluded the following:

- The program inputs include Ecos Consulting staff time and budget for marketing, incentives, incentive administration, and evaluation.
- The program activities/outputs include developing and implementing a marketing plan, recruitment of power supply and computer manufacturers, developing a test protocol, testing and certifying power supplies, paying invoices from participating manufacturers, recruiting additional sponsors, maintaining the website, and sharing data with EPA.
- The expected short term outcomes (1-3 years) are: inquiries from power supply manufacturers, OEMs and SIs, electric utilities, and large consumers; increasing website traffic; accessible and up-to-date testing protocols available on website; $5 incentives for qualifying PCs and $10 incentives for servers, payable to the OEMs or SIs; sales of at least 70,000 qualifying units before end of 2005; participation from at least one major desktop PC OEM; buy-down spurs OEM and SI sales of qualifying PCs; recruitment of at least one other major utility or energy efficiency organization to sponsor the program; EPA includes power supply specifications in its revised ENERGY STAR standard for computers.
    - The program has clearly achieved the targeted short-term outcomes in terms of developing testing protocols, recruiting major OEMs, PSMs, and additional

sponsors for the program, and the goal of including power supply specifications in the ENERGY STAR designation.

- Expected longer-term outcomes include: 75% or higher market share of 80 PLUS-equipped PCs by 2010; industry continuing to embrace ENERGY STAR as a competitive marketing advantage.
    - It does not appear that the program is on track to achieve a 75% market share by the end of 2010; based on the latest ACE model, the market share in 2007 and 2008 appears to be roughly 7-8%.

- Navigant suggests that the program staff move incentives from outcomes to outputs within the logic model, as they are something that the program has direct control over.

- Navigant notes that the program logic model does not offer many specifics in terms of marketing activities or other methods to drive consumer demand for 80 PLUS. Providing more specific descriptions of program marketing activities and outputs would provide more clarity to the program logic and help identify program performance metrics to be tracked.

- The logic model does not clearly identify the target market as larger commercial customers.

- Given that some programs milestones or targets have been exceeded or passed without being met, the program staff should update the logic model to reflect new program goals.

2. ACE Model

Navigant's review of the Alliance Cost Effectiveness (ACE) model (last updated in November 2009) concluded the following:

Energy Savings

- The ACE model currently divides all 80 PLUS units into two tiers: Tier 1 is "80 PLUS units" (82.1 kWh/unit annual savings) and Tier 2 is "ENERGY STAR 5.0" (117.9 kWh/unit). However, the 80 PLUS program now includes five levels of efficiency under the 80 PLUS umbrella (base, bronze, silver, gold, and platinum). If Navigant's primary research indicates that many of the non-ENERGY STAR 5.0 (but still 80 PLUS) units being sold are higher than the base 80 PLUS level, it may be useful to update the ACE model's energy savings assumptions or add in additional tiers to reflect the different levels of energy savings.

- The ACE model's energy savings assumptions appear to blend the energy savings expected from residential and commercial PCs; however, Navigant's discussions with NEEA staff indicated that the primary target market for 80 PLUS is business customers. Given the variations in computer operating parameters between business users and residential users (e.g., annual hours of usage), perhaps using the energy savings estimates

from commercial/business users only would be appropriate. However, if it appears that there is significant spillover of 80 PLUS technology into the residential/consumer market, then the blended savings estimate is likely appropriate.

Market Share

- The forecasted 80 PLUS market share for 2010 is 10.4% (Tier 1) and 5.4% (Tier 2 – ENERGY STAR 5.0).

- The ACE model assumes that the Northwest share of total U.S. computer sales is proportional to the Northwest's share of the total U.S. population; based on 2009 U.S. Census data, that share is now 4.24% as opposed to the 4.1% used in the ACE model (based on 2006 estimates).[33] While it is a minor change, it does impact the estimate of the target market size and thus the market share.

- The forecasts for total U.S. computer sales from 2009-2013 are based on an IDC report dated March 5, 2009; newer data sources are available to update those assumptions. The ACE model currently forecasts 61.5M computers sold in the U.S. in 2010; the latest IDC reports estimate 78.4M computers will sell in the U.S. this year[34], a significant difference from the ACE model assumptions.

- The ACE model assumes that the share of computers that go to the business market remains steady at 62% through 2025; this is an assumption that warrants further review, as recent news reports indicate that the consumer PC market is struggling while the business PC market is expected to make up a larger share of total sales in 2010 than initially forecasted.

- Program staff should update the share of total computer sales that are laptops; the ACE model assumes 58% for 2010, but recent IDC reports forecast that the laptop share will be 63% in 2010 and 74% by 2014. [35] The ACE model also assumes that the share of business PCs that are laptops is equivalent to the share of total computer sales in the U.S. that are laptops; however, it may be that laptops are favored by the consumer market while the business market favors desktop PCs.

Incremental Costs

- The ACE model estimates the incremental cost of 80 PLUS (to the consumer) to be $20 for Tier 2 and $4 for Tier 1 power supplies. Navigant will devote a significant portion of the OEM and SI interview efforts to better understanding the actual incremental costs of different levels of 80 PLUS and ENERGY STAR computers, given the significant impact that these costs have on the cost-effectiveness of the program as a whole.

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[33] http://factfinder.census.gov/.

[34] http://www.itnewsonline.com/news/IDC:-Business-PC-Buying-to-Ensure-Double-Digit-Growth-in-H2-2010/20784/3/3.

[35] http://www.itnewsonline.com/news/IDC:-Business-PC-Buying-to-Ensure-Double-Digit-Growth-in-H2-2010/20784/3/3.

3. Recommendations

Navigant noted several opportunities for improvement to the logic and ACE models in the bullets above; in particular, program staff should update the logic model to reflect current program implementation and to set new goals for the program going forward, as most of the milestones identified in the current logic model have been met. Specific recommendations for the **logic model** include:

- Move incentives from "outcomes" to "outputs".
- Identify the target market as commercial customers.
- Provide more specifics on marketing and how the program intends to drive demand for 80 PLUS within the target market.
- Define program milestones and goals for the program going forward.

The assumptions to be updated in the **ACE model** will be explored in Navigant's remaining primary and secondary research to be completed. At the completion of this evaluation, Navigant will recommend specific changes to the ACE model assumptions if warranted.

Navigant's next step in the market research plan is to conduct interviews with market actors, pending NEEA approval of the survey instruments submitted within the past two weeks. Navigant has developed the survey instruments with the findings of the ACE and logic models review in mind, along with the results of the secondary research and program staff interviews.