

# **Can an Efficiency Program Influence ENERGY STAR Specifications as a Route to Achieving Energy Savings?**

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## **Abstract**

80 PLUS certifies and promotes energy-efficient power supplies for use in desktop computers and servers. The program is supported by 12 utilities and energy efficiency organizations across North America, which have contributed more than \$5 million for incentives to computer manufacturers. The 80 PLUS specifications for power supplies were recently adopted as the standard for ENERGY STAR compliant computer power supplies by the EPA.

This paper shows how one organization was able to structure a program to transform an industry and influence the decision-making process of the national ENERGY STAR program. During the review period, industry representatives contested the proposed specifications, claiming that limited qualifying power supplies were available and that the incremental cost was prohibitive. The EPA was able to demonstrate, because of the 80 PLUS initiative, that qualifying power supplies were becoming increasingly available and decreasing in price. In reviewing the practices of the 80 PLUS program, this paper also highlights lessons learned that may benefit other public and private energy efficiency market transformation programs.

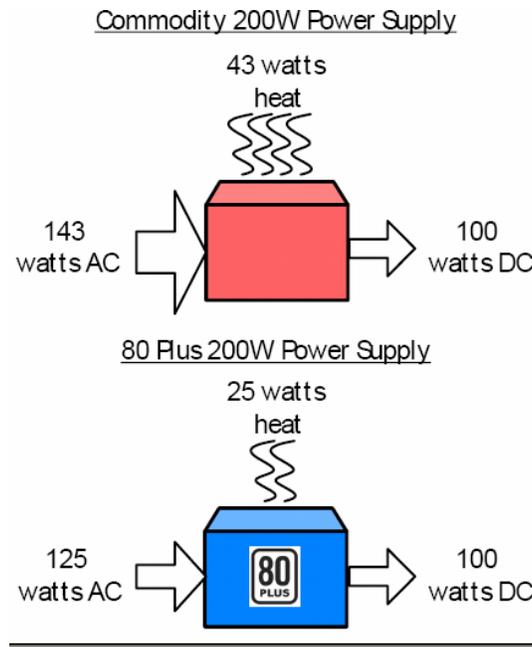
## **Introduction**

The 80 PLUS program was developed and is operated by Ecos Consulting, headquartered in Portland, Oregon. The 80 PLUS program promotes the use of energy efficient power supplies in desktop personal computers and desktop-derived servers. The 80 PLUS performance specification requires power supplies in computers and servers to operate at a minimum level of energy efficiency of 80% at 20%, 50% and 100% of rated load with a true power factor of 0.9 or greater. Power supply manufacturers may receive a rebate of \$5 per desktop and \$10 per server for 80 PLUS units sold within sponsor utility territories. Power supplies are submitted by manufacturers to the Electronic Power Research Institute (EPRI) where they are tested and certified as satisfying the 80 PLUS standard.

As shown in Figure 1, 80 PLUS power supplies use less electricity by converting AC power supply into DC power more efficiently. It is estimated that the use of more efficient power supplies could lead to energy savings of more than 100 kWh annually per personal computer

(400 kWh annually for desk-top derived servers).<sup>1</sup> 80 PLUS power supplies offer additional non-energy benefits, including reduced heat, power factor correction, lower maintenance costs, increased system longevity, and smaller design size.

**Figure 1. Example of Energy Savings from 80 PLUS Power Supplies**



### Program Theory and Logic

The 80 PLUS Program seeks to develop strategies and activities to mitigate key market barriers to the adoption of efficient computer power supplies. A summary of these barriers, strategies and activities, and short term and long term outcomes (progress indicators), by market actor, is presented in Figure 2. As demonstrated in the diagram, the program has adopted a multifaceted approach to promoting efficient power supplies by targeting all the primary market actor groups. Key strategies have included:

- Reducing the incremental cost and increasing supply of efficient power supplies by offering buy-downs to power supply manufacturers;
- Aggressively recruiting, through ongoing meetings and communications, SIs and OEMs to carry and promote 80 PLUS computers;

<sup>1</sup> Dunsky, Philippe, et al., “Transforming the Market for Efficient PC Power Supplies: Opportunities Assessment and Early Experience in Canada,” American Council for an Energy Efficient Economy (ACEEE) 2006 Summer Study.

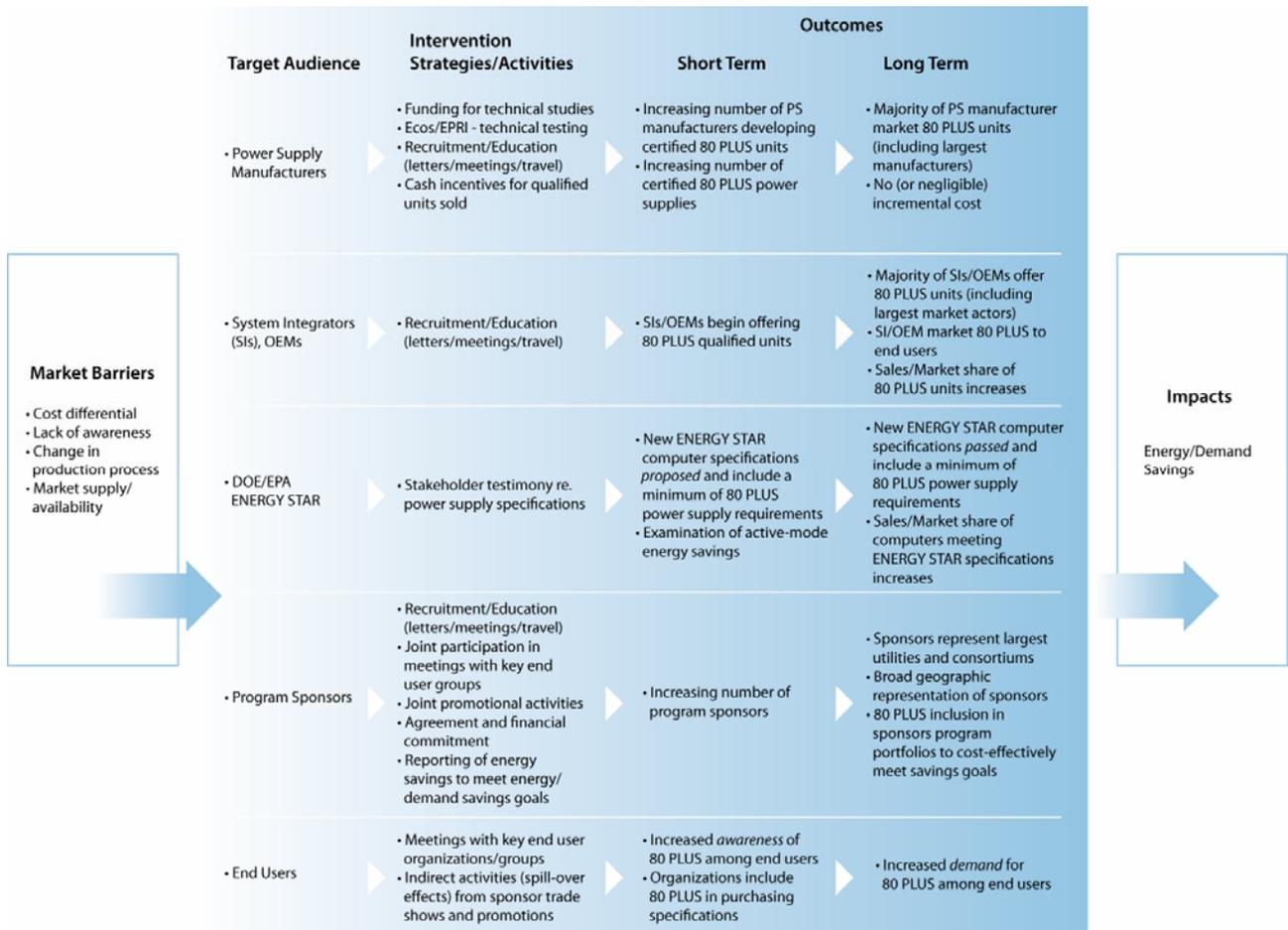
- Increasing the number of program sponsors to help promote 80 PLUS to customers within their service territories;
- Meeting with key commercial sector end user organizations to educate them about the energy and non-energy benefits of 80 PLUS;
- Providing supporting evidence and testimony so that the revised ENERGY STAR computer specifications included a minimum of 80 PLUS requirements.

A recent evaluation examined a number of market progress indicators to assess how well the program has met these objectives.<sup>2</sup> This paper focuses on the influence of the program in the revised ENERGY STAR computer specifications.

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<sup>2</sup> “Market Progress and Evaluation Report One: 80 PLUS Personal Computer Power Supplies,” Prepared for the Northwest Energy Efficiency Alliance by Quantec, LLC, October 15, 2006.

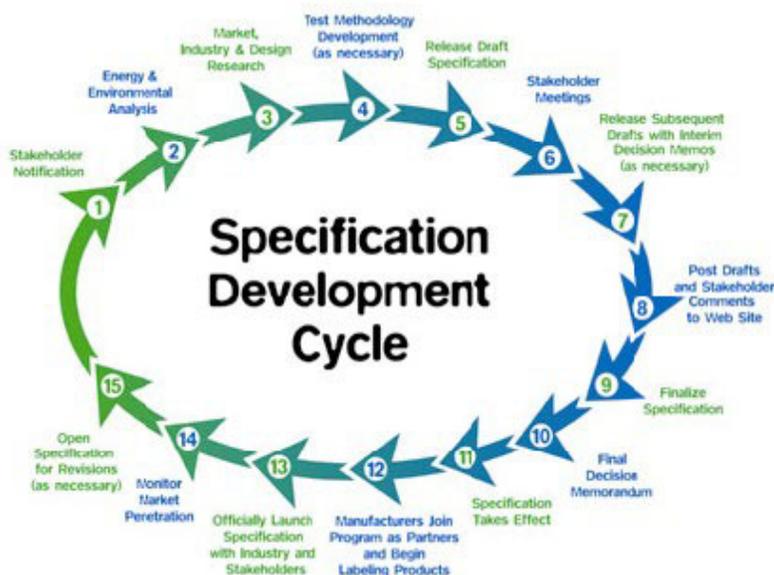
**Figure 2. Program Logic Model and Progress Indicators**



## ENERGY STAR Specification Process

The ENERGY STAR program currently has standards in place for more than 50 products, including home appliances, office equipment, and home heating and cooling equipment. The ENERGY STAR program was first introduced by the EPA in 1992. The product specifications process received an overhaul in 2002. Some of the changes included a more formal review and comment period and increased efforts to cultivate relationships with industry stakeholders, where standards are now ideally developed as the result of a 15-step iterative process (Figure 3). The EPA seeks industry feedback throughout the process of research, initial regulation development and public comment.

**Figure 3. Process for Development of ENERGY STAR Specifications**



Source: ENERGY STAR

In May 2003, the ENERGY STAR program released a document entitled “A Summary of Product Labeling Objectives and Guiding Principles.”<sup>3</sup> This report established guidelines for the development of new and revised ENERGY STAR standards, including:

- Significant energy savings can be realized on a national basis.
- Product performance can be maintained or enhanced with increased energy efficiency.
- Purchasers will recover their investment in increased energy efficiency within a reasonable time period.

<sup>3</sup> This document is available from the ENERGY STAR website ([www.energystar.gov](http://www.energystar.gov)).

- Energy efficiency can be achieved with several technology options, at least one of which is non-proprietary.
- Product energy consumption and performance can be measured and verified with testing.
- Labeling would effectively differentiate products and be visible for purchasers.

Based on these guidelines, the ENERGY STAR specifications for computer were in critical need of a revision. Previous to the October 23, 2006 release of the version 4.0 ENERGY STAR computer specifications (to take effect July 2007), the requirements for ENERGY STAR computers had not been changed since 2000, and, according to the EPA:

- (1) Approximately 98% of computers available in the marketplace carry the ENERGY STAR label, which is an indicator that the ENERGY STAR label is no longer differentiating between standard and high efficiency products;
- (2) Research showed the power management enabling function is not being used as frequently as EPA would like (enabling rate 5% in commercial setting); and
- (3) The July 2000 specification does not address “active” mode (the mode that consumes the majority of energy in computers), which offers significant additional savings to the consumer and the ENERGY STAR program.

### **Milestones for the ENERGY STAR Computer Specifications**

As shown in Table 1 the EPA announced in August 2004 that ENERGY STAR specifications for computers were going to be revised. Three stakeholder meetings were then held, with computer industry leaders such as Apple, Dell, Hewlett Packard, Intel, and Sun Microsystems, to solicit input on proposed changes before the first draft was released on January 25, 2006, 17 months after the initial announcement. There were then additional stakeholder meetings, stakeholder responses, and three revised draft specifications before the final specifications were released on October 23, 2006.

**Table 1. ENERGY STAR Computer Specification Milestones<sup>4</sup>**

<b>August 4, 2004</b>	EPA Announces Computer ES Specification revisions
<b>September 8, 2004</b>	Stakeholders discuss options for revisions at Intel Technology Symposium, San Francisco, CA
<b>March 15, 2005</b>	ES Computer Stakeholder Meeting, Washington, DC
<b>June 20-21, 2005</b>	ITI Computer Stakeholder Meeting, Austin, TX

<sup>4</sup> Further details about the milestones, including meeting announcements, meeting minutes, draft specifications, example datasets, and stakeholder feedback, may be found on the ENERGY STAR webpage. In November 2006 they could be downloaded at: [http://www.energystar.gov/index.cfm?c=revisions.computer\\_spec](http://www.energystar.gov/index.cfm?c=revisions.computer_spec).

<b>January 25, 2006</b>	Draft 1 v4.0 ENERGY STAR Specification for Computers
<b>February 15, 2006</b>	Computer Stakeholder Meeting, Washington, D.C.
<b>April 13, 2006</b>	Draft 2 v4.0 ENERGY STAR Specification for Computers Released
<b>May 18, 2006</b>	Computer Stakeholder Meeting, Washington, D.C.
<b>June 12, 2006</b>	Specification Update Document Released
<b>June 29, 2006</b>	Draft 3 v4.0 ENERGY STAR Specification for Computers Released
<b>September 22, 2006</b>	Draft final v4.0 ENERGY STAR Specification for Computers Released
<b>October 23, 2006</b>	Final v4.0 ENERGY STAR Specification for Computers Released
<b>July 20, 2007</b>	Final v4.0 ENERGY STAR Computer Specifications to take effect

### **Impact of the 80 PLUS Program on the ENERGY STAR Specifications**

The final specifications for ENERGY STAR computers include the full set of 80 PLUS standards for power supplies. The initial specifications, presented by the EPA at the during the 2004 Intel Technology Symposium, called for using Intel’s 2004 recommended efficiency levels for internal computer power supplies: 67% efficient at 20% loading, 80% at 50% loading, and 75% at 100% loading.”<sup>5</sup>

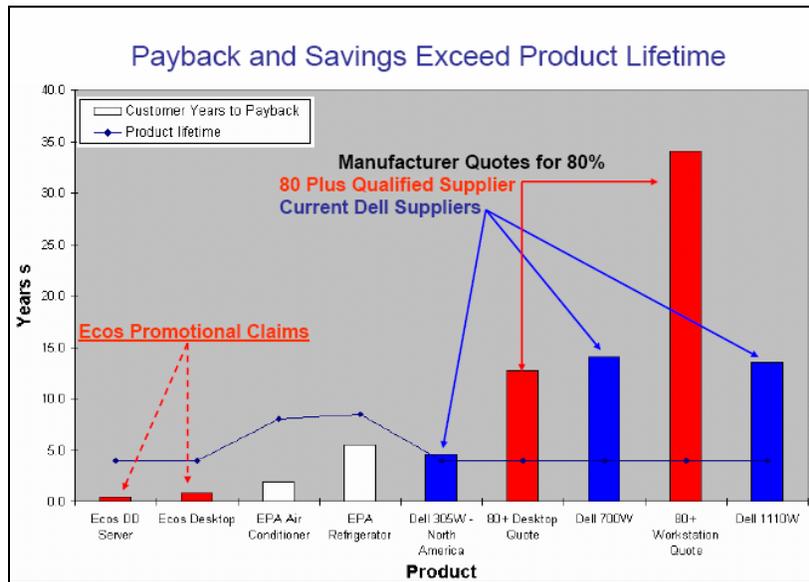
By the time of the computer industry meeting in March 2005, however, the EPA had revised the recommendation for 80% efficient at all levels. The presence of 80 PLUS, and the accompanying incentives and marketing efforts offered by the program, undoubtedly played an important role in this decision to increase the specification standards. As recorded in the minutes of the meeting:

“Jeff Harris from the Northwest Energy Efficiency Alliance (NEEA) spoke to the group...NEEA has put \$900,000 on the table this year geared toward addressing the first cost of using more efficient power supplies (80% +). NEEA is talking to other regions and states, including the Northeast and California (SDG&E, PG&E, SCE); currently a total of \$2 million has been committed from utilities in the west and the northeast for manufacturers... This initiative will be supported by marketing and outreach efforts to institutional purchasers. If EPA decides to require 80% efficiency at 25%, 50%, and 100% of load for computer power supplies in the specification, this utility initiative will help increase awareness and provide additional incentives.”

<sup>5</sup> “Forging Ahead with Desktop PC Power Supply Efficiency Improvements,” EPA Presentation at the Intel Technology Symposium, September 8, 2004, San Francisco, CA.

During the review period, however, industry representatives repeatedly contested the 80 PLUS specifications, claiming that limited qualifying power supplies were available and that the incremental cost was prohibitive. For example, in February 2005 members of the Information Technology Industry (ITI) council argued strongly that the 80% efficiency power supply requirement would face large initial costs that would lead to unreasonably long payback periods. In fact, they conducted initial cost estimates from Dell power suppliers that far greater than the incremental cost estimates from Ecos, leading to payback periods exceeding product lifetimes (Figure 4).<sup>6</sup> They claimed that this violated the third tenant of the EPA guiding principles, where “purchasers will recover their investment in increased energy efficiency in within a *reasonable* period of time.” As a compromise, ITI requested that the efficient power supply not take full effect until 2008.

**Figure 4. Industry Estimates of Payback**



ITI continued to criticize the 80% efficient power supply proposed by the EPA. Comments from the ITI Council, in a May 20, 2005 letter to ICF Consulting, claimed:

“On principle, we continue to oppose EPA establishing separate consumption specifications for internal components. Moreover, early research indicates that the proposed changes to power supply efficiency would be very costly, and would require at least 18 months in re-design lead time. Even then, there is no guaranty that there will be sufficient sources of supply to ensure manufacturers can meet production schedules, etc.”<sup>7</sup>

<sup>6</sup> “Power Supplies,” ITI Presentation at the Computer Stakeholder Meeting, February 15, 2006, Washington, D.C.

<sup>7</sup> ITI Council, Letter to Rebecca M. Duff of ICF Consulting, May 20, 2005.

Even as late as July 2006, during the review of the third draft of the ENERGY STAR specifications, stakeholders were criticizing the power supply requirements. For example, the Japan Electronics and Information Technology Industries Association (JEITA) commented:

“Introducing efficiency requirements for internal power supplies in Tier 1 of the Eligibility Criteria will mean that, currently, there will be many internal power supplies that fail to meet the requirements. Addressing this issue is complicated by the following problem areas: (1) Costs will increase dramatically; (2) Developing internal power supplies that meet these criteria in just one year will require tremendous amounts of labor, requirement acquisition efforts, and development costs.”<sup>8</sup>

The EPA, together with other stakeholders, was able to counter these arguments, however, and demonstrate – through the 80 PLUS initiative – that qualifying power supplies were becoming increasingly available and decreasing in price. For example:

- At the March 2005 meeting a participant commented that, “Newly developed computer power supplies from manufacturers such as Seasonic and On-Semi are already meeting or exceeding the Preliminary Draft proposed internal power supply levels. These power supply designs will limit the use of fans, further decreasing energy consumption.”
- At the June 2005 ITI meeting in Austin, TX, the EPA specifically cited 80 PLUS power supplies as examples of those meeting the specifications, and actually gave a link during the presentation to the 80 PLUS Web site that presented participating power supply manufacturers.
- Snohomish PUD, in a letter to the EPA regarding the draft specifications, openly cited 80 PLUS as a reason the ENERGY STAR requirements should have a minimum of 80% efficiency, stating “It is vitally important to the electric utility industry and their customers that the desktop computer power supply ENERGY STAR specification include the requirement for 90% or better power factor. The 80 PLUS program which includes an 80% efficiency goal and a 90% or better power factor goal, has already begun the market transformation process. The technology has evolved to a point where all power supply manufacturers can build compliant power supplies.”
- One of EPA’s guiding principles in developing and revising product specifications is to set performance levels such that approximately the top 25% of performers in the marketplace can earn the ENERGY STAR; given the increasing availability of 80 PLUS power supplies it was apparent that the 25% goal was attainable.

Conversations with EPA staff responsible for developing the ENERGY STAR computer specifications confirmed that 80 PLUS was “highly influential” in the development of the new standards. According to a senior EPA staff member, “the 80 PLUS program was highly

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<sup>8</sup> “JEITA Comments on ENERGY STAR Program Requirements for Computers, Draft 3,” JEITA International ENERGY STAR Committee, July 21, 2006.

influential in setting the new specifications, offering a turnkey solution, a coherent message with the needed backup data.”

EPA staff noted that it is “almost unprecedented” for the ENERGY STAR program to rely upon a “third party reference design” in the development of any product specification. 80 PLUS presented a good opportunity for ENERGY STAR to undertake the development of a new product specification by providing a solid foundation upon which to begin the process of industry outreach and further product testing.

Senior staff at EPA likewise acknowledged the important role that 80 PLUS played, particularly with respect to the initial systems testing that was conducted in conjunction with EPRI. Without the establishment of third-party testing procedures (by 80 PLUS) and a demonstration that existing technologies were capable of the desired efficiency levels, discussions among industry members regarding efficient power supplies would not have even taken place.

### **Potential Impact of the ENERGY STAR Specification**

A recent evaluation of the 80 PLUS Program conducted interviews with power supply manufacturers, system integrators, Program sponsors, Program implementers, and EPA staff.<sup>9</sup> Respondents generally agreed that the new specifications will have a positive impact on power supply efficiencies. The changes may also “open the door” to future specifications related to operational mode in other consumer electronics.

The speed with which the future ENERGY STAR specifications will be adopted remains open to question. A small number of participants stated that the new ENERGY STAR specifications by themselves won’t change the availability of compliant power supplies. “There will still be plenty of power supplies out there that aren’t 80 PLUS compliant,” stated one non-participant. “The [ENERGY STAR] program makes it recommended, not mandatory.”

Other manufacturers, however, are moving fully towards efficient power supplies, seeing it as a way to differentiate their product from other competitor power supplies. An industry observer reported that the anticipation of the new ENERGY STAR specification alone is driving the market to more efficient power supplies, noting that “By the time the new spec becomes effective, >80% efficient Power Supply Unit (PSUs) should be much more common than they are now. With enough demand, high efficiency PSU components will also become less expensive as economies of scale slide up.”<sup>10</sup>

Ultimately, increased sales will come from amplified consumer demand: there are increasing numbers of private and public organizations with procurement guidelines that require ENERGY STAR purchases, which could lead to sharp increases in sales of ENERGY STAR qualifying computers.

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<sup>9</sup> “Market Progress and Evaluation Report One: 80 PLUS Personal Computer Power Supplies,” Prepared for the Northwest Energy Efficiency Alliance by Quantec, LLC, October 15, 2006.

<sup>10</sup> Mike Chin, The Silent Front. March 21, 2005. <http://www.silentpcreview.com/article227-page1.html>.

EPA staff also commented in interviews that the new ENERGY STAR computer specifications has the potential to lead the way to discussion of the energy efficiency levels of a variety of personal electronics. This could lead to improved efficiencies among power supplies for home entertainment, electronic gaming and related products. A senior manager at Ecos also underscored the important potential of the program – computer power supplies could serve as an entry way to a range of consumer electronics.

## **Conclusions**

***80 PLUS has had a clear influence on the ENERGY STAR specifications.*** The final specifications for ENERGY STAR computers include the full set of 80 PLUS standards for power supplies. During the review period, industry representatives contested the 80 PLUS specifications, claiming that limited qualifying power supplies were available and that the incremental cost was prohibitive. The EPA was able to demonstrate, because of the 80 PLUS initiative, that qualifying power supplies were becoming increasingly available and decreasing in price.

***The new ENERGY STAR specifications will lead to additional energy savings.*** Even during the proposal period power supply manufacturers were increasing their supply of 80% efficient units, particularly as a way to differentiate themselves from their competitors. Some were even indicating that 100% of their units would qualify. Increasing procurement specifications among private and public organizations for ENERGY STAR equipment will certainly drive sales.

***The example of 80 PLUS to attain energy savings through the influence of the ENERGY STAR specification can be replicated for other types of equipment.*** This is an insightful example of how market transformation strategies – including the use of manufacturer incentives, education, and marketing – can influence ENERGY STAR specification criteria. Once the specifications are finalized the market will shift even further, achieving additional savings in excess of what might have been achieved by the program alone. The locking in of ENERGY STAR specifications may also represent an eventual exit strategy for similar efforts. Other types of equipment up for ENERGY STAR revisions should be targeted for future market transformation initiatives, using similar strategies as that used by 80 PLUS.