CalMTA

CASE STUDY

80 PLUS computer power supply

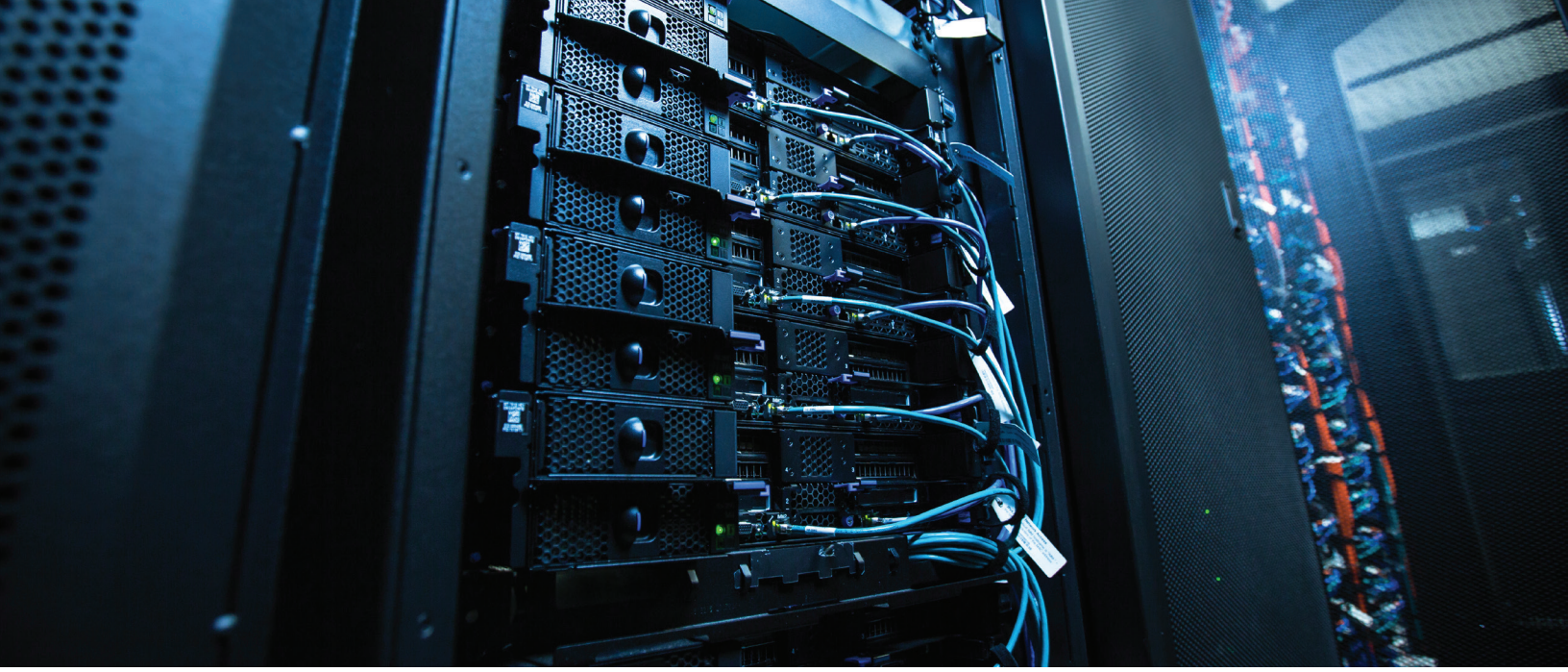
This case study will discuss a successful Market Transformation (MT) program , conducted by the Northwest Energy Efficiency Alliance (NEEA) and others, that has substantially improved energy efficiency in an area that few of us think much about. The 80 PLUS program, which started in 2004, created specifications for efficient computer power supply units (PSUs) that have expanded to become the industry standards still in force today and have contributed to big energy savings in the PC and server markets.

Background

The 80 PLUS program emerged during a period of huge growth in the computer industry. Alongside constant growth in personal computers, from 2000-2005, server shipments increased by 15% each year resulting in a near doubling of servers in U.S. data centers. From 2005 to 2010, the growth rate continued at a slower but still substantial rate of 5%. Taken as a whole, the effect on power demand was enormous.

A key component of a computer is its PSU. From the source of power in a building to where you plug in to the computer being operated, there is a surprisingly large loss of energy. This is the problem that 80 PLUS sought to solve.

Computer PSUs need to convert alternating current (AC) coming from external sources to direct current (DC), which the computer runs on. The "80" in 80 PLUS represents a performance target for the percentage of power yielded from an AC power source. 80 PLUS promoted the idea that PSUs ought to be "80 percent efficient" or better in this conversion. To understand this,



we can start with the power a computer requires to operate and then look at the amount of power it draws from its source. To measure efficiency of the PSU the calculation looks like this:

Power required by the computer = 500 watts

Power drawn from source = 833 watts

PSU efficiency = 500 watts / 833 watts = 60%

In this example, 40% of the power from the source was lost (in the form of heat). However, if the PSU was made to be 80% efficient rather than 60%, we would only draw 625 watts from our source, saving over 200 watts.

At scale, such improvements in PSU efficiency would lead to significant energy savings.

The market transformation strategy

Efforts to increase PSU efficiency began in 2002 when 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 (EPRI) to develop a methodology for testing PSU performance for PCs. As often is the case with market transformation, a rating, a practice or a rule paved the way for standard-setting that provided manufacturers both with a market opportunity and pressure to comply.

In 2004, an 80 PLUS market transformation idea was presented as an initiative at the ACEEE Market Transformation Symposium. In addition to the groups mentioned above, partners including Consortium for Energy Efficiency, NEEA, California's other investor-owned electric utilities, and the New York State Energy Research and Development Authority collaborated

on the project. The program's initial objective was for PSUs rated 80% more efficient or better to become the default product in desktop computers.

The program was launched in spring of 2004 to overcome initial market barriers including low awareness of 80 PLUS standards, a limited number of choices and low supply of products, and costs that were prohibitive for PSU manufacturers.

"The technology is there, everybody has the 'know-how,' but it is cost that is the barrier."

One example of the availability challenge was the experience of Dell Computers. In early 2005, Dell evaluated two 80 PLUS suppliers. One of the suppliers' units was in the prototype phase and was not yet ready for mass production. The other vendor did have a complete unit ready for mass production, but critical differences between the electrical specification and Dell's requirements made it a technically unviable option.

Another case was that of a system integrator (SI — a business that assembles computers from purchased components) who reported having to wait several months before they were able to obtain the 80 PLUS power supplies and build units.

The single most important market barrier was for manufacturers who faced a cost differential for 80 PLUS PSUs versus standard PSUs. "Cost is the big one," reported a participating PSU manufacturer. "The technology is there, everybody has the 'know-how,' but it is cost that is the barrier." Confirming this statement, the 80 PLUS program's survey team observed that all of the participating PSU manufacturers interviewed reported that there was a price difference estimated to be between $10 and $20.

To address these barriers the strategic interventions of the program included the following measures:

- Reducing the incremental cost and increasing the supply of efficient power supplies by offering buy-downs to power supply manufacturers
- Aggressively recruiting, through ongoing meetings and communications, SIs and original equipment manufacturers to carry and promote 80 PLUS computers
- Providing supporting evidence and testimony so that the revised ENERGY STAR computer specifications will include a minimum of 80 PLUS requirements
- Increasing the number of efficiency program administrators 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

As an example of the cost reduction measures, PSU manufacturers of certified units were eligible to receive a $5 buy-down for desktop units and a $10 buy-down for servers. The buy-down was processed through the 80 PLUS program and could be applied for once a unit's purchase was confirmed.

Also, certification of power supplies was conducted by the EPRI (later by CLEAResult). To have a PSU certified, manufacturers paid a $400 fee for each model that was tested and the cost was refunded upon certification. This painlessly facilitated certification, a key component of the model's marketability.

From the beginning of the program in 2004 to its final stage of funding in 2013, several key success indicators were met (listed below). Today, 80 PLUS certification still exists for multiple product applications and efficiency levels — in some cases — have increased up to 94% (see: 80 PLUS Program Details).

Market transformation success indicators

- **Market share:** With peak investment extending three out of eight years of the program, the focus area of the Northwest states saw the share of desktop computers with 80 PLUS PSUs increase from 0% in 2004 to approximately 70% in 2012.[1]
- **Certification:** In 2007, the EPA incorporated the 80 PLUS standard into its ENERGY STAR® 4.0 certification.[2] The 80 PLUS program's efficiency standards have continued to increase until as recently as 2018 and have been incorporated into newer ENERGY STAR certifications for both desktops (ENERGY STAR 8.0) and servers (ENERGY STAR 3.0).
- **Energy savings:** From 2005-2012, the Northwest region's utilities achieved 163 GWh in co-created savings from the 80 Plus investment, or enough to power more than 14,000 U.S. households each year.[3]

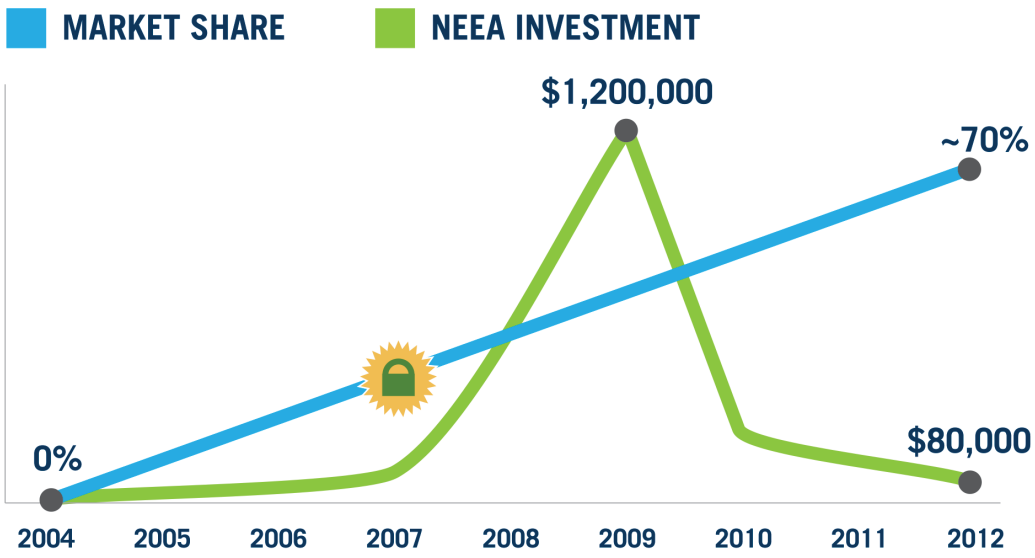


Figure 1: Source (NEEA Innovation to Action 80 Plus Power Supplies report)

Summary

The practice of Market Transformation aims to accelerate the growth of an energy efficient product or practice. In this case, the program saw success by influencing the EPA to integrate continually more ambitious ENERGY STAR standards over time, providing market incentives to get product growth off the ground, promoting efforts to improve awareness, and helping establish an ongoing 80 PLUS certification service.

[1]NEEA Innovation to Action 80 Plus Power Supplies https://neea.org/img/uploads/80-Plus-success-story.pdf

[2]NEEA 80 PLUS Power Supplies https://neea.org/success-stories/80-plus-power-supplies

[3] Ibid.

Sources

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About CalMTA

CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations. We work to deliver cost-effective energy efficiency and decarbonization benefits to Californians through a unique approach called market transformation. Market transformation is the strategic process of intervening in a market to create lasting change by removing market barriers or exploiting opportunities, accelerating the adoption of identified technologies or practices. CalMTA-developed market transformation initiatives also aim to advance state goals on demand flexibility, workforce development and equity. Learn more at calmta.org.

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