U.S. Department of Energy, National Renewable Energy Laboratory, Electronics Lifecycle Management Case Study

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SUMMARY

The U.S. Department of Energy's (DOE) National Renewable Energy Laboratory (NREL) is the nation's primary laboratory for renewable energy and energy efficiency research and development. NREL's vision is to contribute to DOE's goals of reducing U.S. oil usage to less than 15% of current levels and CO_2 emissions by more than 80% by the year 2050. Part of how NREL contributes to these goals is through its culture of energy sustainability on the laboratory campus—practicing energy stewardship through its full life cycle management of computing equipment and employee interaction with electronic devices. NREL is committed to walking the sustainability talk in its living laboratory.

A Federal Electronics Challenge (FEC) partner since 2007, NREL continues to improve and monitor its electronic stewardship practices throughout the entire life cycle of its information technology equipment and infrastructure—acquisition and procurement, operations and maintenance and end-of-life management. Because of this stewardship, NREL was the only Platinum FEC partner among the DOE laboratories in 2011. This case study presents NREL's FEC full life cycle management practices.

NREL'S STEWARDSHIP PRACTICES

NREL implemented several Basic Ordering Agreements (BOA) with vendors to help manage energy-efficient computing equipment requirements and costs. The lab's BOA team partners with these vendors and with staff requesting to buy or replace existing electronic equipment.

NREL adheres to FEC standards for the full life cycle of electronic equipment, including purchasing practices, use, and end-of-life management. The lab has also instituted power management policies and a robust waste prevention and recycling culture, both internal to the lab and to help staff with sustainable practices in the life cycle of their own electronics.

ACQUISITION AND PROCUREMENT

Executive Order (E.O.) 13514 calls for 95% of all new end user computing devices (computers, laptops, and monitors) purchased for and by federal government facilities to be:

- Electronic Procurement Environmental Assessment Tool (EPEAT®)-registered
- ENERGY STAR®-qualified
- Federal Energy Management Program (FEMP)-designated.

FEC further requires that partners proactively evaluate their vendors to ensure that they employ sustainable practices in the manufacturing and delivery of their goods and services.

NREL developed a database to track performance against all FEC requirements. The database includes a table of selected vendors, listing their positive sustainability attributes. The BOA team regularly reviews vendor environmental statements and practices on each of their websites and updates this data into the FEC-tracking database. Because of this practice, the lab ensures that 100% of its purchases not governed by EPEAT standards are environmentally sustainable.

NREL also reviewed its existing laboratory-wide policy on computing device standards and published information and recommended purchasing guidelines for staff specifically addressing this requirement. The BOA team regularly consults the EPEAT website to ensure that they are meeting this goal and adjusts its practices and standard equipment accordingly.

Desktop Computing Devices

NREL has replaced a number of older computing devices over the last two years for the following reasons:

- The lab's guideline is to purchase equipment with a useable life of at least four years.
- NREL's Research Support Facility (RSF) requires that staff use the most energy-efficient electronic equipment to support the building's energy goals.

Purchase of energy-efficient laptops over less efficient desktops grew 42% from 2009, decreasing the average watts per user for desktop equipment 47.5% per workstation. NREL currently purchases 99% of

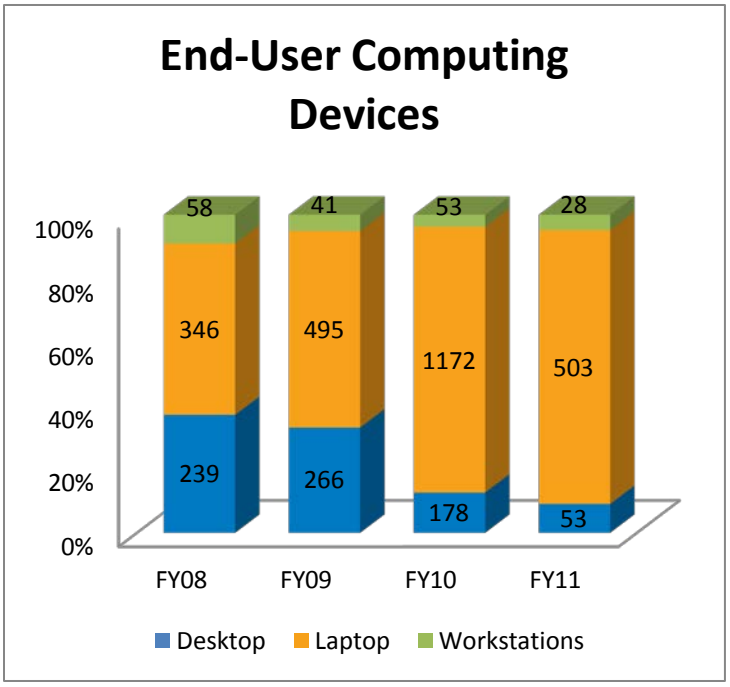
its desktop computing devices as EPEAT- and ENERGY STAR- compliant. Staff requesting non-compliant devices must submit a business case on a standardized form and are evaluated on a case-by-case basis. These devices are usually very high-end scientific workstations. Because of NREL's purchasing policy and staff participation in adhering to purchasing recommended equipment, 69.84% of the lab's computing equipment is EPEAT-gold certified, 26.83% is silver-certified, 0.08% is bronze-certified, and only 3.25% does not align with FEC standards.

Printers, Copiers, Faxes and Televisions

FEC requires that 75% of printers, faxes, copiers and televisions have positive environmental attributes. In preparation for the move into the RSF, NREL replaced all of the individual desktop printers, fax machines and standalone copiers with multifunction devices that default to duplex printing. NREL also purchased several ENERGY STAR wide-screen televisions as conference room displays. One hundred percent of the new equipment purchased across the laboratory in this category is ENERGY STAR-compliant.

COMPUTER USE

All eligible desktop and laptop computers are configured with power management settings before being deployed to the user. Devices are set to turn off the display after five minutes of inactivity and set the hard drive into standby mode after 10 minutes of inactivity. Additionally, all electronic devices in the RSF are plugged into a power-management surge protector that cuts off power to inactive devices when not in use. Exceptions to active power management settings are granted for mission critical systems that cannot experience any downtime for security or scientific purposes.



Power management policies require staff buy-in and interaction, so NREL has implemented staff education to help them understand how they contribute to the laboratory's energy goals through their computing habits. Education includes an instructional video on how the end-user can manually place a device to sleep prior to extended periods of inactivity, an informational aid on how to appropriately use the power-saving surge protector, and information guidelines on purchasing recommendations.

Assuming 2000 hours of computing device use per year and NREL's electricity rate of $0.57 kilowatts per hour (kWh), the following table shows the highest annual energy cost per work station based on plug-load metering data.

Equipment	Power Draw in Use	Power Draw in Standby or Off State	Annual Energy Use per Workstation	Annual Energy Cost per Workstation
Laptop + Monitor = Total Watts (W)	30 W + 20 W = 50 W	4 W + 0 W = 4 W	130 kWh	$ 7.41

Equipment	Power Draw in Use	Power Draw in Standby or Off State	Annual Energy Use per Workstation	Annual Energy Cost per Workstation
Desktop + Monitor = Total Watts (W)	200 W + 20 W = 220 W	5 W + 0 W = 5 W	474 kWh	$ 27.02

END-OF-LIFE MANAGEMENT

NREL has a lab-wide sustainability practice that extends to all aspects of life at the laboratory. The sustainability program addresses recycling, reuse, composting, transportation, plug loads, and staff behaviors, among other programs. End-user computing device end-of-life management is no exception.

Computer Reutilization Policy

NREL's has had a strong Computer Reutilization Policy in place since 2006, which is designed to extend the useful life of a piece of equipment. All computing hardware is evaluated after being replaced or retired to see if it can be reused. Most usable equipment is stored and reallocated for use in labs and by temporary employees and interns throughout the laboratory. Through this policy NREL was able to extend the usable life of the average computer to more than seven years in 2011!

Other computer equipment, both useful and not, is evaluated for one of several other avenues for disposition. Equipment may be:

- Donated to educational or non-profit organizations
- Transferred to a federal agency, state agency, or authorized non-federal recipient
- Sold in a public bid sale
- Recycled in a safe and appropriate manner

NREL has similar policies in place for computer software and toner cartridges.

Recycling Efforts

NREL's electronics recycler used to be located in Illinois, meaning that all recycled equipment had to be shipped 1,000 miles for recycling. During the lab's first year pursuing FEC partnership, electronics recycling was moved to a Denver facility. This facility performs all initial processing locally and then ships the components to its downstream processes.

When the decision is made to retire a computer, trained staff shred the hard drive in an industrial shredder and send the scrap metal to the recycler. This ensures both security of the data contained on the hard drive and that components that have exceeded their useful life are recycled. Since 2008, NREL has recycled over seven tons of scrap metal from shredded hard drives and media.

NREL implemented an electronics recycling program for non-federally owned equipment. At least twice per year, NREL's electronics recycler arrives onsite and takes possession of a diverse range of home electronics. These items are then processed and sent for reuse.

RESULTS AND CONCLUSION

Because of NREL's commitment to full life cycle management of its computing devices, the laboratory is an FEC Platinum award-winning partner. By committing to purchasing energy-efficient-rated desktops, laptops, monitors, multifunction devices, and televisions, NREL has significantly reduced the amount of energy used by electronics. Education programs, along with clearly written policies and guidance, help ensure that staff members are knowledgeable about their role in energy savings at the lab.

To minimize costs, NREL regularly monitors existing equipment and systems to improve and enhance processes and efficiencies. This includes policies and other guidance documentation, plug loads, electronic equipment efficiencies, and total cost of ownership. NREL is also continuously looking for ways to improve other sustainability programs at the laboratory, such as purchasing recycled printer paper and providing recycle bins at each employee's work station.

CONTACT INFORMATION

If you have questions related to this resource or need other assistance with the Federal Electronics Challenge, please contact your Regional Champion: http://www2.epa.gov/fec/technical-assistance.

Visit the FEC online: http://www2.epa.gov/fec/

E-mail the FEC: fec@epa.gov