



Energy performance solutions from NBI

Plug Load Best Practices Guide

Managing Your Office Equipment Plug Load

Guide to Energy Savings

Plug loads can be managed through low- and no-cost measures that are relatively straightforward to implement.

This Guide shows how simple changes can cut costs and save energy in offices.

How and Why to Use this Guide

This Guide shows how power management, inexpensive hardware, behavior changes and energy efficient equipment can save energy and cut costs.

- Learn how office equipment and other plug loads drive up energy use
- See simple strategies for reducing energy use in offices
- Find helpful resources, all available at advancedbuildings.net/plug-loads

Focus first on the office equipment that uses the most electricity:

- Computers
- Monitors
- Imaging equipment
- Computer peripherals
- Server rooms

Other plug loads are also drawing power:

- Task lights
- Space heaters and portable fans
- Projectors
- Televisions
- Vending machines
- Kitchen equipment
- Cell phone chargers

What is a plug load? It's simple. Plug loads are any devices that plug into a building's electrical system.

Why are plug loads important? Electricity use associated with plug loads is on the rise, and plug loads in commercial buildings are now one of the fastest growing end uses of energy.

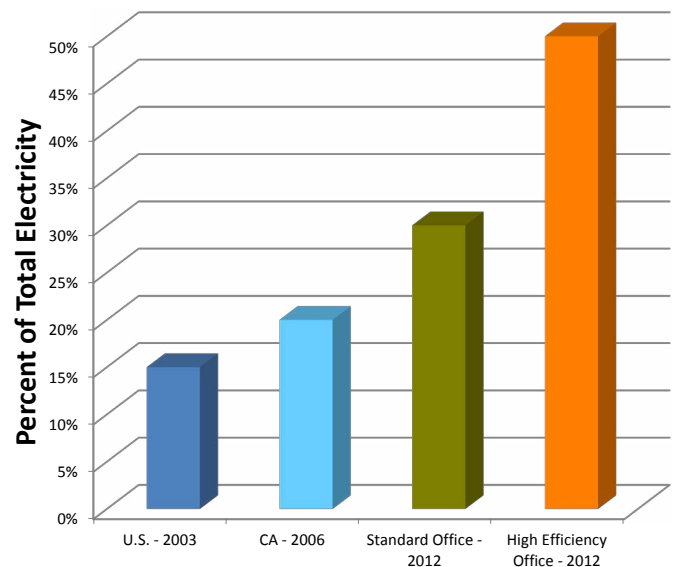
Energy efficiency efforts in commercial buildings historically have targeted lighting, heating and cooling systems, water heaters and major appliances. Today, the typical office worker also uses an ever-growing suite of electronic devices, all drawing from the power grid and running up the utility bill.

The good news is that plug loads can be managed through low- and no-cost measures that are relatively straightforward to implement. This Guide shows how simple changes can help offices save energy and cut costs.

Plug load energy use for computers and office equipment is increasing. In office buildings that have improved the efficiency of lights, heating and cooling it can represent as much as 50% of the total electricity use.

Sources:
US - Energy Information Agency
CA - CEUS
2012 offices - NBI Measured Data

Office Equipment Plug Loads as a Percent of Total Office Electricity



How and when do plug loads use energy? Electronic devices are evolving rapidly. Gone are the days when all equipment was simply turned 'on' or 'off'. Instead, today's electronic equipment operates in a variety of power levels, or modes.

Many newer devices have been engineered to allow reduced electricity use in lower power modes, so switching devices from higher power to lower power modes is an easy way to save energy. But the very best way to save energy is to make sure devices are turned off or unplugged when not in use for extended periods or at the end of the day.

Get to Know Your Power Modes

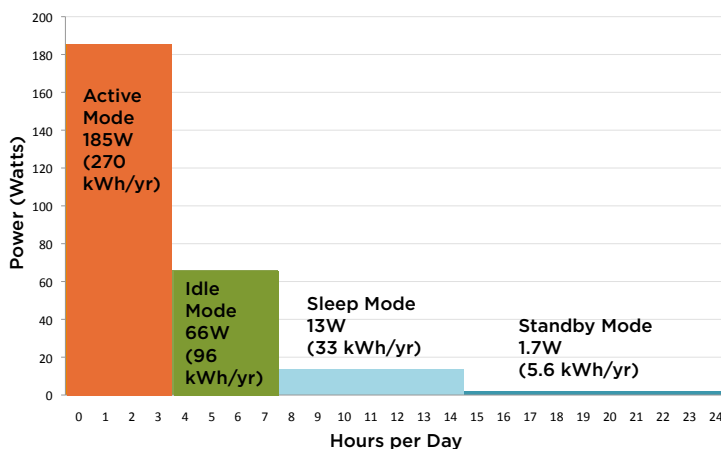
In 'Active' mode a device is on and performing its intended function.

In 'Idle' mode a device is on and ready to perform work, but it is not actively doing anything. Some devices consume unnecessarily large amounts of energy in idle mode.

In 'Sleep' or 'Standby' mode a device has been powered down either automatically with power management settings or manually by the user, and it draws a reduced amount of power. A sleeping device is ready to wake up and return to active mode, after a short delay, in response to a command from a user or the network connection.

In 'Off' mode a device does not draw any power because it is unplugged, or it is plugged into an advanced plug strip that has been turned off.

Power Use in a Typical Shared Printer/Fax/Scanner Device



A typical ENERGY STAR v4.0 qualifying printer/fax/scanner was used in Active mode less than 4 hours per day. The Idle setting allowed the device to be quick-started for imaging work but **reduced energy use by 64%** over Active mode. The Sleep and Standby modes were applied during long periods of inactivity and overnight, and this further **reduced energy use by 88-98%** compared to the Active mode. Ensure power modes are set and operating properly.

5 Simple Steps for Managing Your Plug Load

Step 1-Review

Start smart by gathering your data.

Who are your stakeholders?

Identify who in your office should be involved in decisions about plug-load devices. Stakeholder expertise is critical to achieving buy-in.

What is your budget, and what are your goals?

Your plan will depend on what it is you want to accomplish. Zero net energy? Cost reductions? Better public relations? Consider payback times—upfront costs may be offset by energy savings on your utility bills.

What types of plug loads do you use?

Make an informal inventory. Computers, monitors, server rooms and imaging equipment like printers usually use the most energy, but don't overlook other plugged-in devices. Space heaters, water coolers, task lights and fans can also use considerable amounts of electricity.

How and when does your office use plug loads?

During your inventory, note when plug loads are used. Look for seldom used individual printers or duplicate monitors. Are all your devices essential all day and every day? Are they left on when not in use or overnight?

Step 2-Remove

If you discover devices that are not being used, consult with your IT department. When appropriate, simply remove the unused devices or at least make sure they're turned off.

Step 3-Reduce

When it comes to energy reduction, the best rule of thumb is simply to turn off or unplug equipment when it's not in use. It's as easy as that. But because people are the energy-users, people also need to be the energy-savers. Send your staff a quick 'power down' email reminder toward the end of each workday—within a few weeks, more staff will be flipping the switch and becoming part of the solution.

One way to make it easier to power down is to use an advanced plug strip. Two types of strips are particularly helpful:

- **Load-sensing plug strips** use a master/slave approach. They can be set so that when you turn off your computer, everything else in the plug strip also turns off.
- **Occupancy-sensing plug strips** detect the presence or absence of a user and automatically turn equipment on and off in response.

Reduce Your Use by Applying These Best Practices

Desktop Computers and Laptops



Enable aggressive power management settings. You might assume that computers come with their power management features turned on, but these features must be set to operate efficiently. Educate staff on how to activate the lower power modes. If possible, work with IT managers to explore network power management software that can be configured to start up on login without disrupting system updates. Visit energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_users for information about activating power management on various computer operating systems.

Stay on top of your settings. For example, if settings have been adjusted to keep a computer from going to sleep during a webinar, remember to restore the settings afterward.

Activate sleep settings across networks of computers. Many public domain/operating system solutions and a number of commercial software packages are available to activate low-power settings across entire networks of computers. ENERGY STAR resources are available at energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_low_carbon_join.

ENERGY STAR recommends setting computers and laptops to sleep after 15–60 minutes of inactivity. The lower the setting, the more you save. For laptops, the settings must be enabled in 'plugged in' and 'running on batteries' modes. Savings up to \$50/computer are possible each year

Monitors



Enable aggressive power management settings. For example, screen savers can keep your monitor in active mode and stop your computer from entering an energy-saving mode. Set monitors to sleep instead.

Dim the brightness control. Brightness has the biggest impact on energy use, and it's often set too high. In one office, IT staff dimmed monitors a little each day—energy savings reached 17% before anyone noticed!

Orientation matters. Face screens away from sunlight and reflections to improve performance and reduce glare. The brighter the ambient room lighting, the brighter the screen needs to be.

ENERGY STAR recommends setting monitors to sleep after 5–20 minutes of inactivity.

Imaging Equipment



Enable aggressive power management settings. Like computers, imaging equipment doesn't always come pre-set, so be sure you activate your settings to conserve energy.

Install low-power, digital timers to turn off equipment during non-business hours.

Encourage staff to minimize printing. Less time in active mode means less energy used.

ENERGY STAR recommends setting imaging equipment to sleep after 30–60 minutes of inactivity.



To reduce your energy use, turn down your power management settings to lower power modes.






Step 4–Replace

When it's time to replace old equipment, buy the most energy-efficient and appropriately sized options that meet your needs. Establish energy performance purchasing requirements to

ensure that only the most efficient devices are considered. Keep these suggestions in mind when replacing old office electronics.

Replace Your Old Equipment with Efficient Equipment Appropriate for the Job

Computers 	<p>Consider laptops. A laptop typically uses less than a third of the energy used by a desktop computer and monitor.</p> <p>Consider 'mini' computers. If your performance needs are relatively basic (that is, email, word processing and web browsing), consider mini-computers that do not include built-in screens. Minis are functional, affordable and consume very little energy.</p> <p>Skip unnecessary bells and whistles. Typical computer add-ons like optical drives, huge hard drives or more powerful video cards are all energy drains. Unless you truly need them, skip add-ons. A power supply in the range of 200–300 watts should be sufficient. For even more efficiency, look for the 80 PLUS certified power supply label.</p>
Monitors 	<p>Replace CRT monitors (the ones that look like old televisions). The best new 19–21" LCD monitors draw only 10–15 watts—less than half the power used by old (pre-2004) LCD monitors. Tiptenusa.org and EPEAT.net are good resources for options.</p> <p>Determine the size appropriate for the job, and consider monitors with automatic brightness controls, an energy-savings technology that adjusts the brightness of the screen in response to changes in room lighting conditions.</p>
Imaging Equipment 	<p>Consider sharing printers, since printers use a lot of energy throughout the day, even when idle.</p> <p>Inkjet printers are clear winners when it comes to energy consumption. In general, inkjet printers use significantly less energy than laser and solid ink printers.</p> <p>Choose ENERGY STAR labeled products sufficient to meet your needs. But remember that even these devices can use a significant amount of energy when not configured properly.</p>
LED Task Lights	<p>LED task lights can use as little as 6–9 watts.</p>
Other Office Equipment	<p>Choose ENERGY STAR labeled products sufficient to meet your needs. Although they may not be very numerous, devices such as space heaters, vending machines, televisions and projectors can consume significant amounts of energy.</p> <p>And simplify. Manual staplers and solar calculators work fine and save energy.</p>

Step 5–Retrain

Remember that buildings don't use energy, people do.

Everyone has a role in managing plug loads. To get the best results from new energy-saving measures, keep office staff well-informed. Offer training on new devices such as timers, advanced plug strips and power management settings. And make sure your staff understands why these measures are so important: They save money, they reduce power plant emissions and they help keep our communities—and our planet—healthy and strong.

Send email reminders, especially when new energy-

saving devices or procedures are introduced. You might even consider friendly team-building or interoffice competitions that reward reductions in energy use.



And don't forget to check in with staff to find out if everything is working—if not, determine why not, and work to find a strategy that suits the needs of your staff and still saves energy.

Most importantly, encourage staff to get into the habit of thinking about energy.

Managing Your Server Plug Load to Save Even More Wasted Energy

The Energy Elephant in the Computer Server Room

One of the most significant steps you can take to reduce your office plug loads is to better manage your computer server rooms.

Computer servers and the facilities that house them are the hidden side of our digital life. A fast growing army of servers is powering the digital economy, enriching people's lives, creating jobs and supporting economic growth. It is also responsible for wasting massive amounts of energy.

Optimizing server electricity use is already the subject of intense focus by the IT industry and companies with large data centers. However, the opportunities for savings in smaller server rooms and closets are often overlooked.

According to the Environmental Protection Agency, typical servers in the U.S. use only 5–15% of their maximum capability on average, while consuming 60–90% of their peak power. Servers draw a lot of power simply by being on.

Offices could get the same amount of work done with far fewer servers just by increasing the load on each server, a technique known as virtualization, or by using cloud-based applications instead of in-house servers.

Frequently, businesses are unaware of how much of their electricity bill is attributable to their server rooms.



Small server rooms have big energy savings potential.

Research by the Natural Resources Defense Council (NRDC) indicates that for many office-based organizations, 30–70% of electricity use comes from powering and cooling servers running 24 hours a day.

Research conducted by New Buildings Institute and Ecos Consulting for the California Energy Commission's Public Interest Energy Research (PIER) Program found that **server rooms can consume more than two-thirds of the energy used by office equipment in small offices.** More than 10% of this energy is used to keep server rooms cool with air conditioning.

Businesses that implement virtualization today do it not just to save energy, but also to save money on electric bills and IT costs. Virtualization can even increase the reliability and performance of IT environments.

NRDC estimates that an organization with 10 underutilized servers can save more than \$100,000 over 5 years in energy, hardware, software and consulting costs by implementing a fully virtualized environment.

Fortunately there are many proven, cost-effective solutions to reduce the energy footprint of your servers. Here's how to get started:

- Measure or estimate the energy consumption of your server room
- Switch off unused servers
- Set servers to go into low power mode when inactive
- Optimize server use through consolidation and virtualization
- Consider facilities and hardware efficiency

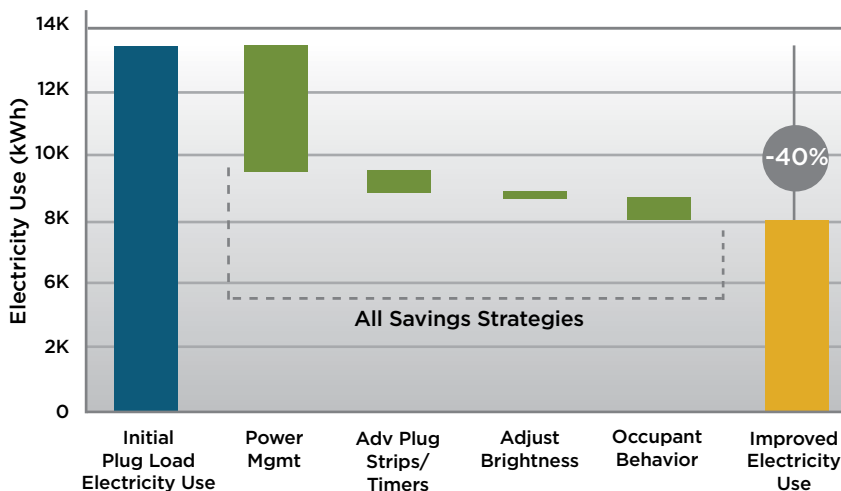
For more information about these strategies and savings opportunities in server rooms, see nrdc.org/energy/saving-energy-in-server-rooms.asp.



5 Steps for Managing Plug Load Energy Use in Offices:

1. **Review.** Identify your needs, inventory your equipment and focus on the devices that use the most energy—usually, that’s the equipment you use the most.
2. **Remove.** Eliminate or unplug unnecessary devices.
3. **Replace.** When it’s time to replace, purchase the most energy-efficient devices for the job.
4. **Reduce.** Turn it off or power it down when not in use.
5. **Retrain.** Engage staff. Make sure they understand why, when and how to power down.

Plug Load Energy Savings Opportunities



In a small office in California, low- and no-cost energy-saving measures reduced plug load energy use by 40%.

Resources

Please visit advancedbuildings.net/plug-loads to access websites, tips, technical resources and additional information about managing plug load energy use.

Helpful websites:

- **Top Ten USA:** toptenusa.org
- **ENERGY STAR:**
Power Management: energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_low_carbon
Purchasing and Procurement: energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing
- **EPEAT:** epeat.net
- **CNET:** cnet.com
- **California Plug Load Research Center (Cal Plug):** calplug.uci.edu

To audit your plug loads:

- nrel.gov/docs/fy11osti/51199.pdf

To replace old office electronics with more energy-efficient devices:

- epeat.net

To learn about the power-management features of your computer:

- climatesaverscomputing.org/act/saving-energy-at-home

For more information about advanced and load-sensing plug strips:

- efficientproducts.org/product.php?productID=24

For more information about locating a highly energy efficient, properly sized computer power supply:

- 80plus.org

For information about screen savers:

- reviews.cnet.com/green-tech/monitor-power-efficiency
- efficientproducts.org/product.php?productID=3



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New Buildings Institute (NBI) is a nonprofit organization working with commercial building professionals and the energy industry to improve the energy performance of commercial buildings. Visit newbuildings.org

Advanced Buildings is a set of tools and resources from NBI that helps commercial building professionals create and operate energy-efficient, high performance buildings. Visit advancedbuildings.net