

Hospitals Pulling the Plug on Energy-Wasting Electric Equipment and Procedures

Reducing plug loads to improve a building's energy efficiency is a frequently overlooked strategy. As this type of energy consumption continues to increase, however, many hospitals are taking a closer look at how to hold down consumption.

This fact sheet has been developed by the U.S. Department of Energy's Hospital Energy Alliance (HEA) to help building owners and operators use effective, energy-efficient technologies and practices to decrease energy consumption and its related costs.

Plug loads, or devices plugged into wall outlets, represent about 6 to 18 percent of total site energy consumed by a hospital.¹ Plug loads impact hospital design directly and indirectly:

- Electrical circuits must be sized to accommodate plug loads.
- HVAC sizing is partly dependent on heat produced by plug load equipment.

Generally, plug load device power consumption is assumed to equal the device's rated power (based on manufacturer data), but this sometimes results in the over-sizing of electrical circuits and suboptimal sizing and design of HVAC systems.

More accurate estimation of plug load power demand—as well as related cooling loads—can result in more optimally sized, more efficient electrical service



As the energy intensity of medical equipment increases, plug loads account for a larger share of hospital energy consumption. Decreasing consumption requires both technical and educational solutions. Limiting energy consumption on non-medical equipment also plays a major role in hospital energy efficiency. *Shutterstock 15802645*

distribution and HVAC systems. It also can provide useful feedback to manufacturers and hospital staff responsible for equipment purchase.

Overcoming Reduction Barriers

Many types of plug-in equipment consume energy even when turned off, accounting for “phantom” loads—also known as standby power or “leaking electricity.” Phantom loads can consume up to 5 percent of an electrical plug load.²

Some medical equipment is kept at full power 24 hours a day, 365 days a year to provide lifesaving services at a moment's notice. Communication is needed among users, researchers, and manufacturers to identify technological or behavioral solutions that can save energy while fully meeting medical needs. The nature of opportunities may vary for different kinds of devices.

Some plug load solutions function automatically when implemented, while others require education, awareness, and motivation. Currently, most available solutions address non-medical equipment.

Non-medical Equipment

Many hospitals are replacing older equipment with energy-efficient equipment and installing auxiliary tools that reduce or shut down power. The following information highlights ways to limit plug load consumption in a variety of hospital situations—often dramatically so.

Office—Managing office equipment energy provides a quick, low-cost starting point. The following are ways to do so:

- Use ENERGY STAR® equipment for computers, monitors, printers, scanners, external power adaptors, copiers, fax machines, digital duplicators, mailing machines, and water coolers. ENERGY STAR-qualified office and imaging products consume 30 to 75 percent less energy than standard equipment. For a complete list of ENERGY STAR-labeled equipment for use in offices, visit http://www.energystar.gov/index.cfm?c=products.pr_find_es_products.
- Work with staff to correct power management settings on ENERGY STAR-labeled equipment. The energy-savings features frequently are configured incorrectly.

1. Consortium for Energy Efficiency. “Commercial Building Performance: Healthcare Facilities.” 2005. Available at <http://www.cee1.org/com/bldgs/hc-fs.pdf>.
2. American Society of Heating, Refrigerating and Air-Conditioning Engineers. *Advanced Energy Design Guide for Small Hospitals and Healthcare Facilities*, p. 160. 2009. <http://www.ashrae.org/publications/page/1604>.

- Replace CRT monitors with LCD monitors. These flat-screen monitors use 50 to 75 percent less energy.³
- Replace desktop computers with laptops and docking stations. Laptops use much less energy than desktop computers. Some desktop computers and monitors can use between 80 and 200 watts—depending on the type of monitor—while laptops typically use approximately 50 watts.⁴
- Use networked power management systems. Centrally managing a network's computer energy settings can ensure each hospital computer has efficient energy-saving modes set correctly. Networked PC power management software is available to activate power management settings across an entire computer network. For more information about power management software, visit http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_low_carbon. Energy managers and the hospital IT department must coordinate closely with end-users to ensure power management (e.g., sleep mode or shut down) is not inadvertently activated on critical systems.
- Reduce phantom loads with energy-efficient power strips. Many



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Ancillary Services

If a hospital clinic or laboratory operates only during normal business hours, its equipment is idle for nearly 16 hours every day. Power strips can greatly help phantom load management by controlling monitors, computers, lights, and even some medical equipment, when the clinics and labs are closed.

Data Centers

Hospital data centers represent an area of major energy usage, often having their own power and cooling systems. Their growth has been stimulated by increasing demand for patient data processing and storage in electronic form.

In addition to a central data center, hospitals may have less centralized server closets in certain buildings, floors, or wings. These server closets may serve specific needs, such as medical telemetry. EPA determined that the following strategies may improve energy efficiency⁷:

- Consolidate servers and data storage.
- Eliminate unused equipment.
- Enable power management on servers, where possible.
- Upgrade to energy-efficient servers.

commercially available power strips have automatic shutoff functions that stop drawing energy when equipment is not in use. Some sense how much power peripherals use and automatically shut off peripherals when a device has been turned off. For example, when the computer is turned off, the smart strip will turn off power to the monitor, speakers, and other connected devices.

- Some power strips have combination outlets, with certain outlets having automatic shutoff functions while others continuously supply electricity. This enables equipment that needs to stay on even when idle (e.g., a fax machine) to be plugged into the same power strip as those that can be allowed to shut off (e.g., a copy machine).

Kitchens—Plug load densities are the highest in kitchen areas.

- Install ENERGY STAR-labeled equipment, including commercial dishwashers, solid-door refrigerators and freezers, fryers and steam cookers, ice machines, and hot-food-holding cabinets. Such equipment can use 10

When designing and/or retrofitting data centers, it is important to consider a host of factors, including mechanical airflow management, air handler systems, humidification, plant optimization, equipment selection, electrical infrastructure, and lighting of the space. For detailed recommendations, visit <http://hightech.lbl.gov/DCTraining/best-practices-technical.html>.

EPA has developed an energy performance rating for data centers as part of its ENERGY STAR Portfolio Manager, its interactive energy management tool. For specifics on the rating, as well as helpful information on data center energy efficiency initiatives, visit http://www.energystar.gov/index.cfm?c=prod_development.server_efficiency#epa.

to 65 percent less energy than standard appliances depending on equipment type.⁵

- Minimize exhaust requirements with VAV (variable air volume) kitchen hoods.

Laundry—Though some hospitals contract out laundry services, others have active, continuous laundries.

- **Washers**—Choose ENERGY STAR-labeled washers, which use about 63 percent of the energy and less than half the water⁶ of conventional washers. Many have a greater capacity, allowing more laundry to be washed in fewer loads.
 - Use front-load washers rather than top-load washers, when possible. Front-load washers automatically adjust the amount of water required for the size of the load of laundry.
 - Consider washers with high-spin speeds. These reduce drying time.
 - Train staff to use energy-efficient practices, as appropriate, when choosing wash load size and hot and cold settings. Hot-water rinses use more than twice as much energy as cold-water rinses.

3. VA Energy Assessment Training: Plug Loads. National Renewable Energy Laboratory: Innovation to our Energy. January 13–14, 2009.

4. Computer Energy Usage Facts. Cornell University Facilities Services. 2005. http://computing.fs.cornell.edu/Sustainable/fsit_facts.cfm.

5. Overviews of different types of commercial food service equipment at http://www.energystar.gov/index.cfm?c=products.pr_find_es_products.

6. ENERGY STAR Clothes Washers Specifications. July 2009–January 2011. http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CW.

7. Report to Congress on Server and Data Center Energy Efficiency Public Law 109-431. U.S. EPA ENERGY STAR Program. August 2, 2007. http://www.energystar.gov/ia/partners/prod_development/downloads/EPA_Datacenter_Report_Congress_Final.pdf.

- **Dryers**—Choose dryers that have automatic shutoff sensors. These sense when clothes are dry and automatically turn the dryer off.

Miscellaneous—Using sensor- or timer-based controls in vending machines, televisions, water coolers, and audio systems will significantly reduce their plug loads. Sensor-based vending machine controls, for instance, can in some cases reduce energy consumption by about 50 percent per year, with a return on investment of about one year.⁸

Patient Rooms—Patient room non-medical equipment offers additional opportunities to reduce plug loads. Energy-efficient power strips can be used with any equipment that can be powered down, such as televisions.

Medical Equipment

Hospital medical equipment is one of the largest categories of energy consumers. It includes patient monitoring, diagnostic, medical imaging, X-ray, surgical, therapeutic, life-support, and laboratory devices.

Imaging equipment, such as an MRI machine or a CT scanner, typically represents the largest single plug load. Medical devices such as patient monitors and EKGs also are considered major energy consumers because while they draw moderate amounts of power, they are used quite frequently. Where applicable, it would be ideal to reduce

medical equipment loads by using energy-saving settings during working hours and by turning off devices during any appropriate non-working hours.

Purchasing energy-efficient medical equipment can be quite difficult because there is little known about usage patterns and actual energy consumption. Neither is there an established medical equipment energy rating or labeling system.

Researchers are actively working to address needs in this field. For example, the Lawrence Berkeley National Laboratory is developing and piloting methods to measure and estimate plug load energy consumption to guide building decisions relative to electrical circuit and HVAC design and equipment purchasing. Additionally, the HEA Medical Equipment and Plug Loads Project Team has made the energy efficiency of medical equipment one of its key areas of focus.

Promising New MRI Equipment

Recently, one manufacturer estimated that its new MRI machines will use about 60,000 kWh less energy annually per machine than previous-generation models. This could reduce the annual energy bill by almost \$6,000 per machine, at an electricity rate of \$0.10/kWh.⁹

Case Study



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Saving While Sleeping

University of Pittsburgh Medical Center (UPMC) facilities, representing 13 million square feet, had a combined annual energy bill approaching \$100 million in 2008, when the Pittsburgh healthcare system embarked upon a major effort to reduce energy usage. One of its early projects is expected to save \$350,000 in electricity costs annually.

- A computer program was installed that is helping UPMC to monitor power settings for 25,000 PCs across its network, setting them to a sleep mode at night.
- The capital cost was \$450,000.
- The cost was offset 30 percent by a grant from the local electric utility.
- This strategy cut 50 percent of the power used by PCs.
- Savings of 5,050,000 kWh yearly are expected.
- The project will pay for itself in just over one year.

8. Putting Vending Machine Energy Consumption on Ice: Climate EDU. National Wildlife Foundation. Maryruth Belsey Priebe. August 2009. <http://www.nwf.org/campus ecology/climateedu/articleView.cfm?ArticleID=94>.

9 <http://ge.ecomagination.com/products/signa-hde-1.5-mri.html>.

Hospital Energy Alliance

HEA is a forum in which healthcare leaders work together with DOE, its national laboratories, and national building organizations to accelerate market adoption of advanced energy strategies and technologies.

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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