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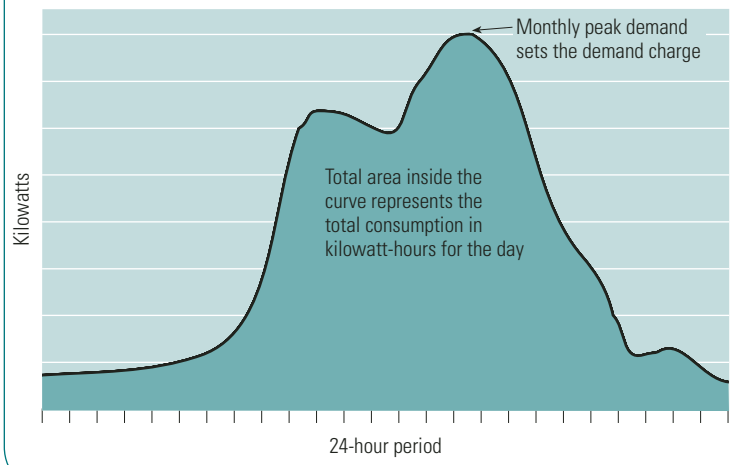
Managing Energy Costs in Hospitals

Hospitals in the U.S. spend an average of $1.67 on electricity and 48 cents on natural gas per square foot (ft^2) annually. In a typical hospital, lighting, heating, and hot water represent between 61 and 79 percent of total energy use depending on climate, making those systems the best targets for energy savings (see illustration, next page).

In order to better manage your building's energy costs, it helps to understand how you are charged for those costs. Most utilities charge commercial buildings for their natural gas based on the amount of energy delivered. Electricity, on the other hand, can be charged based on two measures—consumption and demand (**Figure 1**). The consumption component of your bill is based on the amount of electricity, in kilowatt-hours (kWh), that the building consumes during a month. The demand component is the peak demand (in kilowatts) occurring within the month or, for some utilities, during the previous 12 months. Demand charges can range from a few dollars per kilowatt-month to upwards of $20 per kilowatt-month. Because it can be a considerable percentage of your bill, you should take care to reduce peak demand whenever possible. As you read the following energy cost-management recommendations, keep in mind how each one will affect both your consumption and demand.

Figure 1: Diagram of a hypothetical daily load shape



Quick Fixes

Many hospitals have tight facility budgets, so low- or no-cost reductions in energy expenditures are especially important.

Turning Things Off

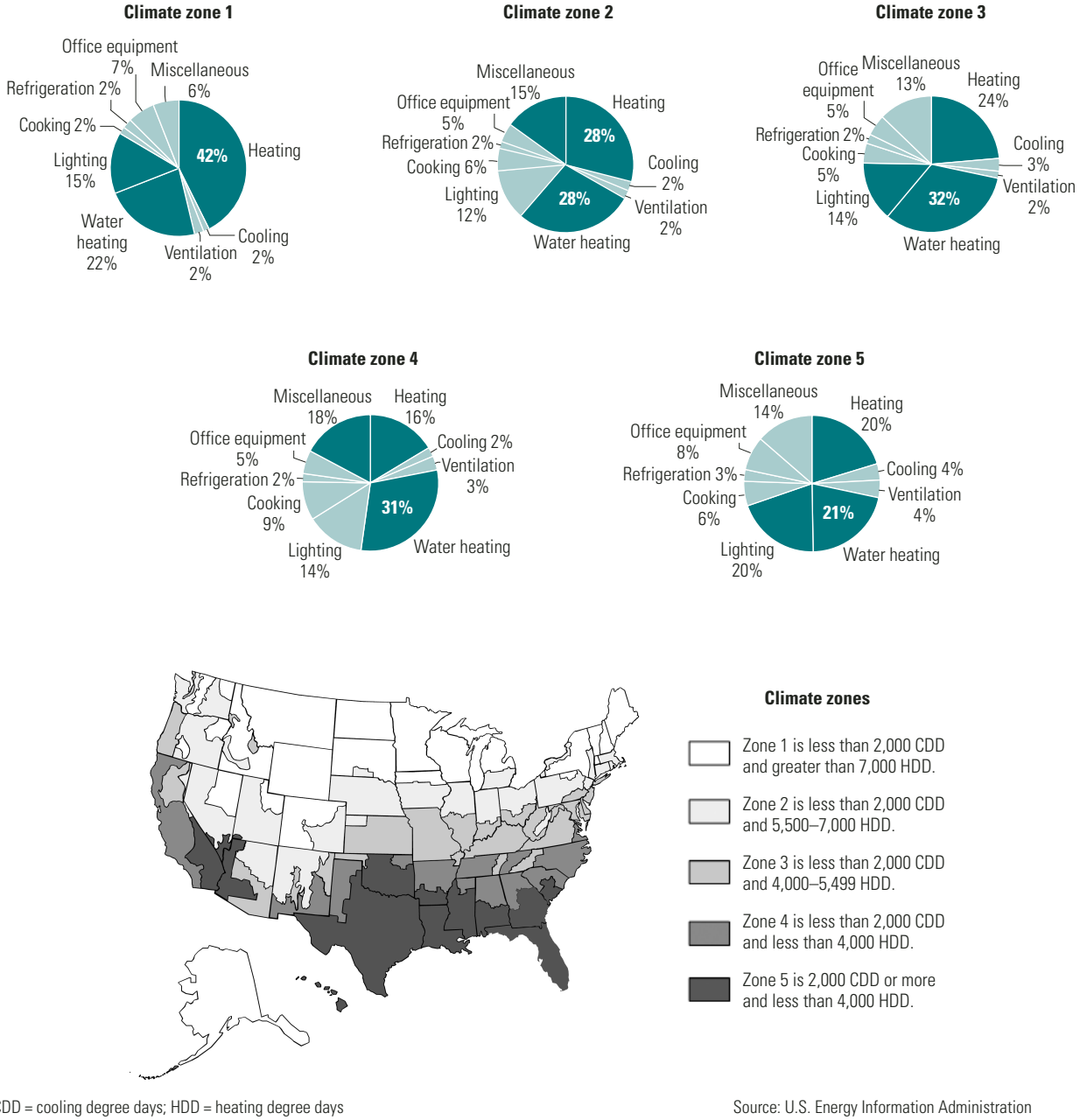
Although it may seem like a simple measure to take, remember that every 1,000 kWh that you save by turning things off equals $100 off your utility bill (assuming average electricity costs of 10 cents/kWh).

Computers. Computers are used intermittently in laboratories and offices and should employ sleep-mode settings or be shut off when the machines are not in use. The typical desktop computer, monitor, and shared printer draw about 200 watts, with the monitor alone drawing about 100 watts. "Smart" power strips with built-in occupancy sensors are available to shut off plugged-in devices like printers and monitors when no users are present.

Lights. Turn off lights when they are not in use. Occupancy sensors can help, but a less expensive alternative is to train staff to turn off lights when they leave unoccupied rooms.

Air-handling units. There may be large fan systems serving areas unoccupied at night—such as the cafeteria, educational areas, or offices—that can be shut off.

Energy consumption in hospitals, by end use, for five U.S. climate zones



Note: CDD = cooling degree days; HDD = heating degree days

Source: U.S. Energy Information Administration

Turning Things Down

Some equipment cannot be turned off entirely, but turning it down to minimum levels where possible can save energy.

Operating-room air-handling setbacks. Many operating rooms have air-handling units that draw 100 percent of their supply from outside air, which needs to be heated or cooled depending on the season. In these rooms, install occupancy sensors or manual switches that will reduce the operating speed of the supply and exhaust fans when the rooms are unoccupied but will continue to maintain air-pressure relationships.

Room temperature setbacks. Not all rooms in a hospital are occupied 24 hours a day. Such rooms should have

programmable thermostats that turn temperatures up in the cooling season and down in the heating season during hours of no occupancy.

Cleaning and Maintenance

Making sure that your HVAC system is regularly cleaned and serviced can help to prevent costly heating and cooling bills.

Check the economizer. Many air-conditioning systems use a dampered vent called an economizer to draw in cool outside air when it is available to reduce the need for mechanically cooled air. If not regularly checked, the linkage on the damper can seize up or break. An economizer stuck in the fully opened position can add as much as 50 percent to a building's annual energy bill by allowing in hot air during the air-conditioning season and cold air during the heating season. About once a year, have a licensed technician check, clean, and lubricate your economizer's linkage, calibrate the controls, and make repairs if necessary.

Check air-conditioning temperatures. With a thermometer, check the temperature of the return air going to your air conditioner and then check the temperature of the air coming out of the register nearest the air-conditioning unit. If the temperature difference is less than 14° Farenheit (F) or more than 22°F, have a licensed technician inspect your air-conditioning unit.

Change filters. Filters should be changed on a monthly basis; they should be changed more often than this if you are located next to a highway or construction site where the air is much dirtier.

Check cabinet panels. On a quarterly basis, make sure the panels to your rooftop air-conditioning unit are fully attached with all screws in place, and also check to see that gaskets are intact so no air leaks out of the cabinet. If chilled air leaks out, it can cost $100 per year in wasted energy per rooftop unit.

Clean condenser coils. Check condenser coils quarterly for debris, natural or otherwise, that can collect there. Thoroughly wash the coils at the beginning or end of the cooling season.

Check for airflow. Hold your hand up to air registers to ensure that there is adequate airflow. If there is little airflow or you find dirt and dust at the register, have a technician inspect your unit and ductwork.

Longer-Term Solutions

You should also consider longer-term solutions. Although the actions covered in this section require more extensive implementation, they can dramatically increase the efficiency of your facility without compromising patient care or comfort. Ask your local utility's representative for more information about initiating such projects.

Commissioning

Commissioning is a process in which engineers observe a building and perform a tune-up to ensure that its systems are operating appropriately and efficiently. Studies have shown that continuously monitoring a building's energy systems can lead to reductions of 10 to 15 percent in annual energy bills. For the typical 100,000-ft^2 hospital, that's equal to about $34,000 in savings per year! Savings typically result from resetting existing controls to reduce HVAC waste while maintaining or even increasing comfort levels for occupants. Commissioning usually costs between 5 and 40 cents/ft^2.

Upgrade to More-Efficient Lighting

Take advantage of daylighting where possible to reduce the need for electric light—proper design is critical to avoid glare and overheating. If your facility uses T12 fluorescent lamps, relamping with modern T8 lamps and electronic ballasts can reduce your lighting energy consumption by 35 percent. Adding specular reflectors, new lenses, and occupancy sensors or timers can double the savings. Paybacks of one to three years are common. Compact fluorescent lamps (CFLs) can replace incandescent lamps in many applications, reducing energy use by two-thirds and saving up to $20 per lamp per

year. Light-emitting diode exit lights that consume only two watts represent a great energy savings over incandescent fixtures, and they are easier to maintain because of their long service life.

Install Occupancy Sensors

Hospitals have many rooms that are used periodically, such as restrooms, storage rooms, break rooms, and offices. For work areas, a combination of occupancy sensors, time switches, and local override controls can accommodate people who arrive early or stay late.

Explore Other Laundering Options

Laundry systems consume large amounts of energy to heat water. Following are some options to consider that are more energy-efficient.

Use ozone laundering. This method performs better than traditional technology on some stains—including Betadine and blood—but worse on others. It saves energy, requires less detergent, and uses much less water. Although this technology does have a different cost structure than the conventional methods (an ozone generator is required, and the system needs more maintenance), a two-year payback period is often possible. It is important to select a vendor that has an effective maintenance support network.

Reduce temperatures. Hospital laundry can be safely washed at lower temperatures. The common practice of laundering in water at 160°F is outdated. Modern detergents and bleaches allow hospital laundry to be effectively washed at 120°F.

Recycle water and heat. Another efficient laundry system uses a storage tank or pit to extract the heat energy from the washer's wastewater to preheat incoming raw water. Additionally, final rinse water can be recovered in a holding tank and used for the first wash cycle of the next dirty load. Microfiltration systems remove particles as small as 0.5 microns from laundry wastewater so that the water can be reused. This not only saves heat energy but also cuts down on your water bill.

Ozone Laundry Manufacturers

Aqua Vita Group: www.aquavita.com

ESI: www.envirocleanse.com

Industrozone Technologies: www.industrozone.com

RGF Environmental: www.rgf.com

Microfiltration Manufacturers

Osmonics: www.osmonics.com

Microdyn: http://microdyn.de

Ceramem: www.ceramem.com

Consider Cogeneration and Other Sources of Heat Recovery

Cogeneration systems provide both heat (for space or water heating) and power. They have more applications and offer more savings potential for hospitals than for any other class of commercial building. Some hospitals are installing advanced incineration systems to destroy medical waste. Capturing and using the waste heat from incinerators can be cost-effective in some cases. The University of Michigan saved $400,000 in yearly steam bills by coupling medical waste incinerators with cogeneration.

Sterilization equipment, laundry, and kitchen operations can all benefit from heat-recovery systems. Waste heat from boiler exhaust stacks can also be effectively recovered and used to preheat boiler makeup water.

The Bottom Line

All of the conservation measures discussed here represent good investments. Most will not only save money but also ensure the comfort of your facility's patients and staff.