Energy Myths: Business Energy Use

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In the face of rising energy costs, businesses are looking for ways to reduce their energy use. Although there are a lot of good ideas out there, there are also a lot of misconceptions about what are effective energy-efficiency measures. Here are some of the most common myths and the facts to set you on the right path.

Myth. Screen savers reduce energy use.

Facts. Screen savers don't cut energy use. Screen savers were developed to mitigate a problem called "screen burn-in" that can occur in both cathode ray tube (CRT) and liquid crystal display (LCD) computer monitors and TV screens. Burn-in occurs when a given image, such as a logo or a menu bar for a computer program, appears on a monitor for a long period of time. The mechanics are different for CRT and LCD displays, but the result is essentially the same—over time, these long-duration images can get "burned" into the screen so that the viewer sees a "ghost" of these images even when they're not supposed to be there. By using a screen saver, you prevent any specific images from being displayed in the same location when your computer is dormant for a long period of time, thus preventing burn-in. But it takes just as much energy to display a screen saver on your screen as it does to display any other program. To save energy, adjust your computer's power management settings to automatically shut the monitor down after a specified period of idle time, and simply turn off the monitor if you are not going to be using it for 15 minutes or more.

Myth. Computers, monitors, and other office equipment will use less energy and last longer if they're left running all the time.

Facts. Turning equipment off overnight does not shorten its life, and the small surge of power that occurs when some devices are turned on is much smaller than the energy used by running equipment when it's not needed. In fact, leaving computers and other office equipment on overnight and on weekends wastes significant amounts of energy and also adds to the wear and tear on the equipment. In general, turn off equipment you are not using or make sure that energy-saving features on networks or individual machines are enabled. Some office equipment, including printers and scanners, features small transformers that use energy even when the equipment is turned off. Plug all such devices into a power strip so that they can be shut down completely with one flick of the switch.

Myth. Surge protectors reduce energy use.

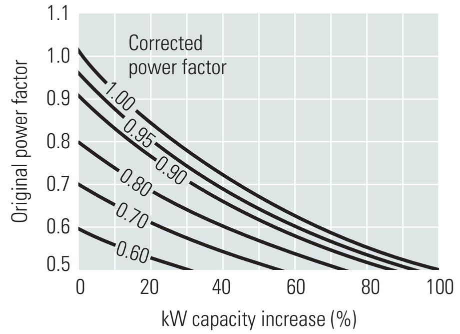
Facts. A small number of transient-voltage surge suppressor (a.k.a. surge protector) manufacturers and vendors persist in making energy-saving claims for their products despite the fact that such claims were thoroughly debunked decades ago. Even if there were some mechanism by which surge protectors could save energy (and there isn't), the reality is that there is simply no opportunity for these devices to do so because they are dormant well over 99.999 percent of the time. They become active only when some event (which may be on the customer or the utility side of the meter) creates a very high voltage spike. Even in a "noisy" (in an electrical sense) industrial environment in which such spikes are relatively frequent, their duration is so short—measured in millionths of a second—that when added together, they occupy a minuscule percentage of plant operating time. Surge protectors are an effective way of protecting your electrical equipment against voltage spikes, but don't buy one to cut energy costs, because it won't.

Myth. When I use a motor that draws fewer amps, I reduce energy use.

Facts. The power needed to drive any motor application and the energy that application consumes are determined by the load, not the motor. It's true that a motor designed to operate on 460 volts (V) will draw half as many amps as a 230-V motor on the same application. But power draw is the product of voltage and

Figure 1: Increasing system capacity through improved power factor

This figure illustrates the impact that improved power factor can have on system capacity. For example, a system with a power factor that improved from 0.7 to 0.95 could accommodate a 40 percent increase in load.



Source: E SOURCE; data from Commonwealth Sprague

current, so all other things (such as power factor, motor efficiency, and slip) being equal, power draw will be the same for both motors. To keep resistance losses equal, a motor designed to run on 230 V will typically have windings half the length of those in a 460-V motor, and the windings will have a greater cross-sectional area than those in a 460-V design, further reducing their resistance. The end result is that resistance-related losses will be almost identical for both motors.

Myth. Power-factor correction saves significant amounts of energy.

Facts. Power-factor correction can reduce energy use by a small amount, but unless your utility charges a penalty for lower power factor, improving it won't have a big impact on your electricity bill. Inductive loads, which for the most part means motors, tend to have low power factor, particularly when operating at partial load. For a given load level, the lower the power factor, the higher the current needed to power the load. The higher the current, the higher the level of losses in all the components of the electrical distribution system in your facility (for example, cables, switchgear, or transformers). So aside from power-factor penalties charged by the utility, the only way to save money with power-factor correction is by reducing the current necessary to drive your load and thereby reducing the losses in your electrical distribution system. How much can you save in this way? There are a number of site-specific factors that affect power-factor-related losses, including the mix of loads in your facility, the type and length of conductors, and where the power-factor-correction equipment is placed (closer to the meter versus closer to the inductive loads), but even in the most extreme cases, it is unusual for savings to exceed 2 percent of consumption. For this reason, it is often difficult for customers to justify power-factor correction on the basis of energy savings alone.

However, where customers can save money by avoiding power-factor penalties, power-factor correction can sometimes provide a rapid payback. Also, by reducing the current needed to perform a given task, power-factor correction can effectively increase the capacity of phase conductors and transformers. This "released capacity" may be particularly valuable if it allows a customer to delay or avoid the purchase of additional transformer capacity (**Figure 1**).

Myth. Using soft-start equipment can cut demand charges.

Facts. The use of soft-start equipment can lead to savings, but it won't reduce the demand charge on your electricity bill. When a motor starts up, it draws a lot of current. This so-called inrush current is often five to six times the motor's full-load running current. All this current creates heat in the motor windings, and heat is what kills motors over time. As their name implies, soft-starters ramp up the voltage applied to motor terminals over time, thereby limiting the inrush current and power, which significantly reduces heat buildup. By doing so, soft-starters can extend motor lifetimes—particularly those of motors that are stopped and started frequently. In fact, with a soft-starter installed, you can turn a motor on and off much more frequently without worrying about damaging the windings. If your motor application involves an intermittent load, you may be able to save money by installing a soft-starter and shutting the motor down in between loads rather than leaving it running continuously.

But if inrush current and power are reduced, why can't soft-starters reduce demand charges? The answer has to do with how demand charge is typically calculated. The meter at your facility measures the average power you consume over each 15-minute period, and your demand charge is based on the maximum value of that average demand during your billing cycle. In contrast, a soft-starter affects a motor's power draw over the course of just a few seconds. The reduction of the motor's power draw over that short period is insignificant in comparison to the time over which the demand charge is calculated. So although the soft starter has a substantial effect on *instantaneous* power demand, it has no noticeable effect on your demand charge.

Myth. I should run my HVAC 24/7 to avoid an increased demand charge from the "spike" that occurs when the equipment comes on.

Facts. Although turning on HVAC equipment will cause a power spike on the order of fractions of a second, this period is not long enough to have any impact on demand charges. Demand charges are based on the average power used in a facility during 15-minute periods. The spike from turning on such equipment simply doesn't last long enough to significantly affect this average. Not only are there no significant demand savings from running HVAC equipment continuously but there is a significant downside as well. Equipment life can be considerably shortened, and unless the equipment is designed to operate at continuously variable capacities, it likely will not be able to properly match the cooling load and thus will waste energy and decrease comfort.

As a separate issue, sometimes the start-up of multiple units is staggered in order to avoid a false peak. If the equipment is accurately sized so that it runs flat-out during peak conditions, then avoiding the start-up peak won't provide any benefit during peak months, but it will during the rest of the year.

Myth. I can rotate equipment on 10-minute cycles to reduce demand with no reduced comfort.

Facts. Cycling equipment on and then off for 10 minutes each can reduce demand charges, but it will also sacrifice comfort. Demand charges are calculated based on the average power drawn by a facility during 15-minute periods. If the HVAC system is cycled off for 10 minutes of this period, then the average power will likely be reduced. However, when a unit is prevented from operating when the thermostat calls for it to operate, comfort will be sacrificed. In addition, if the cycling frequency that is imposed on a unit is greater than what it would normally experience, then this increase can shorten equipment life and will waste energy as well.

Myth. When leaving a room for a short period, it's better to leave lights on than to turn them off.

Facts. For incandescent bulbs, it's always better to turn the lights off. For fluorescent lights, there are some trade-offs: Fluorescent lights use slightly more energy on start-up, but the light needs to be off for only about a second to make up for that surge. The life of a fluorescent light is also shortened by frequent on-and-off switching. The actual break-even point depends on the cost of the lamp and the local electricity costs and is typically 5 to 15 minutes. However, a good guideline for fluorescent lighting is: Unless you're switching the lights every few minutes, it is generally cost-effective to turn the lights off whenever you leave the room.

Myth. 120-V lighting is cheaper to operate than 277-V lighting.

Facts. There is very little difference in operating costs between 120-V and 277-V fluorescent lighting, but if anything, 277-V lighting uses slightly less energy. That's because 277-V lighting draws less current, and electronic ballasts, like all electronic equipment, run more efficiently on low current. Ballast catalogs typically show the same power for 120-V and 277-V versions because the difference is less than 0.5 watts (W), but occasionally you'll see a small spread—for example, one company lists a three-lamp, high-efficiency ballast at 83 W in the 120-V version and 82 W in the 277-V version.

Myth. Cool roofs are always a good choice.

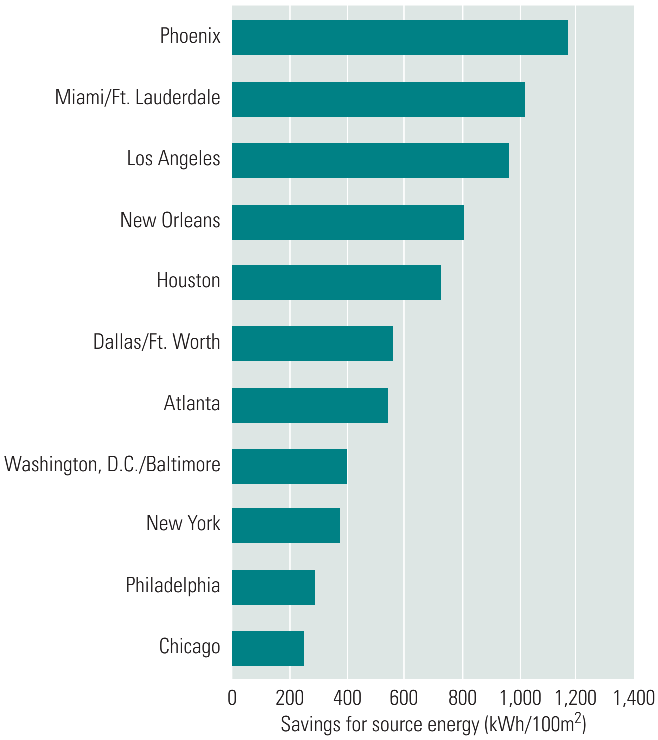
Facts. Cool roofs-—created with light-colored roofing materials that stay cool even on hot days—-can lower air-conditioning loads, but the savings vary widely with location. Typical energy savings run around 20 percent, with simple payback periods of a few years. In the best applications, cool roofs have no incremental cost, delivering nearly instant payback. However, in the wrong buildings, cool roofs may actually have negative implications. Cool roofs are most effective when one or more of the following conditions exist:

- The building has high air-conditioning use, and the cooling season dominates energy considerations.
- There is little or no existing insulation. Note that an energy-efficient building should have both a cool roof and adequate insulation. When installing a cool roof or constructing a new building, you should consult local building codes and your contractor.
- The climate is hot and sunny (at least in the summer).
- New construction is planned, or the existing building is scheduled for reroofing or roof maintenance.

To see if a cool roof is an appropriate choice for you, use the Energy Star roofing calculator, available at http://roofcalc.cadmusdev.com. **Figure 2** provides a gauge for the energy-savings potential of cool roofs in different regions.

Figure 2: Energy savings from cool roofs on commercial buildings

Cool roofs perform differently in different climates. In colder areas and at higher latitudes, savings will be less than they would be in warmer climates and at lower latitudes. (Figure adapted from David Eijadi et al., "Introducing Comparative Analysis to the LEED System: A Case for Rational and Regional Application," Proceedings of the 2002 ACEEE Summer Study on Energy Efficiency in Buildings, Asilomar, California.)



Notes: kWh/100 m^2 = kilowatt-hours per 100 square meters.

Source: E SOURCE