

## WHITEPAPER

# BEST PRACTICES FOR MONITORING AND REDUCING PLUG AND PROCESS LOADS

## Introduction

Plug and process loads, or PPLs, make up a significant percentage of energy consumption in U.S. office buildings: 47%, according to the DOE. PPLs comprise the electricity end uses a building needs to function that aren't related to the heating, ventilation, cooling, lighting, or water heating systems. For example, coffeemakers, printers, computers, elevators, charging carts, and refrigerators, to name just a few. Given increasing usage of plug load devices in office buildings, the energy consumed by PPLs is only going to increase in the future, from 40% to 49% by the year 2040 according to the Office of Energy Efficiency & Renewable Energy (EERE).

According to the National Renewable Energy Laboratory (NREL), plug load management slashes commercial building energy consumption by 10%. In spite of the potential savings, plug load control and management initiatives have not yet been widely adopted in commercial buildings in the United States. More research, funding, and education are needed to make PPL reduction a more common energy-efficiency strategy.

The U.S. Department of Energy has spearheaded a variety of initiatives to help bring greater awareness to the importance of PPL reduction strategies in reducing overall energy consumption in commercial properties. NREL, for example, has created significant resources related to plug load management and PPL reduction strategies. They even offer a [PPL workbook](#) to help building owners and stakeholders estimate the energy-consumption patterns of devices and processes in their facilities.

As a major player in the plug-load management game, BERT also has a vested interest in disseminating

## 40-49%

Energy consumed by PPLs will increase 40%–49% by the year 2040.

helpful information on PPL-reduction techniques and related resources. This brief guide is intended to give readers an overview of current PPL reduction strategies and best practices, as well as provide resources for further education on the subject.

## Championing Change: PPL Reduction Strategies

Research suggests that the best way to reduce PPL-related energy consumption in commercial buildings is to choose a PPL “champion.” This person, or team of people, liaises with building stakeholders to advocate for changes to the building's energy-usage patterns and policies.

This internal advocate must take measures to integrate the PPL measures into the building's institutional culture, giving them a chance to have a lasting impact on whole-building energy consumption.

Doing an assessment of the building's current equipment and devices comes next. A walkthrough allows stakeholders to understand how energy is being used in the building on a granular level, device by device. This information helps stakeholders determine which changes need to be made and which control strategies need to be adopted.

Finally, creating a business case will help complete the establishment of the PPL reduction strategy.

## Basic Strategies for PPL Reduction

When it comes to PPL reduction, there are both general strategies and device-specific ones. Here are some examples of the former:

- Replacing inefficient equipment with energy-efficient devices
- Taking advantage of low power and sleep modes
- Consolidating devices to eliminate redundant loads
- Scheduling timely software updates during regular business hours

## Device-Specific Strategies

This advice relates to specific plug load devices such as refrigerators, small kitchen appliances, vending machines, workstations and computers, printers, and copiers. It also applies to vertical transport processes like elevators and escalators.

- Replace old appliances and get rid of ones that aren't being used on a regular basis.
- For workstations, adopt lower-Watt options like laptops, LCD monitors, LED task lights, and VoIP telephones.
- For printers, copiers, scanners, and fax machines, consider one multifunction devices instead of many smaller ones.
- For elevators, consider occupancy-based control strategies that switch off lighting and ventilation systems when unoccupied; for escalators, find ways to reduce their operation during nonbusiness hours.
- For small-scale food areas, provide and mandate the use of the most energy-efficient appliances available.
- For conference rooms, make sure all equipment is energy-efficient and establish a control strategy that switches off devices (projectors, TVs, monitors, lights) when the room is not in use.

## The Importance of PPL Education

Employee education is a critical part of ensuring that PPL control strategies work properly. Research shows that employees who don't understand the plan put in place in their building probably won't maintain that

strategy or abide by its rules. Adopting measures to make sure employees are on board will go a long way towards ensuring the long-term success of the goal.

Some examples of strategies that might help increase employee buy-in and compliance:

- Emails and other regular communications
- Training videos
- Signage (like reminder stickers on devices)

## PPL Control Strategies: Technology

There are four technologies currently available for controlling PPL energy consumption:

- **Smart Outlets.** These are wireless meter and control systems (BERT's smart plugs are a good example) for all plug-in devices.
- **Advanced Power Strips.** These aren't your average power strips. APS allow building occupants to power select devices (connected to the strips) off and on at will.
- **Automatic Receptacle Controls.** These bespoke outlets are installed in buildings and allow for automatic control based on schedule or occupancy. They are also energy-code compliant.
- **Integrated Controls.** While less common, this nascent strategy allows for centralized control, working with other building systems like lighting and HVAC to monitor and curb energy consumption.

## Other Considerations

During the design phase of a new building, or during renovations, it's important to keep PPL reduction strategies in mind. Things to consider:

- Being energy-code compliant (ASHRAE 2019)
- Estimating the correct PPL capacity (often overestimated and a source of wasted energy resources)
- Making sure process loads are as efficient as possible