BEGINNING TO CAPTURE THE UNTAPPED
ENERGY SAVINGS IN OFFICE PLUG LOADS

Next generation of plug control—tier 2 power strips

In the quest to reduce energy use in offices, plug loads are becoming impossible to ignore. In Midwest office spaces, plug loads account for approximately 28% of the energy used. However, as we install ever more efficient lighting in these spaces, replace HVAC equipment and commission and tune controls, the fraction of energy use from plug loads increases. In many high performance buildings it is closer to 40–50% of the energy used.

New strategies are available for mitigating plug load energy. We recently conducted research on one of the newest: tier 2 advanced power strips (APS). In Minnesota this solution has the potential to save up to 44 million kWh annually in that state alone.

PERIPHERAL USAGE

APSs save energy by controlling peripheral loads such as task lights and monitors that are left on when not in use. We found that a lot of people leave this equipment on: night and weekend "unoccupied" workstation power at most of the sites we monitored was at least 25% of the active daytime use.

COMPUTER USAGE

But computers remain the largest energy consuming device found at a workstation. The type of computer plays a role in the energy consumption—with desktops being more energy intensive than laptops and thin clients. At the three offices that we studied, no companywide computer power management (CPM) policy was implemented, suggesting significant potential for savings through the use of CPM or tier 2 APS.

New Solution Available

Implementation of effective plug load energy reduction strategies must take into account the many ways plugged in devices are used, as well as the variety of people using them. During our study, we tested a new plug load control technology—tier 2 advanced power strips. Tier 2 advanced power strips combine, for the first time, CPM with the control of peripherals typically offered by other APSs.

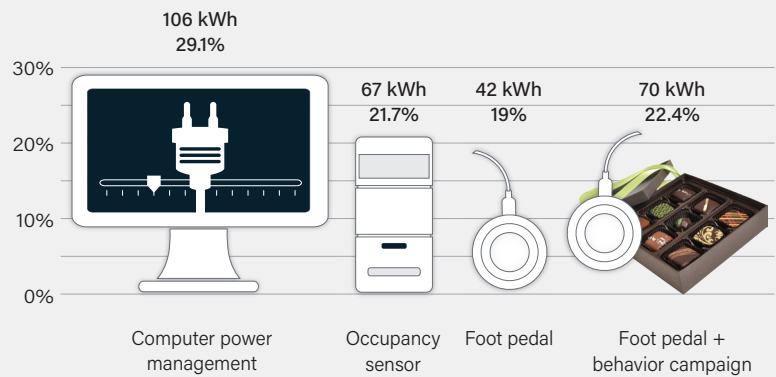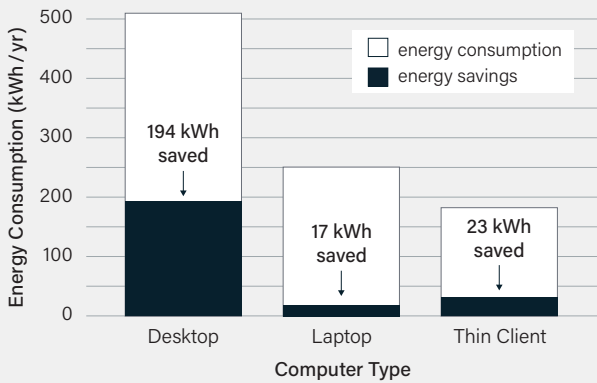**TIER 2 ADVANCED POWER STRIPS CUT PERIPHERAL AND COMPUTER CONSUMPTION**

We tested two different tier 2 advanced power strips.

- Embertec 8PC+ which features a software integration to control CPM.

- Tricklestar PC Advaced PowersStrip+ (1st generation) uses an occupancy sensor to control CPM and is a hardware only solution.

Based on previous research and feedback, we set the CPM delay to 30 minutes for both devices.

The Embertec device saved on average 30% of the workstation energy use in our tests. The Tricklestar device had lower energy savings. The results reported here are for the Embertec device.

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Energy Consumption (kWh/yr) — Computer Type: Desktop (194 kWh saved), Laptop (17 kWh saved), Thin Client (23 kWh saved). Legend: energy consumption, energy savings.

Computer power management: 106 kWh, 29.1%. Occupancy sensor: 67 kWh, 21.7%. Foot pedal: 42 kWh, 19%. Foot pedal + behavior campaign: 70 kWh, 22.4%.

The average energy impact from implementing APS/CPM strategies on desktop, laptop and thin client computers is shown in the top left figure.

OCCUPANT SATISFACTION

CPM can be challenging to implement in office settings—especially when no policy exists, and users are exposed to CPM for the first time. In our study user feedback on the T2 APS devices was mostly positive. Had we implemented a more aggressive CPM strategy, we would have increased energy savings but generated more negative user feedback.

BEHAVIOR INFLUENCES SAVINGS

Previous research tested an education/behavior campaign built around a Tier 1 APS with foot pedal control technology. That research found that occupant behavior can increase energy savings. The research on T2 APS did not test a behavior campaign but its role cannot be discounted in the implementation and success of these devices. We recommend designating a key individual in the office who understands the device and can provide encouragement or assistance to co-workers. This increases the success and acceptance of these devices greatly compared to a third party or utility program "pushing" a technology onto an office.

SUCCESSFUL IMPLEMENTATION

Because the Emberetec 8PC+ requires a 3rd party software to be installed, it is highly likely that the IT department will need to be involved in any such installation. We recommend developing a relationship with the IT department to increase support if any technical issues arise. In today's office spaces, IT departments often push updates automatically overnight meaning it is crucial that the IT department understands and can work with the tier 2 APS devices.

ARE THESE STRATEGIES COST EFFECTIVE?

The tested devices come in at separate price points between $70 and $100 per device. In a new office, where new power strips will be purchased anyway, the incremental cost is between $55 and $85 per device. Life cycle cost analysis yields a break-even cost of $147 for APSs—any power strip that costs less is cost effective. This corresponds to a payback of just over six years with typical incentives. For existing workstations, where a new power strip purchase was not required, the payback period is under eight years. We highly recommend using these devices in new workstations or when power strips need to be purchased. They could also be recommended for use with existing workstations if the longer payback period is acceptable.

Previous Research Results

This study built on previous Minnesota CARD-funded research that tested other strategies for commercial plug loads including standalone CPM, tier 1 APS with foot pedal, tier 1 APS with occupancy sensor and a behavior campaign. Energy savings from the strategies tested in the previous study are shown in the top right figure.

FOR MORE INFORMATION

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Full report to be released March 2019

Research report from previous study: **https://www.seventhwave.org/commercial-plug-load-study**

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