Impact of Advanced Power Strips in Office Buildings

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Introduction

This poster presents the results of a field study completed late in 2012 on the impact of Advanced Power Strips (APS) in commercial office environments. While there is a significant body of published studies on residential applications of advanced power strips, there is little empirical information about the impacts from commercial applications of this emerging technology. The goal of the study was to: characterize typical power usage during active and inactive work periods associated with representative office workstation configurations; estimate the potential savings associated with controlling workstation peripheral equipment through the utilization of APS systems; and recommend protocols for the prediction of potential APS savings, and for conducting impact evaluation of APS programs.

The study results are based on analysis of data collected from metering and user interviews from a sample of 40 workstations in two types of office buildings. The poster summarizes the research method, results, and summary conclusions and recommendations.

Study Methodology - The primary field research for this study was conducted at two commercial office buildings in the State of Vermont. Twenty workstations in each building were monitored for power consumption patterns for a period of two weeks. The collected data was uploaded to custom spreadsheet tools and the potential savings for currently available Tier 1 APS systems were evaluated. Tier 1 APS devices are considered to be plug-in power strips containing one "control" outlet, which allows a device such as a television or a PC to act as a "master control." Multiple "controlled" outlets automatically interrupt power to controlled devices when the "control" device is off or in a low-power standby mode. Additional uncontrolled outlets allow some devices to be left regardless of the status of the control device.

The monitoring procedure followed was systematic and consistent with an effort to record the potential savings at the workstations without modifying or influencing any staff behavioral patterns or equipment settings. The procedure is outlined as follows:

- **Selection of monitoring equipment** – We utilized an energy monitoring device specifically designed to record the usage patterns and power consumption of plug loads. During the monitoring period the PC user continues to operate their PC and peripherals without any change in routine.
- **Pre-monitoring interview and tour** –A tour of the facilities and staff interviews assisted in selecting departments from which to select participant workstations.
- **Data logging installation** - The make and model numbers of the PC and peripherals were recorded, and a power meters were used to record power consumption for reference. Data loggers were installed and staff members were briefed. Data was logged for two-weeks.
- **APS Installation** – The data loggers were removed and replaced them with Tier 1 APS units.
- **Data Analysis** – The logged data was uploaded to custom analysis tool and the potential savings was calculated for each workstation, as well as the average for each site.
- **Follow-up Site Visits** – Approximately three months following the installation of the Tier 1 APS units, we returned to the two sites and interviewed the staff regarding their experiences with the APS

Conclusions - The results demonstrate that there are obtainable savings, but the savings are relatively small given the current state of APS technology, and the challenges associated with both the

interface with PC operating systems, and commercial office work environments. The overall conclusions are summarized as:

- Annual estimated savings for the monitored sites ranged from 0 – 32 kWh, and were very dependent upon PC setups and staff work habits.
- The APS strategy of disconnecting power to peripherals upon shutting down, or entering a "sleep" mode works reliably with most PC and peripheral configurations.
- Current APS products are targeted primarily at home entertainment systems. Current manufacturer instructions included with APS products focus almost exclusively on those installations.
- In order to harvest significant savings, PC operating system power settings, including power saving settings, must be understood and adjusted to assure compatibility with APS operation.
- At both sites, some staff members continue to leave their PCs operating when they are out of the office. In some cases, this is associated with remote access to the PC, but it is also associated with an outdated belief that PC operation is more reliable with 24/7 operation, and/or an incorrect assumption that an operating screensaver provides a power saving function.
- Laptop PCs with docking stations are workable configurations for APS, as undocking the laptop automatically drops the power at the control outlet to a very low level (+/- ½ watt) thereby disconnecting power to the peripherals.
- Manufacturers of peripheral equipment such as printers and monitors are continuing to reduce the power consumption during standby modes. This is a positive development for energy efficiency, yet limits the potential savings associated with APS products.
- M&V can be performed with a variety of accepted methods. However, simply verifying that units have remained in place, and reviewing the savings predictions, will not produce accurate results.
- Short-term persistence of APS units was reported to be very good with this study.

Because of the above limitations, upstream program approaches for Tier 1 APS devices are not likely to be cost-effective for commercial office environments. Direct install or approaches that engage facility and IT staff offer more potential for success. Such approaches provide the opportunity to carefully integrate APS operation with PC power saving settings, and staff work habits. Further refinement of APS products, include the introduction of advanced equipment and strategies, commonly referred to as Tier 2 APS promise to offer improved savings potential for APS plug load control.