COMMERCIAL BUILDING PLUG LOAD ENERGY REDUCTION STRATEGIES

The project goal is to measure commercial building plug load energy savings using available control technologies and occupant behavior strategies.

WHY THIS RESEARCH IS NEEDED

Plug load energy use in commercial buildings is the fastest growing end use in US commercial buildings, projected to grow by 40 percent from 2006 to 2020. This stands in contrast to the decrease in other end uses such as cooling and lighting. There is a significant need to characterize the plug loads in office buildings, identify specific strategies for reducing these loads, and prioritize the strategies based on Minnesota’s energy savings goals.

We will conduct a broad, multi-level field study that measures the magnitude of these loads in typical commercial buildings and measures the potential for strategies to reduce this load. We will use 3 methods: (1) measure device-by-device where needed for accurate measurement, (2) measure entire circuits of plug loads where it is appropriate, and (3) characterize additional offices using a combination of site visits and online surveys.

PROJECT PROCESS AND EXPECTED OUTCOMES

This study will examine a broad set of issues and strategies, and include loads such as PCs, monitors, kitchenette equipment, and copiers. We will perform detailed monitoring in representative office areas over the course of a year to observe enough variation in schedule, occupancy, and workplace activities. The statistically valid results will measure variations by workplace as well as season and business type.

Thirty to fifty buildings will be surveyed to characterize site and plug-load device information. From this initial work, eight to twelve buildings will be recruited to participate in a year-long study involving energy use measurement and plug load reduction strategies. Field measurements will be used to collect baseline data after which plug load control strategies will be implemented and the energy savings will be measured. Key considerations will be cost-effectiveness and accuracy. User satisfaction interviews will also be conducted to help identify the likelihood of adoption (based on satisfaction).

The study will use measured results combined with whole building energy use to assess the impact of reducing plug load energy on building energy use. This holistic analysis will allow the results of this study to be useful for more comprehensive programs such as new construction, custom, and retro-commissioning, in addition to creating more prescriptive opportunities for Conservation Improvement Programs (CIPs).

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PROJECT SUMMARY

Objectives:
Characterize plug-loads in commercial buildings.
Develop accurate energy use measurement and assess plug load reduction strategies.

Utility Implementation:
Deliverables of the project will be a how-to brief for CIP personnel and deemed savings values that can be added to the Technical Reference Manual. The results will also support custom savings to provide a broad range of tools for utility energy conservation programs.

Scope:
30 to 50 buildings/offices will be surveyed for plug-load characterization and 8-12 buildings/offices will participate in year long plug-load reduction study.

Timeline:
January 2015 to December 2017

Non Energy Impacts:
Researchers will provide design teams, owners, and financial decision-makers with economic and occupant acceptance analyses related to the plug load strategies.

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