DR11SCE1.05.01: Demand Response Tests of Lighting in a Class A Office Corridor

OPPORTUNITY

What is the potential for DR Lighting in offices?

According to the California Commercial Energy Use Survey (CEUS), offices are the single largest draw of commercial energy use in California. Offices represent 21% of the total commercial square footage and 25% of total commercial energy usage in California. In the SCE service territory, offices represent 18% of commercial square footage (385,110,000 sf) and have an interior lighting connected load of 1.16 W/sf.

TECHNOLOGY

How does DR Lighting in offices work?

The technology being tested in this study is an advance lighting control system (ALCS), which includes of Lutron H-Series ballasts, which can provide full dimming from 1% to 100%, and occupancy sensors which provide bi-level control of the lighting fixtures between high and low mode. This system is capable of receiving demand response signals and can be dimmed to any level that is agreed upon by the owner and SCE.

M&V

Where did Measurement and Verification occur?

The ALCS was installed in the corridor of the 10th floor of the Landmark Square building in Long Beach, CA. Data loggers were installed in each individual light fixture to collect electric load profile data during DR testing, and to measure demand reductions attributable to the ALCS.



RESULTS

How did DR Lighting in offices perform in M&V?

Demand Response Test Days

DR testing was successfully conducted on the same business hours over three separate days in October of 2011: Tuesday, October 18; Wednesday, October 19; and Friday, October 21. Analysis of the data included five DR tests on three different days, one test for each of the power reduction settings (10%, 15%, 20%, 25%, 30%). Data loggers also recorded a non-test day, October 20, a comparison to demand during the three test days.

Demand Response Reduction

The average reductions from this study were as follows: 1.4 Watts/fixture (W/fix) at 10% DR level; 2.7 W/fix at 15% DR level; 4.3 W/fix at 20% DR level; 4.8 W/fix at 25% DR level; and 7.4 W/fix at 30% DR level. The maximum DR reduction of 7.4 W/fix represents an approximately 17% reduction of average wattage. In an alternative analysis, the impact of dimming from the occupancy sensors was ignored. This resulted in a maximum DR reduction of 8.9 Watts per fixture (0.11 W/sf) or 17% of the commissioned wattage from the fixtures at the 30% DR level setting.

Grouping Fixtures into Zones

The controls were originally designed to group fixtures into zones. It is noted that during the DR testing period all fixtures were grouped as one zone. Therefore, if someone were to activate an occupancy sensor, all the lighting fixtures would change to high light output mode. Although this strategy improves the average DR reduction, it reduces the energy savings capability of the system.

DEPLOYMENT

What are the recommendations moving forward regarding DR Lighting in offices?

Additional recommended steps:

• This pilot only explored incremental DR settings up to 30%. Future studies that examine greater power reductions (for example, incremental DR settings up to 50%) could further the understanding of the power saving potential of this ALCS.

• Further study of the market impact of mass implementation of this ALCS would improve our understanding of factors related to easing the stress to the electric grid.