

DR10SCE01: Office of the Future: Integrating DR and EE in Commercial Office Space Lighting

OPPORTUNITY

What is the potential for DR Lighting in the Office of the Future (OTF)?

SCE is investigating the potential for Demand Response (DR) technologies on several projects to reduce the peak electric system load. Supported by the Office of the Future (OTF) Consortium, a collaboration of some of the nation's largest and most progressive utilities, including Southern California Edison (SCE), the OTF initiative is working to assemble technical guidelines for office renovation projects that specify performance requirements for different attributes of office spaces (e.g., lighting, plug loads, air conditioning, etc.) and whole building that result in at least a 25% and 50% savings over the building energy efficiency code.

TECHNOLOGY

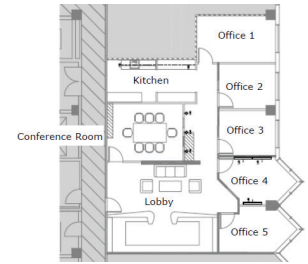
How does DR Lighting in the OTF work?

The technology tested in this study is an advance lighting solution (ALS). High-performance, low-glare 2 x 2 recessed, wall washers, direct/indirect pendants, lensed light slots, and wall mount indirect fixtures were all represented. Separately controlled fixtures were dimmed based on available daylight in order to provide even illumination at the work surface while taking advantage of available daylight. During unoccupied periods, the lights were automatically dimmed and then shut off. Additionally, light emitting diode (LED) task lights were provided at each desk.

M&V

Where did Measurement and Verification occur?

This project consists of a 1,577 square foot office suite in the 24-story Landmark Square building in Long Beach, California. The office suite includes five private offices, a conference room, a kitchen, lobby, and corridor. Lighting and plug load end-use monitoring equipment was installed in the office space to evaluate the potential energy savings and demand reduction associated with advanced lighting design and highly controllable lighting.



RESULTS

How did DR Lighting in the OTF perform in M&V?

Difficulty in Testing

While the DR test calls for an actual percentage reduction in power, the lighting controls used in this project could not directly measure power, only infer it. As a result, the control system relied on preset dimming scenes to deliver the requested demand reduction. Combine this with occupancy sensing, daylighting controls, a dynamic office environment, and some missteps during the testing periods; it became difficult at times to properly isolate the impact of the lighting control system on demand reduction.

Demand Response Reduction

There were significant reductions in the lighting load when a DR strategy was invoked by the lighting controls. For a request of 50% power reduction, the control system delivered 0.254 W/sf (or 25% drop in power), while for a request of 30%, the reduction was 0.174 W/sf (or 30% drop in power). It is interesting to note that for requests for power reduction of 10%, 15%, 20%, and even 25%, the lighting control system under performed significantly. This is likely the result of the lighting control relying on preset dimming scenes to accomplish the demand reduction.

Task Lighting Increases Wattage but Decreases Usage

At first glance, it appears that the design team added wattage to the design by providing dedicated lighting at major task areas and separately controlling decorative features. By designating 'task areas' within the project, lower ambient light levels were established for all other spaces. Separately controlled task lighting with automatic shutoff allowed the designers to put higher light levels specifically where they were required for the task, and with controls, only when they were required by the users.

DEPLOYMENT

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

Additional recommended steps:

- Continue engagement of key lighting controls companies to demonstrate the need and value of having lighting control products measure directly power.
- Evaluation of other market segments that could benefit from incorporating aggressive lighting DR strategies.
- Renovation (or new construction) of an entire building lighting system to fully understand interaction of the various lighting systems and associated controls in delivering cost effective DR lighting strategies.