



### Dimmable Stairwell Lighting

*Stairwell lighting fixtures are normally on 24/7/365, using a lot of energy to illuminate mostly unoccupied stairs, alcoves, and landings. New lighting fixtures have come on the market that incorporate occupancy sensors, activating the stairwell lighting to full levels only in the immediate area of someone entering the stairwell.*



Standard Lighting

#### The Demonstration Site:

The Fillmore Center complex in San Francisco includes upscale high rise residential apartments in a busy urban setting. The 20-story towers comprising the majority of the living spaces have centrally located elevators that are used by the majority of the residents. Each tower is also served by two stairwells located at opposite corners of each building.

This ET project was conducted for PG&E by TMT Associates and evaluated savings of a new retrofit lighting system. The new stairwell lighting system in the Fillmore Center consists of retrofit luminaires with integral occupancy sensors that reduce the light levels when the stairwells are vacant. Each fixture contains a switchable 30-watt primary T-8 fluorescent lamp, and an integral five-watt compact fluorescent lamp that remains on all the time and keeps a low level of light in the stairwell. Ninety-nine of these retrofit lighting fixtures in two stairwells were monitored over a two-week period.



Lighting upon Occupancy

#### Conclusion:

The results are significant. Lights in the commonly used lower levels of the facility were on for a maximum of 35 percent of the time. In the less commonly used areas on the intermediate and higher floors (where most of the lights are), luminaires were on for less than 3 percent of the time. The average on-time for all luminaires was a mere 3.3 percent. In this project, the occupancy sensor control enabled overall stairwell lighting **energy savings of 66 percent and coincident peak demand savings of 50 percent.** A simple payback for this project based on a retrofit of the lighting system is 6.4 years. For the dimmable fixture used in new construction, the payback period is much faster at 2.3 years.

### Fillmore Center Dimmable Stairwell Lighting Study Results (Results are per fixture averages)

Lighting Fixture	Est. Annual Energy Use	Annual Energy Cost	Demand	Upgrade Cost	Simple Payback
Standard 4ft fluorescent F32T8 lamp 263 kWh	263kWh	\$43.79	30W		
Retrofit Dimmable w/F32T8 & 5W standby CFL lamps	90 kWh	\$14.99	15W	\$185.00	6.4 yrs
<b>Savings</b>	<b>173 kWh (66%)</b>	<b>\$28.80</b>	<b>15W Coin. Peak (50%)</b>		

1. The project monitored 99 light fixtures in two stairwells.  
 2. Costs are based on an average electricity price of \$0.167/kWh.  
 3. Upgrade cost includes removal of existing fixtures and replacement with new luminaires, including parts and labor.  
 4. The incremental cost in new construction of \$67 is significantly less than the upgrade cost, providing a simple payback of 2.3 years.

**Increased promotion of this efficiency option could be very cost-effective for PG&E. The technology is available now. It is very easy for building owners and managers to apply via direct replacement of fixtures, and they recognize immediate savings. This measure could save an additional 3 MW in PG&E's peak demand each year.**

Stairwell lighting fixtures with built-in occupancy sensors currently qualify for rebates under PG&E's Standard Performance Contract (SPC) and Savings By Design (SBD) programs. As part of this project, cost/benefit analyses for the technology were performed for both building retrofits and for new construction. The total resource costs (TRC) and program administration costs (PAC) are very favorable for new construction. The analysis for building retrofit is less attractive, but decreasing costs of these lighting fixtures are expected to bring the retrofit TRC ratio above 1.0 as market penetration increases. These fixtures may also be eligible for tax credits under the 2005 Energy Policy Act which are included in the program cost analysis (but not in the payback analysis above).

Application	TRC B/C Ratio	PAC B/C Ratio	PAC B-C NPV
New Construction	4.87	7.94	\$0.068
Building Retrofit	0.71	7.74	\$0.067

ET is now conducting a follow-on project in San Francisco's Transamerica Pyramid Building -- to evaluate the savings in a major office building environment. This project is expected to show even greater energy and demand savings than in the Fillmore multi-family buildings.

New requirements for increased stairwell lighting have been approved by the American National Standards Institute, Uniform Fire Code, and the Life Safety Code. These requirements specify a possible increase in occupied stairwell lighting levels of 10-fold (to 108 lux). If they are adopted by local jurisdictions, dimmable stairwell lighting will be not only an attractive energy saving option, but an essential technology for meeting California's energy goals.