

**SSL DEMONSTRATION:
Tunable-White
Lighting at the
ACC Care Center**

At a residential senior-care center, tunable LED lighting provides energy, lighting quality, and possible other benefits for the residents and caregivers.

The Sacramento Municipal Utility District (SMUD) recently conducted a trial installation of tunable-white LED lighting at the ACC Care Center in Sacramento, CA, and invited the U.S. Department of Energy’s (DOE) GATEWAY program to document the performance of the new lighting systems. Among the primary goals identified by SMUD and ACC were to learn more about how tunable-white lighting affects the sleep patterns, nighttime safety, and other behaviors of the residents; and to better equip the staff to provide excellent care by improving the lighting quality (e.g., reduced glare, better controllability) relative to the incumbent system.



The incumbent fluorescent lighting system in the ACC Care Center corridor.
Photo: Sacramento Municipal Utility District



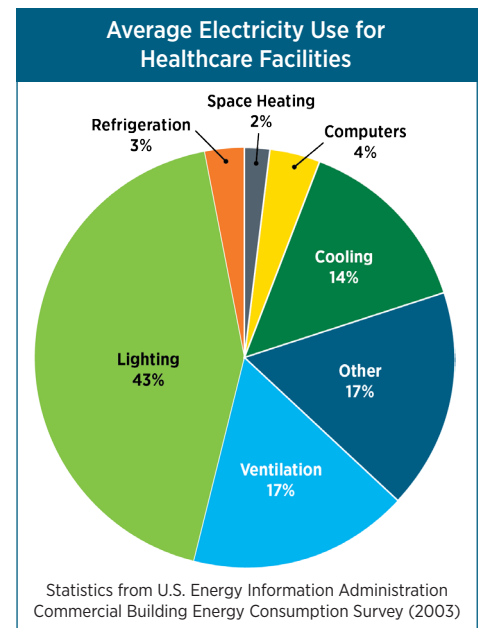
The new tunable LED lighting in the ACC Care Center corridor, shown at the morning setting (specified as 6500K at 66% output, left), the afternoon setting (specified as 4000K at 66% output, center), and the nighttime setting (specified as 2700K at 20% output, right).
Photo: Sacramento Municipal Utility District

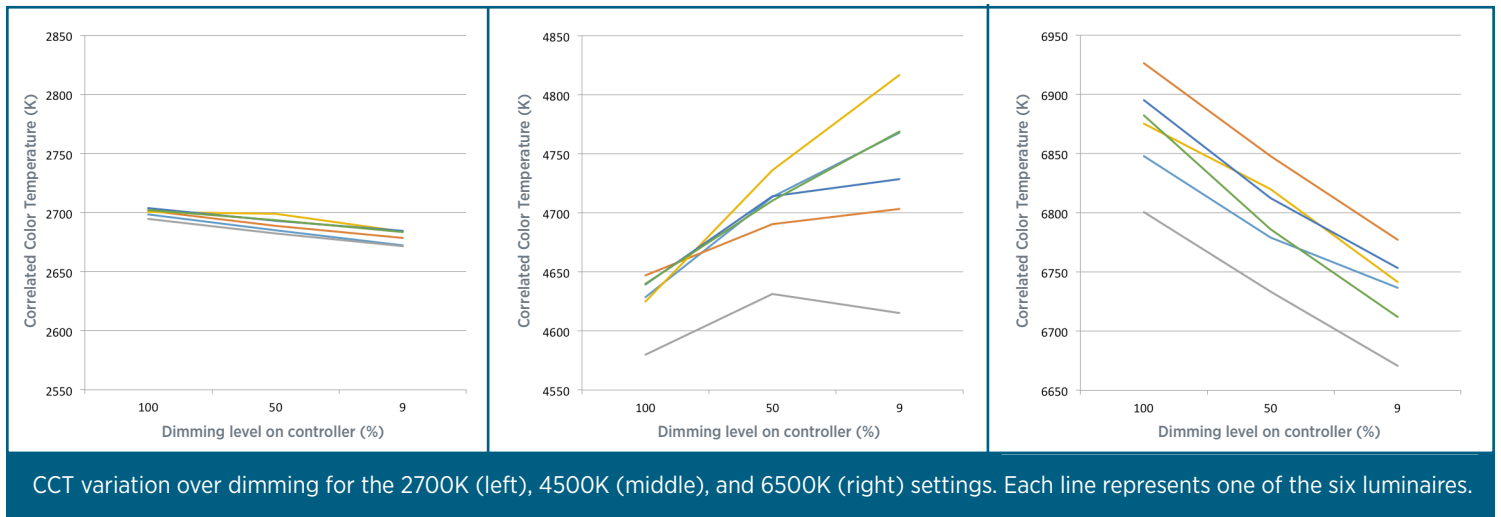
A Trial Installation

DOE’s role in the project was to take pre- and post-installation field measurements of illuminance and color quality, advise SMUD on equipment specifications, and compare the estimated energy consumption of the new system with that of the old one. The lighting solutions followed guidelines published by the Lighting Research Center of Rensselaer Polytechnic Institute, which are based on the role light is believed to play in suppressing the release of melatonin, a hormone that helps control the sleep-wake cycle. Disturbed sleep patterns are common among the residents of senior-care facilities, due not only to the results of aging but also to such ailments as Alzheimer’s disease.

At the time of specification, there were very few tunable-spectrum luminaires available that were suitable for replacing the incumbent fluorescent systems. Several different tunable-white LED systems were chosen and were installed in one corridor, two resident rooms (including bathrooms), the nurse station, the common family room, and the administrator’s office. The incumbent fluorescent systems were evaluated in August 2015 and the trial LED systems in December 2015.

The illuminance levels in the resident rooms and bathrooms did not meet current industry standards with the incumbent fluorescent system, but exceeded Illuminating Engineering Society recommendations for the over-65 age group with the LED system. Color consistency for the tunable LED luminaires used in the corridor, nurse station, family room, and administrator’s office was very good between luminaires and over the dimming range. Energy savings for the tunable LED luminaires in the





A mirror with integrated LED lighting was installed above the bathroom sink, and a surface-mounted LED luminaire with decorative lens was installed above the toilet area. The amber LED night lighting that was integrated into the railings is also shown. Photo: Pacific Northwest National Laboratory

corridor was estimated to be 68% relative to the incumbent system, considering both the reduced power and the automatic dimming.

Tuning the Spectrum

The combination of spectral tuning and dimming with the LED systems in the residents’ rooms, the adjacent corridor, and the nurse station made it possible to use light that was likely to suppress the production of melatonin from morning to midday, and that was less likely to suppress production of melatonin in the evening and at night. ACC staff documented a number of important health-related benefits that may have been attributable, at least in part, to the lighting changes. For example, among the three residents studied, agitated behaviors such as yelling and crying decreased following the LED trial installation. In addition, psychotropic and sleep medications were significantly reduced for one of the residents. And in the corridor studied, the number of

recorded patient falls decreased after the LED installation. What’s more, it was reported that residents of other corridors were now “hanging out” in the LED corridor.

Among the lessons learned from the project were that contractors aren’t yet familiar with tunable systems and controls, that finding the proper balance of automatic versus manual tuning of the lighting spectrum and intensity is challenging, and that educating residents and staff is essential when implementing new lighting solutions in senior-care facilities.

Despite the small size of the pilot study, the ACC Care Center plans to incorporate many of the lighting solutions and strategies as best practices for future renovations and expansion.

Final reports on GATEWAY indoor demonstration projects are available for download at <http://energy.gov/eere/ssl/gateway-demonstration-indoor-projects>.

GATEWAY Demonstrations

GATEWAY demonstrations showcase high-performance LED products for general illumination in commercial, municipal, and residential applications. Demonstrations yield real-world experience and data on the performance and cost effectiveness of lighting solutions. For more information, see <http://energy.gov/eere/ssl/gateway-demonstrations>.