

Reprint from the December 2009 Issue

eLECTRICAL SOURCE

Night-Time Street Lighting Powered By The Sun

Eneref Institute reports on use of solar-powered LED area light fixtures for energy saving outdoor illumination.

Solar-powered area lighting is an opportunity for the electrical business community to offer a significant new innovation to commercial facilities. One such innovative lighting company in the United States might offer a glimpse into the future of outdoor illumination.

Although, not yet along major highways, solar-powered LED light fixtures from SolarOne Solutions of Framingham, Massachusetts are beginning to show up as street lights, pathway lights and as parking lot lighting in many parts of the United States and, very recently, in a project in Canada.

In Burlington, Ontario, the Appleby Woods apartment complex just installed nearly 20 solar-powered fixtures to illuminate the entire parking lot, without any underground trenching wires. Beyond the installation of the SolarOne streetlights, Appleby Woods' commitment to sustainability includes ecologically friendly building materials and energy saving design.

The turning point for SolarOne Solutions came last year with the largest installation of solar-powered LED fixtures in the Northeast at the Massachusetts Maritime Academy, the oldest such school in the U.S. The Maritime Academy is an environmentally progressive facility so it's no surprise the

school chose to install 73 of SolarOne's solar-powered LED streetlights. The lamps were high lumen white 5,500K LEDs, creating high visibility without glare because of the high color temperature of the low-level lighting.

The Academy's primary goal was to

height, some decorative options for the entrance, white lighting and special lighting effects.

The existing HPS fixtures, with yellowed acrylic lenses and isolated floodlights, offered poor color rendering and produced high levels of glare. And the project's architect, Karen Dubrovsky of Prellwitz Chilinski Associates, in Cambridge, Massachusetts, wanted to remove the old mismatched lighting as well.

"LED lighting feels more natural and appealing than yellow and orange sodium lighting. SolarOne Solutions combines the best of both worlds; beautiful LED lighting and photovoltaic solar power by employing a unique



Appleby Woods Apartments

upgrade the existing campus lighting as well as reduce areas of insufficient lighting. They also wanted a low pole

management system to control both for maximum efficiency and reliability" affirms SolarOne Solutions President,

Moneer Azzam.

The fixtures are powered by photovoltaic (PV) cells that convert light energy into electrical energy. The system receives all its power from the sun. What sets these fixtures apart is a technology called SO-Bright that makes them far more efficient and reliable, ensuring that the lights are always on at night, regardless of cloudy days or long winter nights.

The very nature of LEDs is fundamentally compatible with solar energy. You can think of LEDs as the inverse of solar cells. A solar cell is a semi-conductor that converts light to electricity, while an LED is a semi-conductor that converts electricity to light. During the day, sunlight on the solar panels creates an electrical current. A controller manages the process and uses maximum power-tracking to match the panel's production of energy to the battery.

And unlike other types of lighting, LEDs can be controlled to adapt to the ebb and flow of changing weather patterns and seasons. For example, from mid-November through mid-January, in the Northern Hemisphere, solar panels receive less sun. And unlike, say, fluorescent lights, LEDs improve under colder condition, which is when the solar system needs it the most.

Brighter is not necessarily better. More than any other lighting system, properly designed LED systems offer uniform lighting; and uniform lighting is actually easier on our eyes than a mix of bright spots. That's because our eyes adapt to one particular light level easily, but we have more difficulty adjusting to variations in light levels.

The Massachusetts Maritime Academy found the streetlights easy to install. The installation preserved the land by eliminating the trenching and repaving required for underground lines of conventional streetlights. The technology is housed inside an attractive Hadco Lighting Company design. The fixtures have a decorative appeal and of course offer the Academy bragging rights that come with installing

environmentally friendly lights.

Not all solar-powered streetlights work in every situation. Superior solar lighting design mandates that the system operate through the longest night, and thereby charging its battery on the shortest day. Under these conditions, the needs of the battery are not always well matched to the power characteristics of the solar panel. Winter in the northern latitudes is the greatest challenge for solar-powered lighting.

A technology developed by SolarOne is what makes the system possible. The system, called SO-Bright Maximum Power Tracking (MPT), marries the LED light output with the solar energy input and is the electronic brain. The technology actually captures more energy from the solar panel in winter months while providing additional runtime through sunless periods. Generally, the better the lighting system - brighter, longer lasting lights - the bigger the solar panels that are needed. However, with SO-Bright, the size of the solar panels are reduced by half that of ordinary panels.

At Massachusetts Maritime Academy, twenty two SolarOne fixtures were set up at one of the entry drives. Each had a mounting height of 14-ft and provided 8.3 Lux. In the parking lot area eight units were set up with a 20-ft mounting height that offered as much as 1.64 Lux. Along pathways, 43 12-ft fixtures with 8.3 Lux were assembled.

Unlike grid-wired LED lighting, solar-powered lighting requires more planning. SolarOne Solutions is instrumental during initial specification phase; determining the solar array needed to produce sufficient energy to serve the electrical load under all the conditions.

The second key step is estimating how many, sunless days to expect. For sunnier climates SolarOne generally recommends no less than 4 to 5 days of battery power storage, and 10 days for cloudier regions. And when placing solar panels, consider that the best orientation of the panels is south, but al-

so that performance can be affected by the shadows of trees or buildings.

According to Moneer Azzam, SolarOne President, the MPT algorithm essentially joins the power characteristics of the solar panels and the LED lights, ensuring that the maximum amount of energy available from the solar panel finds its way into the battery. "This advancement in solar-powered lighting control addresses charging efficiency when and where our customers need it most," says Azzam.

Particularly extraordinary is the projected lifespan of the system; the LEDs and drivers have a projected 11 years and the batteries up to six years. The solar panels have a 25-year lifespan. The system itself - battery and LEDs - is very low maintenance and the Academy can respond quickly to knockdowns because of the full backup system.

Ming-Jay Shiao of Solar Design Associates was the Specifying Engineer who advised the school to employ the SolarOne Solutions light fixtures. Gregg Conboy of Erland Construction was the General Contractor for the project and said that setting the fixtures in place was straightforward.

Architect Erika DeRoche, PCA of Prellwitz Chilinski Associates was instrumental in the overall campus lighting design.

SolarOne Solutions was the first solar powered lighting company to offer max power tracking, and the first to use solar powered LED lighting for general illumination. The fixtures are suitable for a large variety of applications. And fitting can be reconfigured to complement a variety of applications, pole types and sizes. Using dedicated precision LED optics, light distribution and uniformity can be controlled with far greater accuracy.

Of course solar-powered lights eliminate electricity bills, but various in-

centives and tax credits in the US from utilities as well as from local, state and federal agencies help fund projects. The Eneref Group maintains a list of the various associations, many of which provide information to navigate the complex world of government and non-government funding. ●



This article is an
excerpt of the future
Eneref report which
assesses the im-

pediments to building zero-energy urban communities in the US. A companion film documentary, The Eneref Project, will seek to demonstrate to key decision-makers how zero-energy communities can be commercially viable.



Mass Maritime Academy



The Massachusetts Maritime Academy found the streetlights easy to install.