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Focus

Place in the Sun

Solar LEDs present opportunity for general aviation contractors and airports

by [Debbie McClung](#)
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As an autumn sunset faded from the Waukon Municipal Airport in October 2009, history was made for the general aviation (GA) facility located in the northeastern tip of Iowa. After more than 40 years of operation, the traditional pilot-activated runway lighting system was replaced with self-contained solar light-emitting diodes (LEDs)—the first solar installation of its kind in the state.



The concept of the sun powering airfield visual guidance lighting was scarcely a possibility 10 years ago. Although on the radar, it was overshadowed by nearly two decades of Federal Aviation Administration (FAA) research, testing and the slow adoption of solid-state LEDs over inefficient incandescent lamps. The U.S. Department of Energy estimates that 50 million kilowatt-hours of electricity alone could be saved annually in the country if all taxiway luminaires were changed over to LEDs.

Today, photovoltaics are launching LEDs to a new level of utility for general aviation and commercial airports. Advances in off-grid LED technologies are shifting global discussions to sustainable technologies that can complement or replace existing lighting and save aviation entities money in both the short and long term, said Allister Wilmott, founder and director of Aviation Renewables Corp.—a consulting company that collaborates with national and international industry stakeholders, including the Illuminating Engineering Society of North America Aviation Lighting Committee (IESALC), the FAA, the U.S. Department of Defense and the North American Treaty Organization.



Solar LED fixtures can be mounted to frangible couplings or various obstructions.

“GA airports are no longer limited to a conventionally electrical powered lighting system or battery system if used for emergency or sporadic services. They have the option to procure self contained (solar cell, battery, LEDs, and fixture all in one unit) solar-powered LED runway edge, threshold, taxiway, obstruction, helipad, PAPI, airfield signs and wind cone lights,” Wilmott said.

Landing support for GA

Waukon, which is one of 31 smaller public-owned airports in Iowa, and another 1,900 nationwide that are not eligible for federal funding through the FAA, sought Airport Improvement Program (AIP) state grant assistance to relight the edges of its new 2,500-foot asphalt overlay project. Kay Thede, aviation program manager, Iowa Department of Transportation's Office of Aviation, said the solar alternative was determined to be the most feasible method to supplement rehabilitation efforts for an airfield with relatively low activity

levels, yet it supports vital local air transportation and specialized activities, such as agricultural applications, flight training and physician visits.

The investment in the contractor-installed 44 runway and threshold units has been win-win.

“The state and city saved \$8,000 over a standard buried cable, savings that can go toward additional projects. At the same time, the city will reap the benefits each year with lower electrical bills while using an environmentally friendly lighting system,” Thede said, adding that, “the Iowa DOT is viewing this as a pilot project to see if solar lighting can play a bigger role in the state's air transportation system.”

Self-contained solar fixtures eliminate the need for powered infrastructure, including cabling, regulators, transformers, trenching, conduit, vaults and power controls. In addition, typical LED benefits extend to their solar counterparts, including longer lamp life and a decrease or total elimination of energy consumption without compromising functionality.

“The solar lights do the same job as the other lights,” said Frank Byrnes, Waukon Airport manager.

Industry experts report that solar-powered LEDs are well suited to the GA sector and have received FAA support due to their plug-and-play design in environments—especially remote locations—where power may be unavailable, unreliable or too expensive to design, install and maintain.

Limitations for commercial

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U.S. military training bases abroad have embraced the low-profile portable lights.

There are viable applications for international commercial aviation, but limitations exist with LEDs and their solar cousin that are currently restricting their implementation in the United States. Industry experts have cited issues such as lower intensity levels, lack of a tethered backup power source and the inability of LEDs to radiate enough heat to melt ice and snow from the luminaire's optics. Marcia Alexander-Adams, FAA spokeswoman, said the FAA has not drafted a policy or equipment certification that relates to solar in airfield operations.

"The only concern we have is that batteries have sufficient capacity to last through periods of lack of sufficient sunshine to recharge them," she said.

This consideration has curtailed usage at commercial service airports, with the exception of the approved application for solar power obstruction lighting, such as construction barriers, fences, poles, towers, which is detailed in FAA Engineering Brief (EB) No. 76, "Using Solar Power for Airport Obstruction Lighting" (Jan. 11, 2008).



Solar LEDs can be staked into the ground, asphalt and concrete.

The brief states, "A direct current (DC) powered L-810 LED obstruction light may typically use one-tenth of the power required for an equivalent incandescent light. The innate power efficiency inherent in LEDs allows much smaller solar power systems than previously possible. When coupled with recent technology advances in photovoltaic solar panels (and associated components like batteries), solar-powered LED lights can become a cost-effective option. This is especially true for tower lighting applications when the distance from commercial power lines exceeds one-half mile. The cost for an extension of a commercial power line can range from \$10,000 to \$30,000 per mile, depending on location and terrain. In many cases, a solar power system can be designed for half the cost of a commercial power line."

Solar fuels longevity

Australia-based Avlite Systems Inc. develops and manufactures portable and permanent solar-powered airfield and obstruction lighting solutions to International Civil Aviation Organization and FAA specifications. First used in Australian marine markets, the systems are now applied to aviation to aid emergency medical and humanitarian efforts worldwide. Overseas, U.S. military training bases have embraced the low-profile lantern-shaped portable lights that sit on a nonskid rubber tile base or can be mounted to frangible couplings and staked into the ground, asphalt or concrete, or it can be mounted on various obstructions.

P.J. Dillon, Avlite business development manager for North America, pointed out that the initial capital expenditure for solar systems is comparable to procuring traditional lighting equipment, but the efficiencies of the fixtures can contribute to a shorter return on investment and a longer lifecycle.

"What airports like about the lights is their longevity. Their 100,000 hours of life works out to be 22 years based on a 12-hour night. The batteries last 3 to 5 years, so there's zero scheduled maintenance for at least 3 years," Dillon said.

Like their powered counterparts, the most common problems, users say, are strikes sustained from mowers and snow plows and the occasional collision with an aircraft. Mike Rogan, aviation support officer, Aeronautics Division of the Montana DOT, said state-owned Seeley Lake Airport is a grass landing strip on the perimeter of a scenic Montana flying community where a pilot recently skidded over four AV70s before coming to a full stop.



Airfield obstructions, such as fences, can be economically marked at night with mountable solar LEDs.

"It busted them up, but they never quit working. We were able to repair three of them. They have good batteries and they're durable and tough. The only drawback I see is they're not a real high intensity light," Rogan said.

Solar takes off in multiple applications

Following a lengthy and costly traditional lighting project at another state-owned airport, the Montana DOT decided to employ 26 AV70s along the majority of Seeley Lake Airport's 4,575-foot runway, as well as placement on both thresholds. A local pilot assists in their winter protection.

"When the runway needs to be plowed, a user picks up the lights and stacks them in snow drifts to protect them from the plow blades," Rogan said

The state grant-funded solar fixtures complement the facility's windsock, which is uplit by a separate solar-powered system mounted on the pole's cross arm.

Cash-strapped GA airports have identified multiple uses for solar LEDs but perhaps none with such an unusual driving force as St. Lucie County International Airport in Fort Pierce, Fla. An active flight school population that routinely exceeded established landing pattern boundaries annoyed residents, creating a noise compatibility issue. St. Lucie Airport Director Diana Lewis said that despite several



attempts to educate pilots, a unique abatement approach resulted in contractor-installed radio controlled AV70s mounted on a row of electrical poles. The lights, Lewis said, cue pilots to make a turn that keeps their aircraft within the landing pattern.

The FAA estimates the cost for an extension of a commercial power line can range from \$10,000 to \$30,000 per mile, but PV systems can be designed for half the cost.

Additionally, when the Florida DOT required the airport to deploy obstruction lighting to mark 2,000 feet of a chain link fence it determined was too close to the centerline of the main 6,500-foot runway, solar fixtures were the choice.

A bright future for contractors

Wilmott, a member of the IESALC's GA Committee, believes solar lighting is greatly untapped for the nation's noncommercial airports.

"Approximately 14,000 general aviation airports and heliports exist in the U.S. I would say that only 1 to 4 percent of GA airports are using solar LED lighting in some capacity," Wilmott said.

As solar lighting grows, so too do the opportunities for contractors. For hybrid solar LED lighting systems with high-voltage cables, Wilmott said, the opportunities are very similar to installing conventional cable airfield lighting systems.

"For visual flight rated airfields that do not require cables, a qualified electrical contractor may still be required to safely and properly install the self-contained lights," Wilmott said. They may also play a role in the testing and installation of radio frequency communications.

"They are an important part of the solutions, especially as the technology advances into greater, more permanent applications at higher lighting levels, such as instrument-flight-rated airports," Wilmott said.

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