a division of Hubbell Lighting, Inc.

LED SOLAR-POWERED WALKWAY LIGHTING

Retrofit Project at US Marine Corps BEQ

THE CHALLENGE

Mandates currently set forth by the U.S. federal government pertaining to federal facilities* make solar-powered LED lighting an ideal solution. One requirement is that federally owned property and buildings are mandated to materially reduce current energy use. A second requirement is to improve energy "security," by employing renewable power that operates independent of electrical utility grids.

Federal Energy Policy Act of 2005,
Executive Orders 13423 and 13514

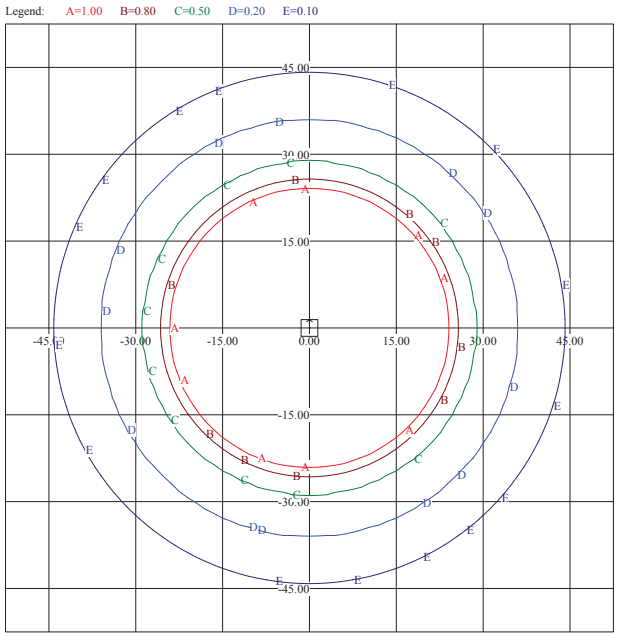
P R O J E C T

At a U.S. Marine Corps Bachelor Enlisted Quarters installation, there were 172 area and walkway lights previously installed and operating. Light fixtures were “post-top” pole-mounted luminaires using high-energy-consuming 150-watt high-pressure sodium lamps. Goal of the project was to disconnect the BEQ lighting and retrofit with much lower-watt, higher-quality, longer operating-life light from solar power; thus, the area would be completely off a costly, potentially compromised public electrical grid.

The most efficient, economical way to meet federal mandates was to reuse existing light poles, and attach new, more efficient LED post-top fixtures that provided equal- or better-quality light than high pressure sodium. Technical calculations determined that an 18-watt LED direct light fixture, “Slide”, from Beacon Products, proved superior and was cost effective. All existing light poles were reused, with existing underground conduits and wiring in most locations. Ground-mounted stand-alone solar electric power arrays were installed, able to operate up to four fixtures each.

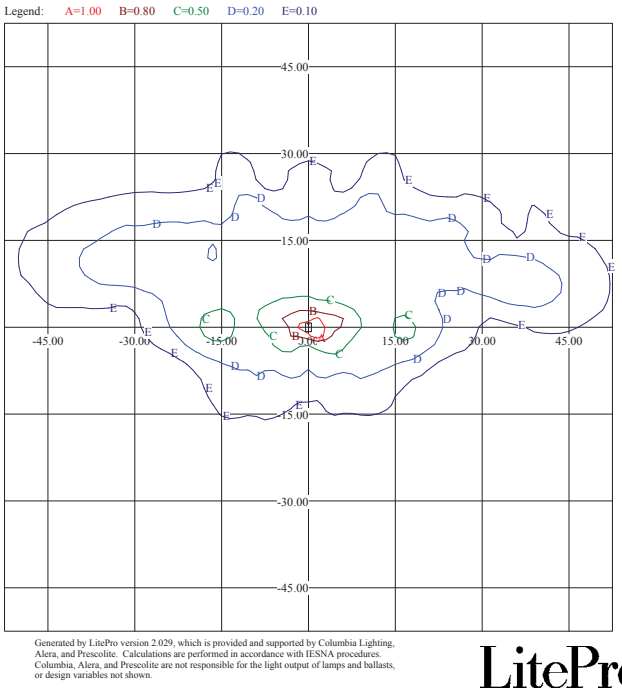
THE METHOD

The current layout and locations of the existing light poles as well as distances were researched. Then a fixture design was chosen which was able to meet the guidelines which are necessary to meet the current light output with 1/10th the power. A fixture must perform at its best optically while also taking into consideration the life cycle and maintenance costs, thermal management, and lamp power consumption. Beacon was able to meet that challenge. We then complete a lighting study to meet lighting guidelines for walkways and determined that the 18 Watt Slide fixture would be used.



150 WATT HPS

The solar power design determined how many fixtures could be powered with one small distribution feeding the current wiring. The sun power was studied for the area of installation as shown in the graph. We mounted the solar modules at optimum tilt for maximum exposure during winter December sun averages. We used an array of 4-85 Watt single crystal photovoltaic modules. The array is able to produce 19.4 amps of power into a battery storage device for each hour of sun. The sun power on the chart for the area states 4.73 sun hours, Multiplying the 19.4 amps provided by the modules x 4.73 sun hours = 91.76 amp hours being able to be put into the battery storage device each night. The fixtures draw 18 Watts @ 12 VDC draw 1.5 amps per hour, operating dusk to dawn for 13 hours in the area would require 19.5 amps x 4 fixtures on an array= 77.6 amps to be taken from the battery storage device for each night. The battery sizing had to provide over 5 days of operation with no sun therefore a 448 A.H. battery storage device was used. Operating 77.6 amps for 5 nights = 388 amps hours, rendering over 5 days of storage for secure off grid stand alone site lighting.



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LitePro

18 WATT LED

THE OUTCOME

The use of clean renewable energy products has reduced the exterior lighting energy consumption and is not affected by grid power interruption. The BEQ light fixtures operate dusk to dawn. They formerly consumed 371,520 Watts of costly grid power each night. New LED lights operate with improved white-lighting quality, far lower maintenance costs, and higher visual acuity for enhanced facility security. The new solar units draw zero watts electricity, and are completely independent of an outside electrical utility grid.

Proven LED Efficiency

Beacon Products only uses the latest proven LED chips & driver manufacturers with controlled junction temperatures for a long life expectancy.

Site Information

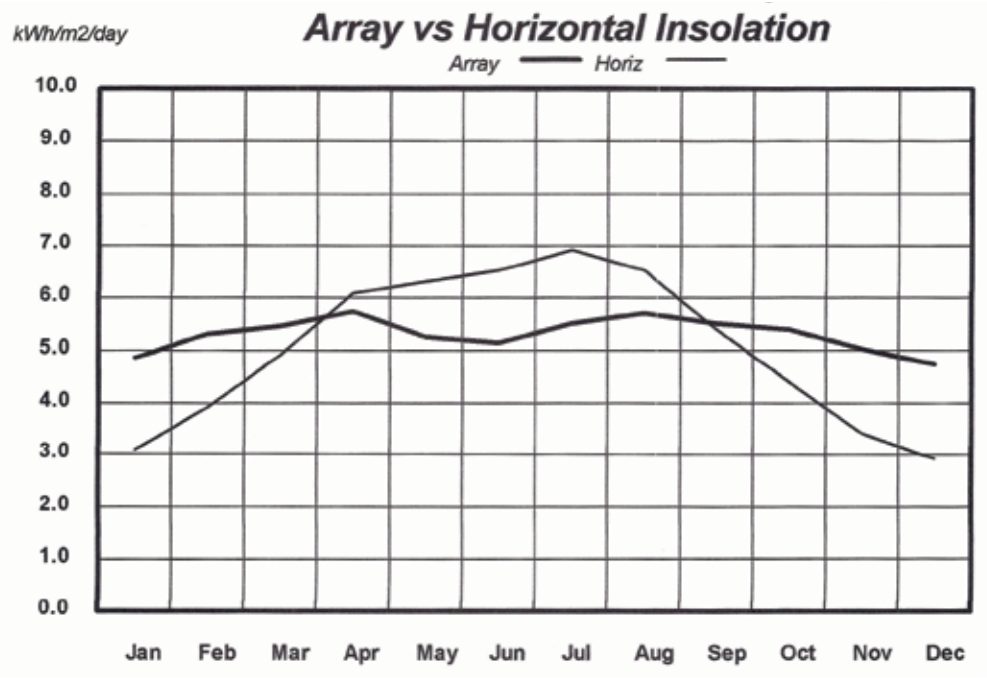
Site Name:
City: **SAN DIEGO**
Country: **USA**
Latitude: **32.7 deg N**
Longitude: **117.2 deg W**
Prepared by:
Comments: **NREL : 23188**

Region/State: **CA**

Elevation: **9 m**
Array Tilt: **45 deg South Facing**
Array Azimuth: **0 deg**

Insolation Information

Month	*Horizontal Insolation (kWh/m2/day)*	*Avg Daily Temperature (deg C)*	*Clearness Factor (KT_Bar)*	*Tilt Factor*	*Array Insolation (kWh/m2/day)*
Jan	**3.10**	**14.1**	**0.58**	**1.57**	**4.87**
Feb	**3.90**	**14.8**	**0.59**	**1.36**	**5.30**
Mar	**4.90**	**15.3**	**0.58**	**1.11**	**5.45**
Apr	**6.10**	**16.7**	**0.61**	**0.94**	**5.76**
May	**6.30**	**17.8**	**0.57**	**0.84**	**5.26**
Jun	**6.50**	**19.3**	**0.57**	**0.79**	**5.13**
Jul	**6.90**	**21.7**	**0.62**	**0.80**	**5.52**
Aug	**6.50**	**22.6**	**0.62**	**0.88**	**5.72**
Sep	**5.40**	**21.9**	**0.59**	**1.02**	**5.52**
Oct	**4.40**	**19.8**	**0.60**	**1.23**	**5.40**
Nov	**3.40**	**16.7**	**0.58**	**1.48**	**5.02**
Dec	**2.90**	**14.1**	**0.58**	**1.63**	**4.73**
				Minimum:	**4.73**
				Average:	**5.31**



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