PRODUCT UPDATE

The Solar Renaissance operating system was first piloted in the fall of 2007 in Sullivan County, NY, and by the summer of 2009, it was operating reliably in more than one thousand systems across the US and internationally. Due to rapid efficiency improvements in LED technology, the Solar Renaissance product now requires 25% fewer LEDs and 30% less solar panel surface area to produce satisfactory light output. These improvements mean that 10% to 15% fewer fixtures will be needed for a given location. All these factors make for a most promising future.

WARRANTY INFORMATION

The standard warranty on Philips HADCO fixtures is three years. This is intended to address the finish of the product and is standard in the lighting industry. The structural aspects of the Philips HADCO fixtures have been demonstrated to last for decades.

SolarOne® offers a standard five year warranty with all the systems it sells, with a provision that discounts the value of the battery on a pro-rata basis – therefore reducing its value 20% per year. Beyond 10 years, only the solar panel is covered by a power warranty that runs for a total of 10-25 years.

The parts and estimated lifetime are as follows:

- **Lamp (10-15 years)**
- **Driver (10-15 years)**
- **Battery (5-7 years)**
- **System Manager (10-15 years)**

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SOLAR RENAISSANCE LAMP POST Toolkit

DECEMBER 2009

This toolkit is designed to help local officials make informed decisions about siting solar lamp post projects in their communities. It contains valuable information on choosing a site, preparing the site, installation and maintenance.

About Sullivan Renaissance

Sullivan Renaissance is a beautification and community development program that provides seed grants to communities in Sullivan County, located in the Catskills Region of New York State.

The program, principally funded by the Gerry Foundation, is a recognized leader in bringing innovation and best practices to over 400 community revitalization and volunteer beautification projects since it began in 2001.

In 2007, a project to brighten three communities with solar-powered lamp posts was initiated by Sullivan Renaissance. Project partners included the **New York State Energy Research Development Authority (NYSERDA)**, **Philips HADCO**, and **SolarOne ® Solutions.**

A total of twenty-four prototype “Solar Renaissance” lamp posts were installed at three sites in Sullivan County: Bethel Woods Center for the Arts, Swan Lake Park in the Town of Liberty, and the Village of Woodridge.

Photo credit: Moneer Azzam (top); Nick Skinner (center and bottom right); PhilipsHADCO (bottom left)

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Sponsors & Project Partners

Gerry Foundation

Sullivan Renaissance

New York State Energy Research and Development Authority (NYSERDA)

Philips HADCO

SolarOne® Solutions

Bethel Woods Center for the Arts

Town of Liberty

Village of Woodridge

Why Solar?

Beginning in 2006, Sullivan Renaissance staff started exploring ways to bring period style lamp posts to our quaint village main streets as part of our beautification and community development efforts. However, lighting an outdoor area at night typically requires high-powered light sources, which consume relatively large amounts of energy. Wiring can be cost prohibitive and we were also concerned about light pollution. This led our staff to explore whether off-grid solar lighting could be a solution to this challenge.

We reached out to leaders in the solar lighting industry, and were inspired by a presentation given by Dr. Richard Perez, Research Professor, Atmospheric Sciences Research Center at the University at Albany, and Moneer Azzam, President of SolarOne® Solutions, who told us "solar **can** make sense in New York."

We continued to work further with a forward thinking team including SolarOne® Solutions, Philips HADCO, and the Lighting Research Center (LRC) of the Rensselaer Polytechnic Institute, among others, to bring the latest developments in solar technology to community groups participating in Sullivan Renaissance projects. In this process, a "Renaissance Model" solar lamp post outdoor lighting fixture was created, using existing components of photovoltaic (PV) panels designed as banners, aesthetically pleasing victorian style lamp posts, with hanging baskets and leading edge software. The fixture was designed to address the considerations of architects, planners, municipal officials, and residents who are looking for a traditional style lighting fixture powered by the latest solar technology.

Sullivan Renaissance discussed with different communities the prospect of participating in a NYSERDA solar lamp post demonstration project. The objective was to study three different "real-world" site locations for the solar Renaissance lamp post so that a range of applications could be field tested to increase the likelihood of other areas in New York State "going solar" for their outdoor illumination needs. Independent research conducted by the LRC included performance of the systems and components, energy savings, lighting conditions provided, life cycle costs, residents' opinions of the systems, maintenance and other important factors. A Field Test DELTA publication has been completed and is available for free download from the **LRC website:** http://www.lrc.rpi.edu/programs/delta/index.asp.

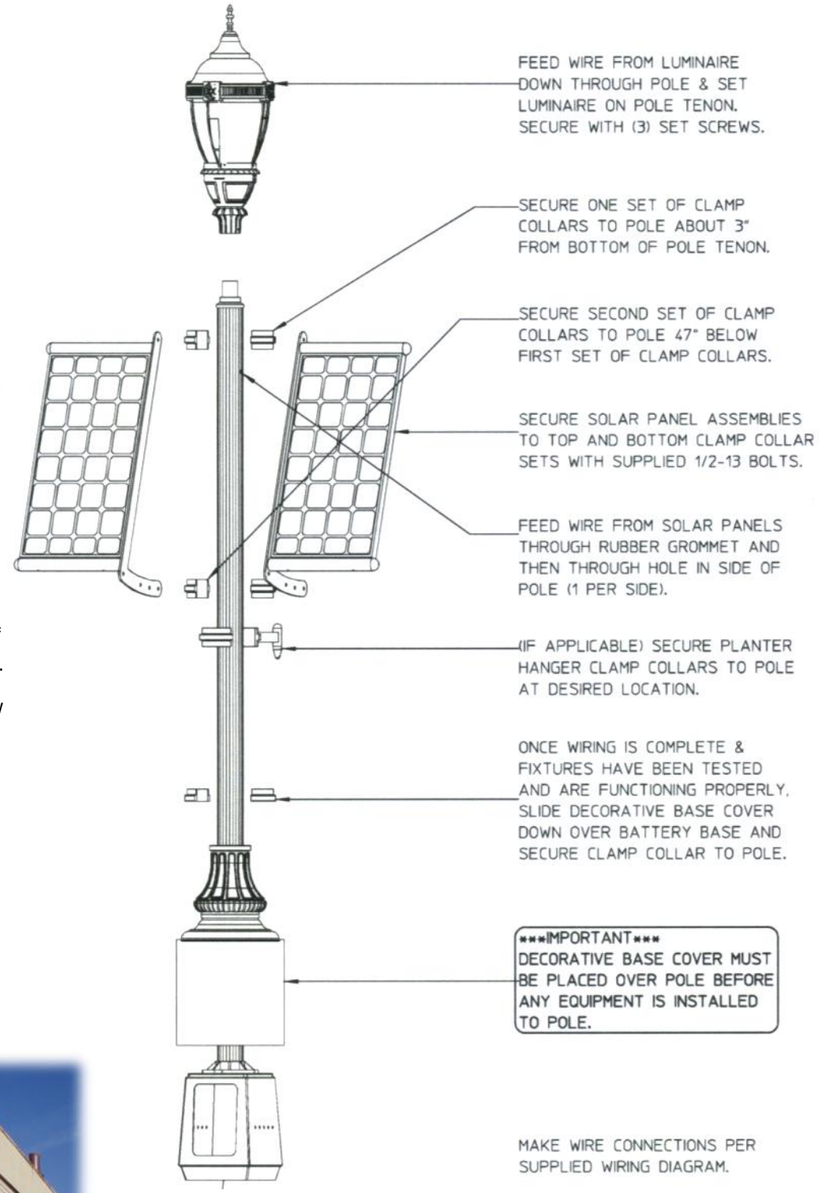
This demonstration project has proven to be a catalyst in creating collaborative public-private solar partnerships in demonstrating successful environmental technologies.

Solar interpretive banners, designed by Alt Technica (approximately 42" high x 21" wide), on the back of the photovoltaic panels of the solar Renaissance lighting system, communicate the presence of solar energy and announce the collaboration between Swan Lake Park and Sullivan Renaissance.

Installation & Maintenance

- Personnel characterized the installation of the Renaissance luminaires as easy.
- Neither cleaning nor snow-shoveling of PV panels was necessary in the winter.
- Installation can be done by facility crew or public works employees.
- As with any piece of hardware, there must be a commitment to ownership and maintenance. Periodically doing a visual inspection and running a couple of diagnostic checks (battery voltage, solar panel voltage, error check) is suggested but not mandatory. We expect battery replacement will be needed every 5 to 7 years.

Detailed Installation Instructions



Lessons Learned

What You Need to Know

Selecting the Product

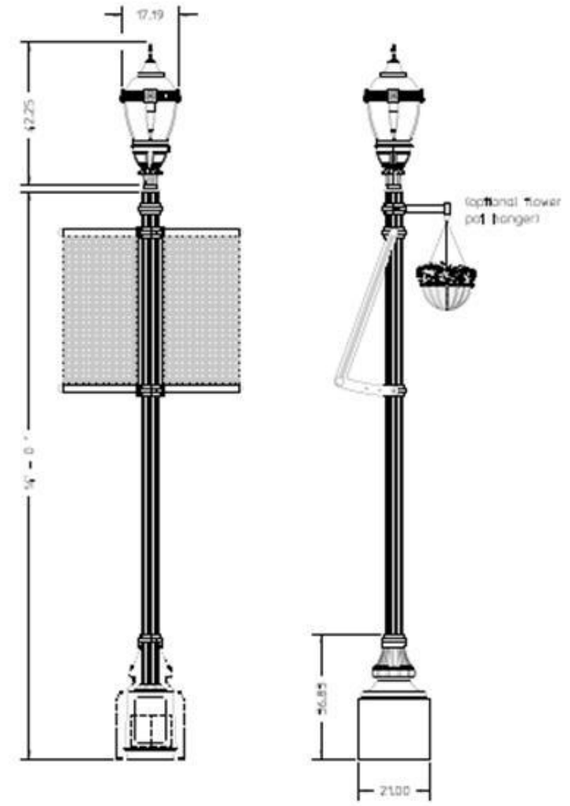
- The solar and battery system must be sized for the worst-case weather conditions for a given location. This is a service offered by solar engineers and some solar lighting manufacturers.
- System should conform to “best practices.”
- Solar lighting comes in a wide range of styles, light-levels and costs to match your needs. Traditional decorative fixtures will range from $7,000 to $10,000 per lamp post and there are basic fixtures available that range from $3,600 to $6,500.
- Consult with a local or regional lighting representative to explore options.

Selecting the Site

- The site must have adequate sun exposure and orientation with few shading obstacles (buildings, trees). Ideal orientation is pointed to the south at a tilt that equals latitude + 15 degrees from the horizontal. In other words, if the site is at 40 degrees latitude then the panel should be tilted at 55 degrees from horizontal. The solar panel should have good solar access between 10 and 2 pm in the middle of December.
- A professional shading analysis may be required for difficult sites. At the simplest level, shading can be estimated with photographs, sketches or measurements. A more detailed level requires a site visit and a shading analysis tool at the solar panel location. There are physical tools and there are digital tools available to perform this analysis.
- Consider distance and costs of hooking up to electric grid.
- Solar lighting can support LEED certification. Consider local, state or federal incentives.

Preparing the Site

- The foundation should be engineered to meet local codes for the given load, soil and temperature conditions.
- Municipal/institution engineer provides CAD drawing to lamp post manufacturer from which an application layout is created.
- Application layouts reviewed, revised or approved by solar engineer using the preliminary shading analysis.
- Municipal/institution engineers make recommendations for the width and depth of concrete footings based on wind load and safety parameters.



Schematic drawing of the “Renaissance” PV-powered outdoor lighting system (courtesy: PhilipsHADCO)

About the Design

The solar Renaissance LED system design was inspired by Sandra Gerry, Chair of Sullivan Renaissance, to address objections of architects and planners who consider lighting systems powered by solar panels and batteries as aesthetically unappealing. Philips HADCO and SolarOne® Solutions jointly developed a solar powered lamp post for decorative lighting.

This lighting system seamlessly integrates state-of-the art photovoltaic power and LED lighting technology managed by SolarOne’s intelligent MC2 controls, into a classic Hadco Hagerstown traditional fixture. The result is a stylish street light that operates independently of the electrical grid.

The prototype solar “Renaissance” lamp post was unveiled at the **Sullivan Renaissance Winter Conference** in February 2007 at the Event Gallery at Bethel Woods Center for the Arts. The enthusiastic responses from conference participants led Sullivan Renaissance to explore collaborations and funding opportunities to help demonstrate this technology, independently evaluate it and bring it to a commercial level.

Sullivan Renaissance 2007 Winter Conference

PRODUCT INFORMATION

"Solar Renaissance" is a photovoltaic solar-powered LED luminaire. The manufacturers, Philips HADCO and SolarOne® Solutions, redesigned a conventional post-top luminaire to operate four LED modules, which are mounted in the top of the luminaire and oriented to face downward.

The system is powered by two deep-cell batteries that are charged by two photovoltaic panels, 5.9 sq. ft. (0.5 m2), and peak power rating of 90 W each. These are mounted at 20° from vertical and are oriented to face south. Battery charging (daytime) and discharge (night) is controlled by a system controller located at the base of the pole. An additional LED controller determines output and duration; the system is typically programmed to operate for 6 hours commencing at sunset at full output, and then reducing output to approximately 30% output for the remainder of the night.

HOW SITES WERE CHOSEN

Sullivan Renaissance sought community partners with priority given to:

- Lamp post areas with a high degree of visibility to the public
- Sites with adequate sun exposure and orientation with few shading obstacles
- Communities with an adequate municipal budget for installation, shipping, handling and incidental replacement costs for lamp post parts. The estimated cost to the municipality per light was $750.00 per lamp post. (This turned out to be an accurate estimate for 2 of the 3 installation sites).

PROJECT PARTNER COMMITMENTS

- A resolution passed by the Town/Village Board to agree to participate as a partner for the purposes of the NYSERDA grant application.
- A letter of commitment from the Town/Village Board to become a partner at one of the site locations on the basis that the grant will be awarded to Sullivan Renaissance as the lead organization for this demonstration project.
- Willingness of the municipality to participate in an experimental demonstration project.

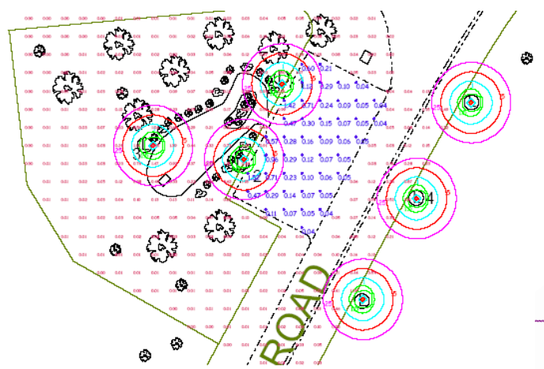
BETHEL WOODS

The area selected at the **Bethel Woods Center for the Arts** was the street and parking lot adjacent to the monument marking the original site of the 1969 Woodstock concert located on West Shore Road and Hurd Road in Bethel, NY. The country road has minimal ambient light and minimum obstructions of sky. A shading analysis and application layout was provided by SolarOne Solutions. The photometric plot below indicates the actual layout of the systems, overlaid from the shading analysis readings recorded previously during SolarOne initial site visit. Four solar Renaissance systems (17 feet tall) were installed by Bethel Woods facilities staff and two systems were added as part of the NYSERDA project.

Summary of Installation Costs for Lamp Posts:

Engineering for footings	640
Dig holes	650
Pre fabricated concrete footings & anchor bolts (6 @ 450)	2,700
Luminaire (8,500 x 6)	51,000
Total:	**54,990**

The Bethel Woods installation took a 3-man crew less than 2 days to complete. The first lamp post took about 3 hours to install. The remaining 5 lamp posts took 1-1/2 to 2 hours each to install.



VILLAGE OF WOODRIDGE

The **Village of Woodridge** had planned to replace eight existing high pressure sodium lamp posts that were in disrepair. This presented an opportunity to evaluate possible cost savings benefits to the village by using off-grid PV-powered lamp posts.

The village wanted to keep the existing electric as a backup as they were skeptical about solar and wanted to have holiday lights, which the solar lamp posts could not accommodate. Holiday lighting is something the solar industry needs to consider in the future.

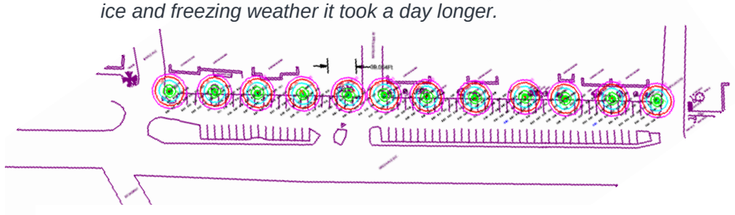
The village engineer provided Philips HADCO with a CAD drawing from which the application layouts were created. The application layouts were reviewed and revised by engineers from SolarOne Solutions using the preliminary shading analysis taken from the site.

Measurements taken by the LRC reveal that light levels under the new lighting are both greater and more uniform than the lighting that was there before. Surveys indicate that people greatly prefer the new lighting over the old, are able to more clearly recognize people approaching them on the sidewalk, can see better, and feel safer and more secure.

Summary of Installation Costs for Lamp Posts:

Engineering design & Construction Supervision	3,337*
Dig holes and sonotube installation (1,200 x 12)	14,400
Luminaire (8,500 x 12)	102,000
Total:	**119,737**

** The higher engineering costs reflect extra labor because the poles of the lamp posts were shortened to 14-feet to accommodate a 30" concrete footing extending above ground requested by the village to prevent possible lamp post damage by head-in vehicle parking. Removal of the old lamp posts and new wiring was at the community's expense and not part of the demonstration project. Installation was originally estimated to take two days, but with snow, ice and freezing weather it took a day longer.*



SWAN LAKE PARK

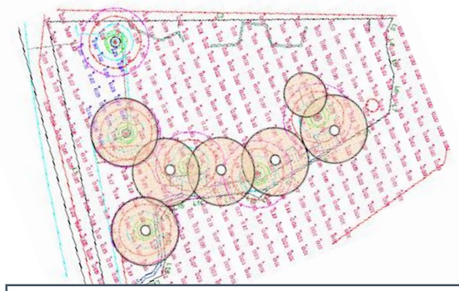
Six luminaries on 14-foot poles were installed at **Swan Lake Park** to illuminate a new wooden boardwalk next to a small lake. Due to an issue of potential flooding in the area, the town engineer recommended raising the concrete footings 30" above ground. The community chose to cover the concrete with decorative block.

In Swan Lake, results with the LED lighting were similar to Woodridge. Overall, opinions about visibility were positive.

Summary of Installation Costs for Lamp Posts:

Engineering for footings	640
Dig holes	650
Pre fabricated concrete footings & anchor bolts (6 @ 450)	2,700
Luminaire (8,500 x 6)	51,000
Total:	**54,990**

The Swan Lake installation took a 2-men crew 2 days to complete.



SUMMARY OF FINDINGS:

Community residents were generally happy with the PV-powered LED lighting system, providing positive feedback concerning its appearance and function, and felt that it provided appropriate illumination for a variety of sites within these rural communities. A PV-powered LED outdoor lighting system may present a viable alternative to grid-connected systems in situations where grid power is either unavailable, or costly to bring to a site.