Going Green With Solar Panels

Solar energy options today are capable of meeting electrical needs for golf course maintenance facilities and can pay for themselves over time.

BY ANDREW J. JORGENSEN

For obvious reasons, renewable energy continues to warrant significant attention and demand in nearly every industry today. Fortunately, as technology continues to improve and greater efficiencies in real-world scenarios are achieved, solar systems are becoming more practical than ever before. In this case study, the method of capturing solar energy for conversion into usable electricity is being utilized with great success at Candler Hills Golf Club in Ocala, Florida.

In 2011, a solar system comprised of 297 photovoltaic panels was constructed atop the maintenance facility at Candler Hills Golf Club. Photovoltaics are a method of generating electrical power by capturing solar radiation and converting it into usable energy. For our system, inverters are used to convert direct current (DC) solar energy captured from panels on the roof into alternating current (AC) electricity that can be used to power building utilities and equipment and charge batteries.

The 297 solar panels combine to produce roughly 56,000 DC watts of energy and, for our location in central Florida, approximately 90,000 kilowatt hours (kWh) per year. This is more than enough to meet all of the electrical needs at our facility. Any unused power can be sold back to the energy company because our system is tied back to the power grid through a two-way meter. The system is not connected to a bank of batteries because a storage system is very expensive and not practical for our needs. So if the power goes out, we lose power as well.

Energy production varies with location and time of year. For our locale in central Florida, the peak season for solar energy production is September through April because the sun is nearly perfectly perpendicular to the rooftop

panels, resulting in maximum absorption. Conventional wisdom would suggest that energy production would be highest during the warmer months of May through August, when sun intensity and duration are greatest. The contrary is actually true for two reasons. First, the angle of the sun is directly overhead, resulting in much of the solar radiation glancing off the panels. Second, extreme heat causes solar panels to be less efficient, which must be accounted for during the summer in southern climates like Florida.

The panels we chose have an 80-percent efficiency rating at 30 years, meaning that in 30 years they will still be producing nearly 45,000 DC watts, or 80 percent of their original 56,000 DC-watt capacity. The system was designed to produce 115 percent of our maintenance facility's current needs, knowing that we will eventually be consuming 100 percent of what the panels produce as the output efficiency of the panels reduces over time and our energy use increases.

We had considered the solar panel system for some time, but the initial cost was significant, which originally caused us to opt against the project. In early 2011, however, our energy provider announced a photovoltaic rebate program that offered a refund for a portion of the cost of the system. Since it is a rebate, funding had to be provided up front to the system installer, with the rebate check from the energy supplier coming later.

The rebate was dependent on passing a review of the proposed system and building in which the system was going to be installed. Helping us capture the most solar energy is that our building faces due south and has the perfect roof pitch for solar panels. Also, the building is still quite new and the shingles should last another 15 years or more, which reduces ongoing maintenance costs associated with removing the panels for re-shingling after system installation. In our case, once our energy provider inspected the system and building, we passed with flying colors and were approved for a rebate of nearly $90,000 toward the cost of the system. This reduced the cost per watt of the system down to approximately four dollars.

Today, we are also able to use the system for a 30-percent tax credit on our company taxes at the end of the year, further offsetting the cost of the system. So, when considering the rebate combined with the tax credit, the total cost of the system ended up being just 40 percent of the original estimate.

Furthermore, we recently had an energy audit performed by the energy supplier. The audit resulted in installing several additional energy-saving mechanisms, including photocells on

outdoor lights, timers on motors and pumps, energy-efficient fluorescent lighting, and energy-efficient air conditioning in the offices.

Looking forward, our system has a payback of roughly 12 years. This means that in 12 years, when everyone else is still being billed for power, we will no longer have to pass on these charges to our customers. Clearly, it is a way for us to reduce expenses without any adverse effects to course quality. Over the 30-year life of the system, and excluding installation costs, we are looking at a total savings of roughly $200,000 in electrical costs.

Some tips that I gained from the project include:

- Whether you currently desire to install a solar system or not, check if your energy supplier offers a free energy analysis. Feedback provided from our analysis resulted in us saving nearly $200 monthly in energy costs.
- Most, if not all, energy providers charge based on peak demand. They calculate the peak energy demand for a thirty-minute period, then charge you that demand price for the entire billing period of the energy you consume. Our demand was approximately 6 a.m. when we arrive for work and proceed to turn on lights, computers, air compressors and motors. Unfortunately, the solar system was not producing energy at this time, given the absence of full sunlight. We found that we could reduce our peak energy demand by about 50 percent simply by not turning on certain large energy consumers until they were actually needed and coordinating this closer to when the solar system was producing power. In our case, this included delaying the activation of air compressors until around 7:30 a.m. and the water recycling system until 8:30 a.m. or later.
- Consider a solar power system as an investment, because it can pay for itself in time. In our case it is 12 years.
- Use the past 10 years of energy costs to help estimate a trend of where your energy costs are heading. What you pay will not be the same 10 or 20 years from now, and this should be factored into calculating the payback period.
- When reviewing candidates for installing a solar system, choose an installer who has been in business for a long time with a proven reputation. Solar energy is becoming more popular, and there are a lot of inexperienced installers on the market. Do you homework and speak with past customers for any companies being considered.

- Determine what kind of warranty each candidate offers for the installation. Since the solar system will be installed using clips and brackets that will be attached to the roof, ask each company about the hardware they use and how they seal the penetration through the shingles or roofing materials. If a minimum of a one-year warranty is not provided, you should negotiate or find another installer. This is especially important if you live in an arid climate, where it rains only a few times annually and a roof leak may not show up for some time. The installer should be responsible for any repairs needed.
- Once an installer is selected, make sure they:
  - help you find rebates in your area. It is possible that you may qualify for more than one.
  - use a qualified electrician.
  - are insured and obtain a copy of their insurance certificate. This holds true for any third parties hired by the installer as well.
- If shingles or roofing materials are in questionable condition or nearing the end of their usable life span, replace them prior to system installation. This will save a lot of headaches down the road.
- When estimating sunlight exposure to the roof, consider possible obstructions that may present themselves in the years ahead. Trees with any potential to block sunlight to the panels on the roof should be removed.
- Consider your future energy needs. If the system is designed to meet your current needs, upsize it. The industry is constantly changing and new and improved electric mowers and vehicles are coming to market. It almost goes without saying that more equipment and tools in the future will be electrically powered.
- Panels are rated according to their 80 percent efficiency life. Cheaper panels may only offer a 15- or 20-year 80 percent efficiency rating. For a few dollars more, you can lengthen the life of your system with a more efficient panel.
- Once a year, panels require cleaning to maintain maximum efficiency. Several brands of window cleaners can be attached to a hose, which is ideal for spray cleaning the panels.
- Be involved in the entire process and understand the installation and operation of the system. You will frequently be asked to answer questions about the system and its purpose and benefits.
- Take pictures before, during, and after the project. Track progress with close-ups and shots. Aerial photos work great, too.
- Promote your project. Press releases and articles are effective in promoting the system to your local community. Anything you can do to get people talking about the environmental initiatives occurring at your course is excellent public relations.

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Solar panels installed atop the roof of the turf care facility at Candler Hills Golf Club in Ocala, Florida, meet all electrical needs for maintenance activities.