Golf course energy use Part 3: Energy planning, upgrades and the future

Energy use and costs will be changing for every business, including golf, and superintendents must be prepared.

Editor's note: *This article is the third in a three-part series about energy use on golf courses. The series is based on a utility-funded energy efficiency outreach program to 320 golf courses in Southern California conducted from 2006 to 2008. The program was the first energy outreach program of its kind and completely free to the customer. It identified areas of energy savings opportunity, focusing attention on irrigation and water management as well as lighting and golf car charging. The program provided the customer with a cost-benefit analysis for potential work performed. Samples indicated a potential of 30% energy savings for participating courses.*

Understanding a course's energy use and how to reduce these costs has been shown to stabilize operating expenses and even bolster profits. As explained in the second part of this series, Desert Mountain Golf Club in Scottsdale, Ariz., was able to decrease the energy costs of its Chiricahua Course by approximately 30% over a two-year period by understanding how its energy company bills for power delivery. Desert Mountain shows first-hand how costs can be reduced without huge expenditures.

Energy is used in almost every aspect of the operations of a golf course. After water, energy is probably the factor that will have the greatest effect on golf in the future. Most courses are finding that the cost for power has continued to escalate, becoming a significant expense in a golf course's overall operating budget. Why then does energy use continue to be one of the least understood areas of any aspect in the management of golf courses?

The energy savings program for courses in Southern California found that energy- and cost-savings opportunities do exist in the golf industry through reduction of overall energy use, overall kilowatt reduction, energy management and cost planning. For the most part, golf courses in Southern California were eager to save on energy costs, but their lack of understanding of their energy use and the current economic state of the industry were clear barriers.

Samples indicated savings of 30% and more were achievable. Maintaining overall pump efficiency, maximizing water-window efficiency and watering less are the top three potential saving opportunities for golf courses. Water-window efficiency and watering less can be done with little to no upfront costs, but maintaining a pump's maximum overall plant efficiency involves annual service, costing anywhere from $1,000 to $10,000. However, maintaining overall pump efficiency can yield energy savings of 5% to 15%, substantially covering most of the costs of upkeep.

Opportunity also exists in the clubhouse and maintenance buildings: upgrading to energy-efficient lighting (compact fluorescent bulbs, T-8 fluorescent tubes), installing occupancy sensors, heating and air-conditioning tune-ups, and shifting the use of golf car charging equipment and other large energy consumers to off-peak times.

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A typical lighting project for an average-sized clubhouse will cost around $8,000 to $10,000 to complete and will show a payback in one to three years, depending on how much a course is paying for energy.

The No. 1 barrier to making efficient upgrades is economic. In the Southern California program, most courses were more willing to pay additional energy costs than to spend large amounts to upgrade systems. As a result, it was common to see a course that could not afford to buy a new system continue to use the old one and pay 20% to 30% more in energy costs. This is understandable. Falling profits and loss of play have made it more difficult for golf courses to make large upfront expenditures. However, golf courses will soon find that investments in upgrades to their facilities will be necessary for survival.

In the end, it comes down to how motivated a golf course is to understand its energy use and whether a course is willing to commit to energy-saving programs. In California and elsewhere, energy costs are on the rise, and governments are on the fast track to monitor, regulate and quite possibly tax the customer's energy use. These factors are creating an incentive for customers to understand energy use so that they can reduce it and thereby cut costs.

What's in the future?

Smart energy grid and smart metering

The current power-delivery grid, for the most part, has been in place since the 1960s, and experts across the nation describe our current system as being close to or at the end of its life span. Enter the *smart energy grid.* The smart grid uses the existing infrastructure with some upgrades in technology to create a new "looped" system to increase the efficiency of the delivery system and reduce blackouts and long-term outages.

The current system is designed to branch off from a series of central substations, running power to individual uses such as a city or large developments. Under the current model, if one substation goes down, an entire service area goes down with it. Under the smart grid system, additional lines would be added so if one area goes down, switches would localize the problem to the area of concern while allowing power to be delivered through alternate backup lines and substations. (In golf irrigation terms, it is the equivalent of looping your mainline pipes.) This would confine the power outage to a smaller area while the system continued to provide power to the majority of users.

Smart metering (a new advancement in moni-

The Lakes CC in Palm Desert, Calif., has a long history of upgrading the efficiency of the entire facility. First with golf course renovations, then with energy efficiency upgrades, The Lakes continues to be a leader in conservation practices. **Photo courtesy of The Lakes CC**

A smart meter provides an even greater level of detail of a customer's actual power use and is known to be the future of meter technology. It can read data in real time and can send data back to the utility company about how and when power is used at a particular site. A smart meter has built-in power-quality monitoring and can also send power-outage notifications back to the utility company. **©iStockphoto.com/Trevor Fisher**

A standard solid-state electronic meter is an advance over the electromechanical meter, displaying readings on an LCD screen and allowing readings to be taken remotely. In addition to showing how much electricity is used, a solid-state meter can take kilowatt-load readings to measure the total kilowatt demand on the system. These demand readings are usually taken every 15 minutes. **Photo by A. Staples**

The electromechanical induction meter operates by counting the revolutions of an aluminum disc that rotates at a speed proportional to the power being consumed. This type of technology dates back to 1888, and these meters can only be read manually. Inaccuracies called "disc creep" can occur in these types of meters, causing inconsistencies in billing. **©iStockphoto.com/Trevor Fisher**

toring power consumption in greater detail) will allow energy companies to communicate with their customers in real time to identify potential problems before they lead to outages. Because a smart meter is constantly monitoring use and relaying data back to the utility company via an Internet connection through the power lines, overloads or downed wires can be detected before they become severe problems. The utility is therefore able to act quickly and possibly decide to temporarily shut down other systems, bring additional power on line or schedule repairs or maintenance.

Another advantage to smart metering is that customers will know exactly how much energy is being consumed at any particular time of the day. Research performed by the utilities has found that the more customers know about their overall energy use, the more likely they will be to change their habits. For example, if customers know how much the flat screen TV costs to run — even when it is plugged in but not being watched — the more likely they will be to turn it off to save energy. Technology also is being developed that will enable each energy-consuming piece of hardware such as a television, air conditioner or microwave oven to send a specific code directly to the smart meter so a customer will know exactly how much energy each item consumes in a month.

Why hasn't a system like this already been put in place? Permitting, environmental issues and the overall feasibility of instituting a project of this size are some barriers. However, the largest factor is cost. How should the costs be divided among all the parties that would benefit? On the one hand, it may be detrimental to the current low-cost provider in the area because a new line would allow a new plant to better compete from a greater distance. On the other hand, this type of system has the potential to deliver power more efficiently to benefit the industry as a whole.

Other factors will also affect the end-user. In areas of the country where these technologies have been investigated, users have seen their bills increase because the old system inaccurately measured actual energy use. In some cases, security issues have been identified, possibly leaving customer data open to invasion by computer hackers. In any case, end-users would likely see some benefits from a new system, but they would also likely bear additional costs.

Why is this important? First, much of these costs will be passed to the end-user (a smart meter will allow most of these costs to be passed along to the largest users). In other words, each util-

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Implementing an energy management plan

Energy management is a systematic way of planning, organizing, implementing, monitoring and controlling energy use in a facility to achieve the most efficient energy use possible. After reading the first two parts of this series, superintendents should understand: (1) the larger the kilowatt load, the more it will cost; (2) the amount of total kilowatt load will dictate how a golf facility will be billed and will determine the number of billing options available; (3) the type of account will determine how much a facility will pay for electricity; and (4) outside factors such as a utility company's cost of doing business, government regulation or advancement in technology all affect the end price and will determine how motivated a golf facility will be to save electricity. These four factors all play into whether an energy management plan is practical and feasible.

Plan

Meet and talk with your utility company representative. Discuss current system design requirements, time-of-use and rate plans. Develop options as to how a golf facility can be billed versus how it uses energy. Most important, set goals for the management plan. Without goals, success will be hard to measure.

Organize

Begin by understanding the overall energy use of the facility. Break out each use separately (that is, golf course, pump station, clubhouse, maintenance building, etc.), so that each aspect can be tracked. The manager of each use should be responsible for his or her area.

Track usage by month, so that efficiency variances during certain times of the year can be understood. For example, in desert communities that overseed every year, energy use on the golf course spikes because of the energy required to make the transition to cool-season turfgrass. How does the energy use in October compare to the rest of the year? Is energy being used efficiently compared to the rest of year, or is there waste? Factors such as total energy use, overall water use and kilowatt demand all play into the end value of the energy purchased.

Implement

As part of the management plan, every effort should be taken to choose the most energy-efficient options when making upgrades. Premium efficiency motors, variable speed drives and compact fluorescent light bulbs are all very efficient measures with favorable paybacks. When these upgrades are being planned, check with the utility for incentive options and even low-interest loan programs. Not only do these incentives help offset costs, but they also can help you decide whether to move forward with a project.

Implementing an energy management plan will most likely include making changes to the current operation. Educate the employees as to whys and hows of an energy management plan. Ask employees for their ideas about how to save energy.

Monitor

The value of an energy management plan is monitoring. Understanding how much energy is being saved and checking current use against prior months/years is the only way to determine whether the plan is working. Every energy-using piece of equipment should be tested regularly to ensure optimal performance. Since the energy industry is constantly changing, a golf facility should check for the latest in energy-efficient upgrades.

Control

Ensure everyone is sticking to their goals; hold employees accountable for their goals. Use these goals when making decisions on staff and equipment purchases. Communicate your goals to vendors so they understand what kind of products the facility is interested in. These expenditures should not be taken lightly.

Seek assistance from the utility company. Many of the utilities are now as interested as their customers in saving energy. Use this opportunity to ensure full value for your dollar.

—A.S.

ity could have the ability to raise or lower prices for different uses based on the new information gathered through smart metering. Currently, one meter charges the same rate, regardless of the uses on the individual meter. With a smart meter, individual pieces of equipment on the same meter could be billed at different rates. Second, smart metering will begin to change the way products are designed and built, incorporating new criteria based on how energy will be consumed. Golf course pumping stations will have tools that communicate when a station is being charged higher rates or is being run off the pump's best efficiency point. Household equipment like a television will have built-in energy management tools that will completely shut off the power when the equipment is not in use. Many of these adjustments are still years away from being implemented.

Carbon footprints and a cap-and-trade philosophy

It is now widely accepted (by scientists and, more important, by the U.S. government) that emissions created by burning fossil fuels (for example, by coal-burning power plants) are contributing to climate change. This issue is prompting utility companies to make historic adjustments to their business. Because most power plants generate electricity by burning fossil fuels, utilities and power companies are now looking for ways to reduce these emissions and their carbon footprints by reducing the need to produce more energy.

A *carbon footprint* describes the cumulative amount of greenhouse gas emissions caused directly or indirectly by an individual, organization, event or product. As a power plant burns fossil fuels to generate electricity, emissions are produced, increasing that plant's carbon footprint. If a company owns multiple power plants, its carbon footprint is the cumulative emissions produced by these plants.

Greenhouse gas emissions have been calculated over the past number of years and are the basis in a plan to set limits on the amount of emissions a company is allowed to produce (the cap) and to tax users that exceed a predetermined level of total emissions. The system rewards the most efficient companies by allowing them to sell their extra permits to the companies unable to perform under their allowance (the trade). Users that exceed the cap on emissions will have to purchase permits (often called green credits) to offset the amount of emissions exceeded. The federal government will auction these permits to the inefficient companies, creating a potentially large revenue stream for the sellers of the credits.

Talk of a cap-and-trade system has been around since the early 1990s and has already been instituted in Europe. Just last month, the House of Representatives narrowly passed a new bill to adopt a cap-and-trade system in the U.S. The bill still must be passed by the Senate, but pressure to implement this type of a system will continue to gain support, and many believe it is just a matter of time before it becomes law.

Why does this matter? This change in environmental politics presents an excellent opportunity for golf courses everywhere to take the lead in making changes that show how golf at all levels of operation can help to reduce and sequester greenhouse gases. Reduction of energy use is just one way a golf course can reduce its carbon footprint. Minimizing the use of petroleum-based fuels, fertilizer and chemicals can also help reduce a course's footprint. Research is also under way to understand how golf course turfgrass can sequester CO_2 and other harmful gases, further proving the point that golf is in a perfect position to help lead the way in addressing this new challenge.

The more knowledge the golf industry has, the more likely it will be able to cope with potential regulations and price increases. (For more information on cap-and-trade, go to www.americanprogress.org/issues/2008/01/capandtrade101.html.)

Renewable energy

Renewable energy is defined as energy generated from natural resources such as sun, wind, tides or geothermal heat from the earth's core. At present, approximately 7% of our country's power is generated from renewable sources. However, according to the U.S. Department of Energy and the Energy Policy Act of 2005 (EPAct 2005), federal regulation will require this percentage to increase over the next five years, ultimately doubling our renewable production by 2013. These changes could bring some opportunities the golf industry needs to be aware of.

Many of the green credit investments will be made in renewable energy projects. A major issue related to integration of renewable energy projects into a town or development is the space required for the all the equipment needed for the renewable plant. Solar panels, wind turbines and even geothermal tubing all need space to operate effectively. This obstacle can actually be an opportunity when applied to golf course developments. Maintenance building roofs, covered parking areas, large lakes or ponds and even awkward parcels of land within the development are all open to integration of renewable power projects. Add in

Tijeras Creek GC in Orange County, Calif., installed a new energy-efficient Rain Bird pump station as part of its commitment to overall resource management and reduction of energy use throughout the facility. **Photo courtesy of Tijeras Creek GC**

Online resources

Southern California Edison (www.sce.com) and Pacific Gas & Electric (www.pge.com) were both active in the energy savings program, and their Web sites provide information about how businesses can save energy.

The U.S. Department of Energy (www.eere.energy.gov/) has extensive information about reducing energy costs. To learn about projects that increase energy efficiency and to find energy cost calculators for many types of products, go to: www1.eere.energy.gov/femp/technologies/procuring_eeproducts.html

For general information about the power grid: http://en.wikipedia.org/wiki/Electrical_grid

Ironwood CC in Palm Desert, Calif., participated in the savings program and supports Palm Desert's goal to reduce the city's energy use by 30% within five years. **Photo courtesy of Chris Miller**

the opportunity for a golf course to adjust its layout during possible renovation projects, and golf courses are now positioned as a possible solution to this obstacle.

Many renewable energy projects have already taken place at golf courses across the country (1). As our government makes renewable energy more of a priority, grant money and tax credits will continue to increase, making projects more feasible. Nearly all golf courses are in a position to cut costs, and renewable energy provides an avenue to almost eliminate one major line item from the budget. Given that a golf course will always have to pay for energy, why not invest in the future health of the facility? These types of projects may not make sense for every facility, but all golf courses should be prepared to act when the economics are favorable and the time is right.

Conclusions

As our economy continues to struggle and the government mandates improved energy efficiency, the golf industry needs to be prepared to evolve. The old business model of building bigger, more expensive golf developments regardless of player demand has failed. The rules are changing and so is the definition of a great golf course. A great golf course is now one that uses sustainability as a guide, providing long-term stability for every golfer and owner alike. The entire industry should realize that efficiency matters not only for the survival of all the existing golf courses, but also for the development of courses yet to be built. Everyone's aim should be to reduce energy and water use and maximize operational costs to increase a course's profitability, and reinvest these savings into the overall facility. When the economy improves, the golf industry will be asked to make a simple decision when building new golf courses — take the risky route of an old, failing business model and continue to be another statistic in a struggling golf industry, or take the new safe route by integrating proven sustainable practices in order to achieve a successful, profitable golf course.

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The research says

- Golf facilities that understand energy use can reduce it and thereby reduce their costs.
- The future of energy use lies in renewable energy sources, reduction of a facility's carbon footprint and smart metering, which will more accurately measure customer energy use.
- Government policies will regulate energy conservation, and golf facilities must be prepared to reduce their consumption.