THE ENERGY OBSERVER

Energy Efficiency Information for the Facility Manager

Special Issue – August 2006

Introduction to Renewable Energy Options—Vol. 1

The Energy Observer summarizes published material on proven energy technologies and practices, and encourages users to share experiences with generic energy products and services. This quarterly bulletin also identifies informational sources and energy training for facility managers and staff. ***The Energy Observer*** is a service of the **Energy Office, Michigan Department of Labor &**

Improving building energy efficiency is typically your first and best cost reduction strategy. However, those that have already invested heavily in upgrading energy efficiency may want to consider renewable energy options. Listed in this edition of the Energy Observer are several wind and solar options to consider.

WIND ENERGY

Wind is a source of clean, renewable energy. While the start up cost of implementing wind energy into your facility may deter some people, in the long run the savings could be quite substantial. This applies especially if your facility or application (such as using a wind turbine to pump water) is in a remote location where generating electricity from a diesel generator can range from $0.25 to $1.00 per kWh. Compare this to modern turbines generating electricity at $.05 to $.10 per kWh!

Applications

The most common use is the wind turbine (vertical and horizontal axis) which transforms the kinetic energy of wind into mechanical or electrical energy. For remote applications, a wind pump system is another viable option.

- **Small Wind Systems**

If your area has a high potential to harness wind as an energy source, it may be wise to consider a small wind system for your own facility.

The two links below may help you make a preliminary assessment regarding the potential of a wind system at your site. The first is the Wind Energy Payback Period Workbook found at www.nrel.gov/wind/docs/spread_sheet_final.xls. Developed by the National Wind Technology Center, this spreadsheet takes into account financing, wind characteristics, and system properties you are considering. It then provides the system payback period. The link which will provide you with the wind characteristics in Michigan is www.michigan.gov/eorenew. This link also includes a small wind system guide and a list of suppliers.

- **Wind Pump**

A wind turbine can be used to drive a rotating or reciprocating pump. Like a wind turbine, a wind pump has a rotor, a tower, and foundations. However, the hydraulic pump replaces the generator. Often, the rotor shaft drives the pump directly, which eliminates the need for a gearbox. Most wind pumps are relatively small, typically enabling a power source to pump water at a remote location.

Although a manufacturer should be contacted for assistance, another quick calculation that can be used to gauge what size turbine will satisfy your energy output needs is:

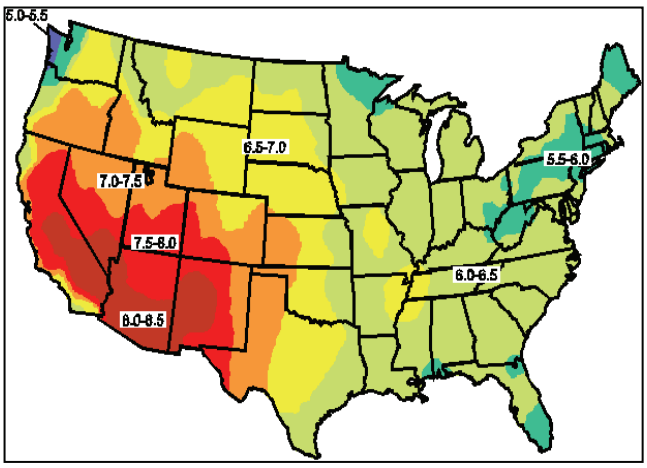
$AEO=0.01328D^2V^3$

AEO-annual energy output (kWh/yr)
D-rotor diameter (ft)
V-wind speed (mph)

SOLAR ENERGY

Every day, more energy falls on the U.S. than is used in an entire year. Of course the challenge lies in using this renewable resource. The map below gives an estimation of the amount of solar energy directed on the contiguous United States each day. From the illustration, Michigan receives roughly the same amount of solar energy as Florida!

Figure 1-Avg kWh/m^2/day



APPLICATIONS

There are a number of proven methods in use including photovoltaics, solar hot water systems, as well as designing buildings for passive solar heating and cooling.

- **Photovoltaics**

Solar Photovoltaic (PV) cells directly convert radiant energy from the sun into electricity. Typically made from crystalline silicon, photovoltaic modules can be used to supplement a portion of a facility's power generating load. While high costs may drive off some customers, many applications exist for commercial buildings such as installations for exterior/parking lot lighting, sign lighting and emergency telephone stations. A solar powered attic fan is another viable option for smaller facilities.

- **Solar Hot Water Systems**

Solar hot water heaters use the sun to heat either water or a heat-transfer fluid in collectors. A typical system will reduce the need for conventional water heating by about two-thirds, and is also a great resource to heat pools. For larger applications, a backup water heater is sometimes installed in series with the preheat tank to maintain the desired water temperature during extended cloudy periods. Initial costs are higher than installing a boiler system, however maintenance costs are low and the fuel is free! How quickly the system will pay for itself depends on the climate and amount of solar radiation on a particular site.

- **Passive Solar Heating & Daylighting**

Passive solar heating, perhaps the most cost efficient technique of buildings, occurs when sunlight passes through a window, hits an object, is absorbed and converted to heat. The most efficient window orientation for heat gain is due south, but any orientation within 30 degrees of due south is beneficial.

Another important aspect that comes into play when designing a building is optimizing daylight. The term "daylighting" refers to using the overall light of the surrounding sky to illuminate building spaces, not just direct sunlight.

Renewables In Action

Zeeland West High School in Zeeland, MI illustrates just how well these renewables can 'generate' a substantial amount of savings. Funded mostly through donations, the school installed a 10kW turbine on site which saves $1,200/year in utility costs. Both the high school and middle school supplement their electric generation with solar photovoltaic cells. Software for these 1,000 Watt systems also allows the units to serve as an educational tool for students in their science classes.

TAX INCENTIVES/GRANTS

The Michigan Legislature is currently examining bills to provide tax credits to individuals and companies that invest in renewable energy sources. There are also numerous grant opportunities available to assist in funding a renewable energy project. To view a complete list of grant programs, as well as a comprehensive list of state and federal incentives promoting renewable energy, please visit http://www.dsireusa.org

Buying Green

The option of 'buying green' is a great way to employ the use of renewable energy sources. Michigan now allows every company to choose their energy provider. Renewable Energy Credits (RECs) are available for purchase to supplement the use of conventional fuels. For more information on available options in the state of Michigan, go to http://www.green-e.org.

Rebuild MI Community Partnerships RFP Public and non-profit organizations may submit proposals for grants up to $24,900 to form a Rebuild MI community partnership in their community.

Public Housing Commission Rebuild MI Partnerships RFP Public Housing Agencies may submit proposals for grants up to $24,900 to form an energy partnership with others, including other MI Public Housing Commissions, and the MI Energy Office. Proposals for both grants are due by 9/18/06. To request a copy of the RFP, contact Tom Krupiarz at (517) 241-6184 or takrupi@michigan.gov

For a complete list of grants/services visit: www.michigan.gov/energyoffice

For more information on this/past issues or to request an email subscription of ***The Energy Observer***, contact:

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Stay tuned for Volume 2 of An Introduction to Renewable Energy Options which will focus on Biomass Energy applications for facilities.

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