

Bureau of Recreation and Conservation Green Principles for Park Development and Sustainability

Principle #4: Conserve Energy

The best way to save energy is not to spend it.

Renewable energy and energy efficiency mean less air pollution (including mercury, nitrogen oxides and carbon dioxide), less water consumption and less waste. It means less dependence on foreign oil and more self-sufficiency. It means less ground level ozone, less acid rain and less particulate matter in the air. There are many opportunities to include renewable energy technology and energy efficiency techniques in site design. Please consider these different alternative energy sources and energy efficiency techniques to power your facilities as you move forward with your project planning and site design.

Accomplishing Energy Efficiency

The following are some techniques that can be incorporated in your site design to help save energy and money, and benefit the environment at the same time:

- Include in your site planning a mandatory maintenance schedule for your building to:
 - Clean filters
 - Replace belts
 - Commission the building (give your building a “tune-up”)
 - Achieve a certain % of energy consumption
- HVAC rehab
 - Use state-of-the art, high efficiency, heating, ventilation and air conditioning (HVAC) and plumbing equipment, chillers, boilers, and water heaters, etc. Use variable speed drives on fan and pump motors. Use heat recovery ventilators and geothermal heat pump technology for up to 40% energy savings.
 - Programmable system to turn on during the day and off at night
 - Fan cyclers/sensors to replace or attach to heat pump
- Waterless urinals
- Censored faucets
- On-demand controls in shower houses (faucets, toilets, lighting, fans)
- Instantaneous water heaters or solar water heaters
- Sky lights
- Light level meter or dimming system
- Reduce outdoor night-time light pollution by avoiding over-illumination of the site and use low cut-off exterior lighting fixtures which direct light downward
- Use energy efficient T-8 and T-5 bulbs, high efficiency electronic ballasts, and lighting controls. Consider using indirect ambient lighting with workstation based direct task lighting to improve light quality, reduce glare and improve overall energy performance in general office areas. Incorporate sensors and controls and design circuits so that lighting along perimeter zones and offices can be switched off independently from other interior lights when daylighting is sufficient in perimeter areas.
- Use Energy Star certified energy efficient appliances, office equipment, lighting and HVAC systems.

Solar

Solar technologies use the sun's energy to provide heat, light, hot water, electricity, and even cooling, for many different types of facilities. Solar power is probably the cleanest, most viable form of renewable energy available and it can be used in several forms to help power your facility. Many gardens use solar lights or solar garden water features.² A variety of technologies have been developed to harness solar

energy. In Pennsylvania, these technologies include: photovoltaic systems (produces electricity), solar hot water heating, and passive solar heating and daylighting.

Wind

Wind is a clean, inexhaustible, indigenous energy resource that can generate electricity. Wind energy is one of the fastest-growing forms of electricity generation in the world.^{1, 3} Pennsylvania has good wind resources in portions of the state. Municipalities and non-profit organizations can use small wind turbines for on-site energy generation.⁵

Geothermal Heat Pump

The 10 feet of earth directly beneath the surface maintains a nearly constant temperature between 50° and 60°F (10°-16°C). Like a cave, this ground temperature is warmer than the air above it in the winter and cooler than the air in the summer. Pennsylvania has low to moderate temperature resources that can be tapped for direct heat or for geothermal heat pumps. Geothermal heat pumps take advantage of this resource to heat and cool buildings.¹

Biomass and Biofuels

Biomass energy refers to organic matter that has stored energy through the process of photosynthesis. It exists in one form as plants and may be transferred through the food chain to animals' bodies and their wastes, all of which can be combusted.⁶ Biomass and biofuels provide an excellent opportunity to heat and power buildings. Heating options may include the installation of a wood chip heating system, wood pellet furnace or boiler systems, corn furnace, or simply using a biodiesel blended heating oil commonly referred to as a bio-heat product. Biofuels can be used to power small-scale workshop machinery and electricity generators as well as vehicles.¹ Biomass is one of the most plentiful and well-utilized sources of renewable energy in the world.⁶

Using Plants to Reduce Heating and Cooling Needs

Plants can significantly reduce a building's energy needs; it's cooler in the shade of trees during the summer and warmer behind vegetation that block winter winds. The general rule is to plant deciduous trees (those that lose their leaves in winter) on the south and west sides of a building where the sun's rays are most direct and intense. These trees will provide shade during summer but permit the winter sun to provide warmth. Where there isn't room for trees, shrubs and vines can provide similar benefits. Extensive use of trees to shade buildings, streets, driveways and other large paved surfaces can even cool entire communities. To reduce winter heating costs, plant evergreen trees and shrubs as windbreaks. Most cold winds come from the north or west (though this can vary locally), so on those sides of the building plant a dense row of evergreens that maintain branches low to the ground. Where new construction is planned consider "greenroofing" where roofs are specially designed to accommodate plants. Such roofs provide insulating value that further reduces heating and cooling needs and can be very long-lasting when properly maintained.⁴

References:

1. Department of Environmental Protection. Alternative Energy. <http://www.depweb.state.pa.us/energy/cwp/view.asp?a=1379&q=485551>
2. American Solar Energy Society. Go Solar: How to get started with solar energy. http://www.ases.org/index.php?option=com_content&view=article&id=162&Itemid=7
3. U.S. Department of Energy. Energy Efficiency and Renewable Energy. State Energy Alternatives. Alternative Energy Resources in Pennsylvania. <http://www.eere.energy.gov/>
4. U.S. Environmental Protection Agency. Benefits of Green Landscaping in the Mid-Atlantic. <http://www.epa.gov/reg3esd1/garden/benefits.htm>

5. Pennsylvania Wind Working Group. <http://www.pawindenergynow.org/>
6. Alternative Energy. Alternative Energy Solutions for the 21st Century. <http://www.altenergy.org/>

Additional Resources:

Energy Star. Green Buildings. <http://www.energystar.gov/>

Penn State University EMS Energy Institute. Biomass/ Biofuels.
<http://www.energy.psu.edu/sp/biomass.html>

Pennsylvania Biomass Working Group. Developing Renewable Energy.
http://www.pabiomass.org/PABioenergy_BrochureOPT.pdf

American Wind Energy Association. <http://www.awea.org/>

Clean Energy Mid-Atlantic. <http://www.cleanyourair.org/>

U.S. Department of Energy, Energy Efficiency and Renewable Energy, Wind Powering America.
<http://www.windpoweringamerica.gov/>

American Solar Energy Society. <http://www.ases.org/>

In My Backyard. National Renewable Energy Laboratory. <http://mercator.nrel.gov/imby/>