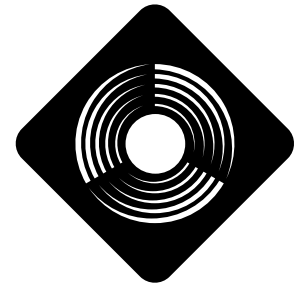


ELECTRICITY FROM THE SUN

FACT SHEET 6 A RESOURCE FOR CLASSROOMS AND TEACHERS



RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

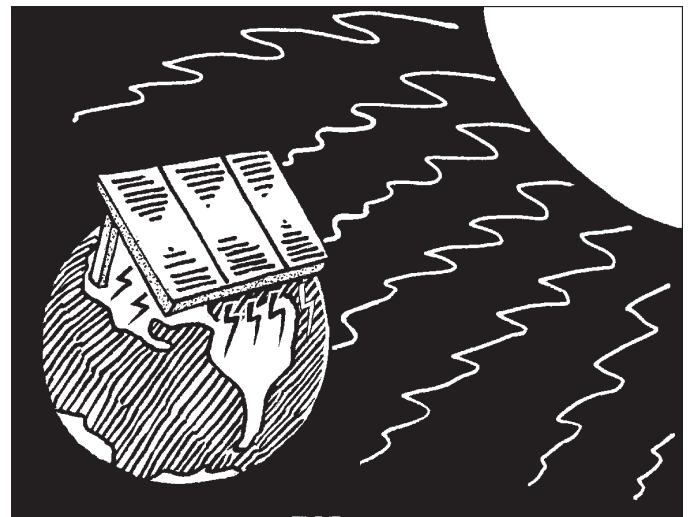
Highlights

- ◆ Earth: A huge solar collector
- ◆ Winds and wind turbines
- ◆ Plants store sunlight
- ◆ Falling water, heat and light into watts

Using the Sun's Energy

Solar energy sustains life on earth for all plants, animals and people. The earth receives radiant energy from the sun in the form of electromagnetic waves, which the sun continuously emits into space. The earth is essentially a huge solar energy collector. This energy takes on various forms, from direct sunlight used through photosynthesis by plants to grow, to heated air that causes wind, to evaporation of the oceans that falls back as rain and becomes rivers. This energy can be tapped indirectly as wind, biomass and hydroelectric power, and directly as solar energy (thermal and photovoltaic).

Solar energy is a renewable resource that is inexhaustible and readily available, unlike fossil fuels such as coal, oil and natural gas. It is a



SUNLIGHT POWERS THE EARTH The earth is like a huge solar collector that turns sunlight into natural forces such as wind, rain and growing plants.

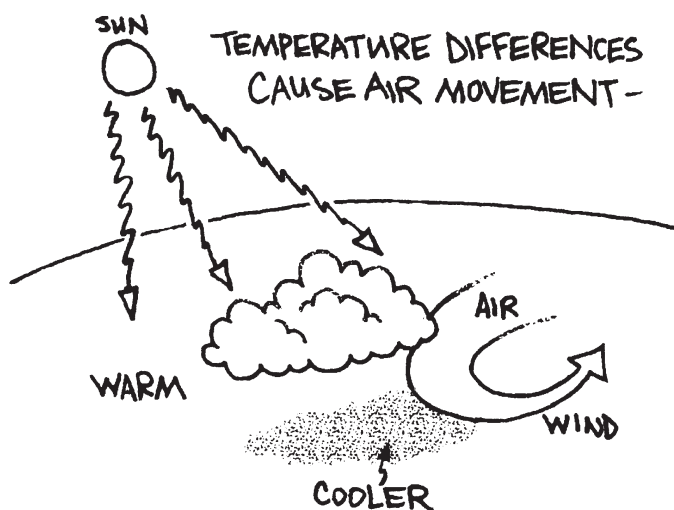
clean energy source that can be used pollution-free and allows for local energy independence. The amount of power from the sun that reaches the earth at noon on a clear day is about 1,000 Watts per square meter. This is equivalent to a 100 Watt light bulb completely focused on a surface the size of a large notebook. Capturing solar energy often requires purchasing expensive equipment. Yet because renewable energy resources are free, the cost to use them is similar to, and sometimes lower than, other energy sources such as fossil fuels. The environmental costs of renewable energy sources are much lower than conventional energy sources.

WIND ENERGY

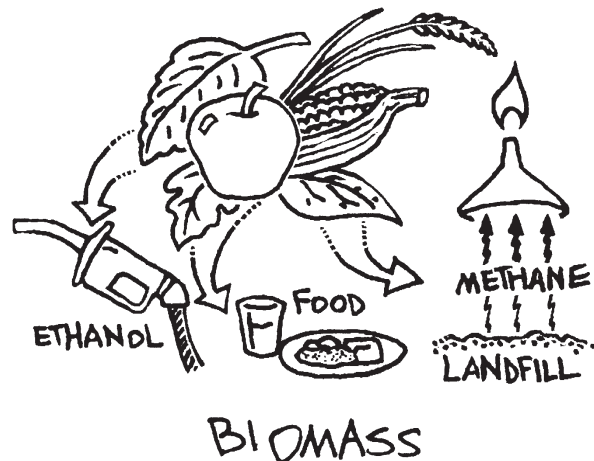
Wind is created because the sun heats the earth's surface and the atmosphere unevenly. This causes temperature differences that drive air masses around the planet. This air movement is aided by the earth's rotation.

Windmills use wind energy to pump water. But this energy can also be used to fulfill the energy needs of an electric company, community, or home. Modern wind turbines use the kinetic energy of the wind to produce electrical power. Texas is rapidly evolving as the wind energy leader in the United States. Texas has the second largest wind energy potential of any state with over 135,000 MW of potential. In 2001, Texas electricity production topped 3 billion kWh from wind energy.

The climate for growing wind energy usage in Texas has been encouraged through the state's



WIND IS CAUSED BY THE SUN Uneven solar heating of the earth's land, water and atmosphere causes air to move around as wind.



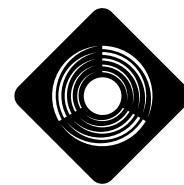
BIOMASS IS STORED SOLAR ENERGY Energy stored in plants can be used for many useful purposes such as fuels, food, clothing and paper. Biomass can change form naturally such as when old newspapers or food scraps turn into methane at a landfill.

electric utility industry restructuring law signed by Governor Bush in 1999. The law promotes development of Texas' least-cost renewable energy resources and is already having a profound effect on development of new wind farms. One of these, a 200 MW facility at the King Mountain Ranch near McCamey, will be the largest in the nation. By 2002, there will be over 1,000 MW of installed wind turbines in Texas.

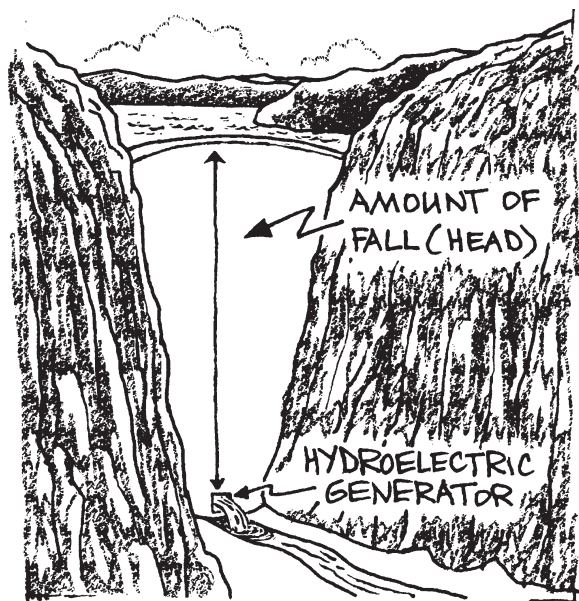
BIOMASS ENERGY

Biomass is solar energy that has been stored as plant and animal material. When you eat vegetables, you are consuming the sun's energy the plant stored as it grew. Your body uses the vegetables' biomass to give you energy to work and play.

Today, biomass energy in corn is used to produce cleaner-burning fuels, such as ethanol.



RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS



MOVING WATER PRODUCES POWER Water flowing through a dam runs through a turbine to generate electricity. Tall dams produce more power than short dams since the water falls farther.

At urban landfills, where typically about three-fourths of municipal solid waste is biomass, methane gas is naturally produced. The gas can be used to generate electricity.

HYDROELECTRIC ENERGY

Water is the foundation of life and falls as rain-fall because of the sun's radiant energy on the earth. This process provides a continual supply of water to the earth's surface. The power of falling water is energy that can be harnessed to produce electricity. In fact, the largest power plants in the world are hydroelectric.

Water can be dammed in a reservoir and released through turbines that directly produce electricity. The amount of power that can be taken from falling or flowing water is dependent upon the amount of water available

and how far it falls. In simple terms, one gallon of water falling one foot per second can light up a 10 Watt light bulb.

SUNLIGHT AND THERMAL ENERGY

Solar energy can be used to heat your home. By orienting a home on an east-west axis, and using proper window glazing and shading, much of your home's heating needs can be met with solar energy. Likewise, most residential hot water needs can easily be met with a simple solar water heating system.

Sunlight can also be used to make electricity through thermal (heat) processes. A solar pond at the University of Texas at El Paso absorbs the sun's energy and generates electricity and usable heat. The pond, half a football field in size, produces 60 kW of continuous electricity (day and night) and delivers heat to a nearby food cannery.

SUNLIGHT AND PHOTOVOLTAICS

Electricity can also be produced from sunlight through a process called photovoltaics. "Photo" refers to light and "voltaic" to voltage. A thin silicon cell, four inches across, can produce about one watt of direct current electrical power in full sunlight. Solar powered homes, water pumps and calculators are a few common examples of how PV is used today in Texas.

The future is bright for using renewable resources around the world. Using renewable



resources can supply electricity and create local jobs. And it's good for the earth.

Governments, electric companies, and people like you who choose to pursue a renewable/sustainable energy future now will be the ones who can offer Texas the experience, know-how and leadership for helping meet our energy needs in the 21st Century.

Resources

FREE TEXAS RENEWABLE ENERGY INFORMATION

For more information on how you can put Texas' abundant renewable energy resources to use in your home or business, visit our website at www.InfinitePower.org or call us at 1-800-531-5441 ext 31796. Ask about our free lesson plans and videos available to teachers and home schoolers.

ON THE WORLD WIDE WEB:

American Bioenergy Association
www.biomass.org

Texas wind research at West Texas A & M
www.windenergy.org

American Solar Energy Society
www.ases.org

Helpful Organizations

Comprehensive educational source for renewables:

CENTER FOR RENEWABLE ENERGY AND SUSTAINABLE TECHNOLOGY (CREST)

*777 North Capitol Street, N.E. #805
Washington, D.C. 20002
(202) 289-5370
solstice.crest.org*

Renewable energy education:

TEXAS SOLAR ENERGY SOCIETY

*P.O. Box 1447
Austin, TX 78767-1447
(512) 326-3391 or (800) 465-5049
www.txses.org*

Great source for wind energy information:

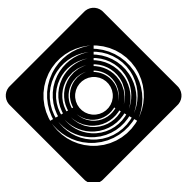
AMERICAN WIND ENERGY ASSOCIATION

*122 C Street, N.W.
Washington, D.C. 20001
(202) 383-2505
www.awea.org*

Trade association for Texas renewable companies:

TEXAS RENEWABLE ENERGY INDUSTRIES ASSOCIATION

*P.O. Box 16469
Austin, TX 78761-6469
(512) 345-5446
www.treia.org*



RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

STATE ENERGY CONSERVATION OFFICE

111 EAST 17TH STREET, ROOM 1114
AUSTIN, TEXAS 78774

PH. 800.531.5441 ext 31796
www.InfinitePower.org