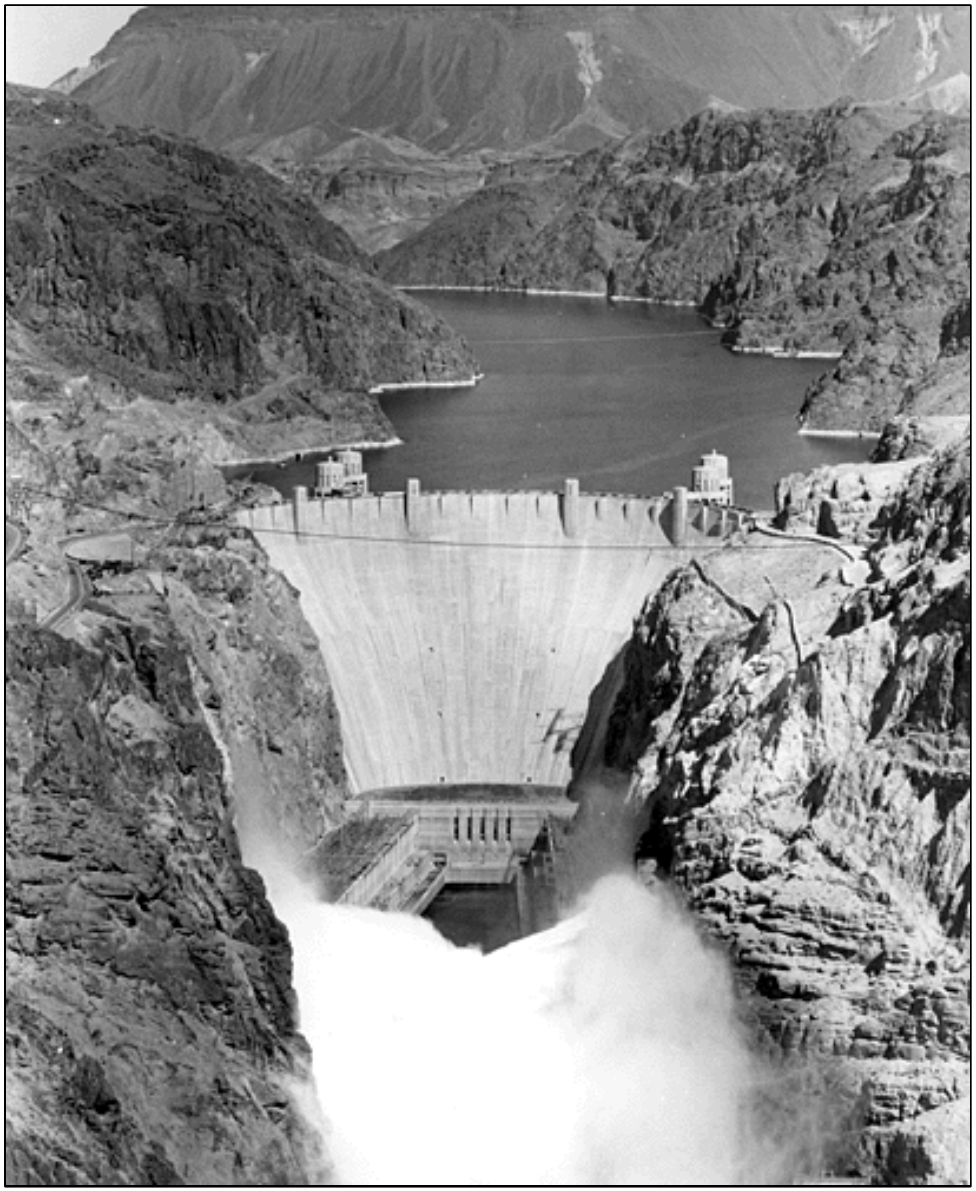
Renewable Energy

- Hydroelectric
- Solar: Photovoltaic, Light and Heat for Buildings, Solar Thermal Electricity
- Geothermal
- Biomass
- Wind Power

ENERGY CENTER
OF WISCONSIN
We show you how

Hydroelectric: Energy from Water

Hoover Dam
(aka Boulder Dam)
near Las Vegas



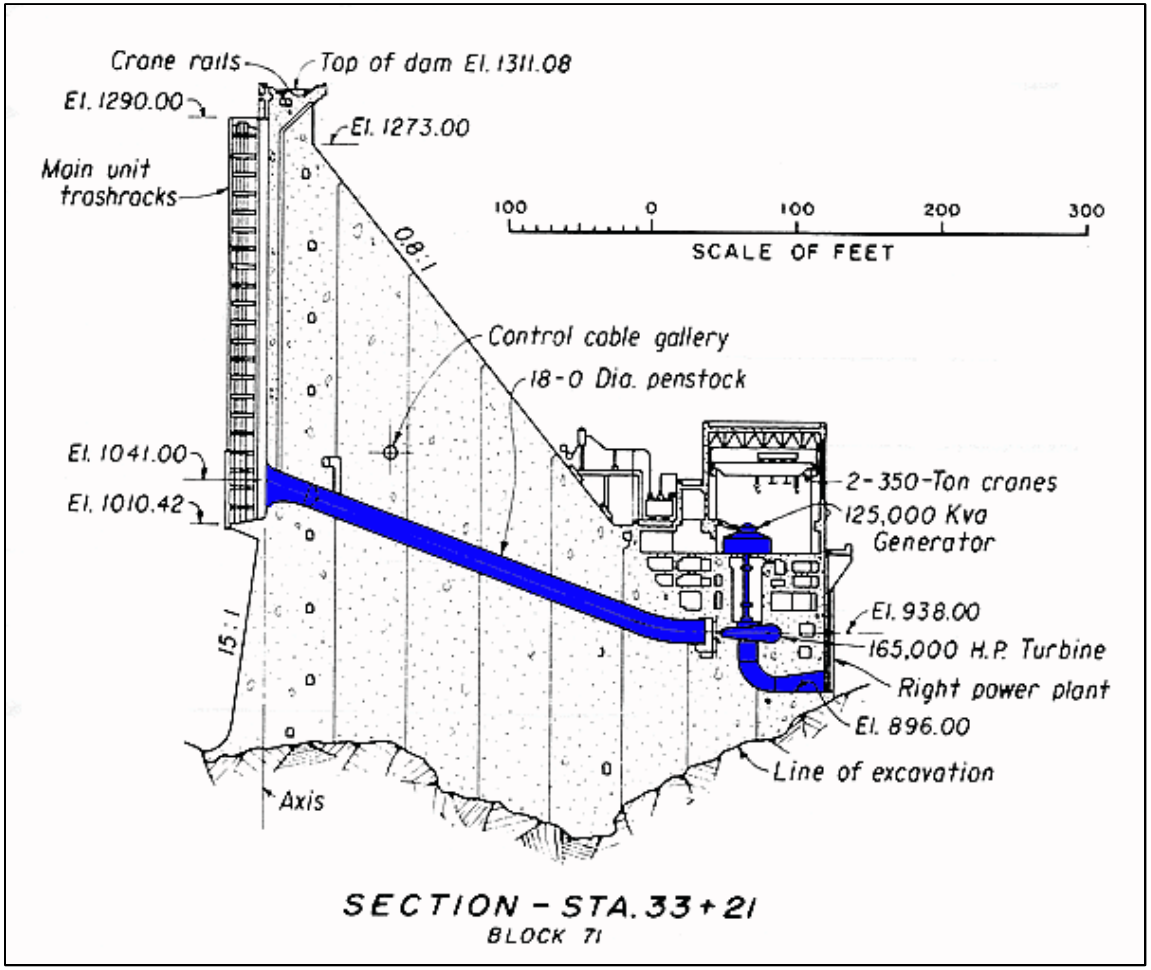
Source: FERI.

How a dam works

Water rushes down the pipe.

It pushes on the turbine.

Then it exits to the front of the dam.

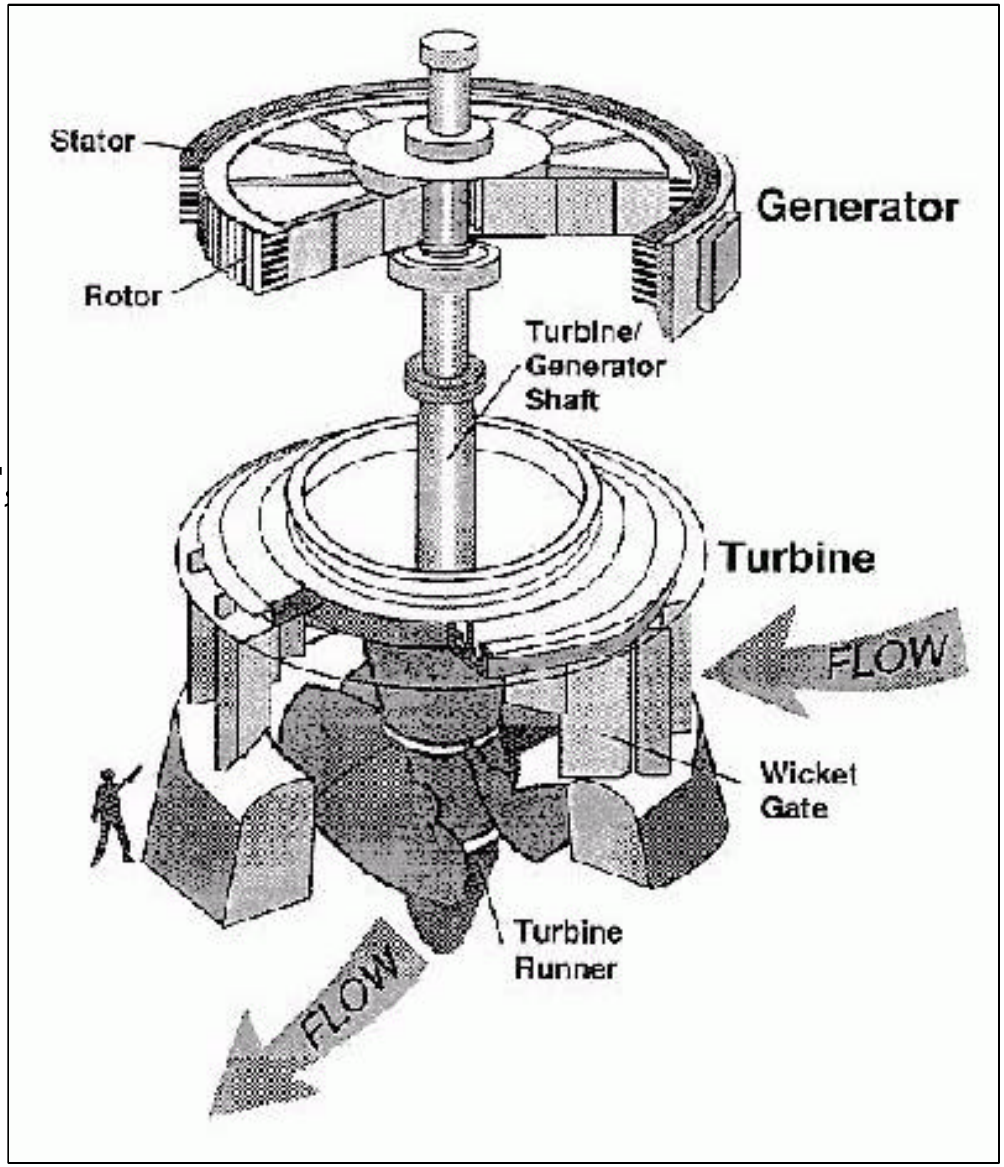


Source: Grand Coulee Dam.

Water pushes on the turbine.

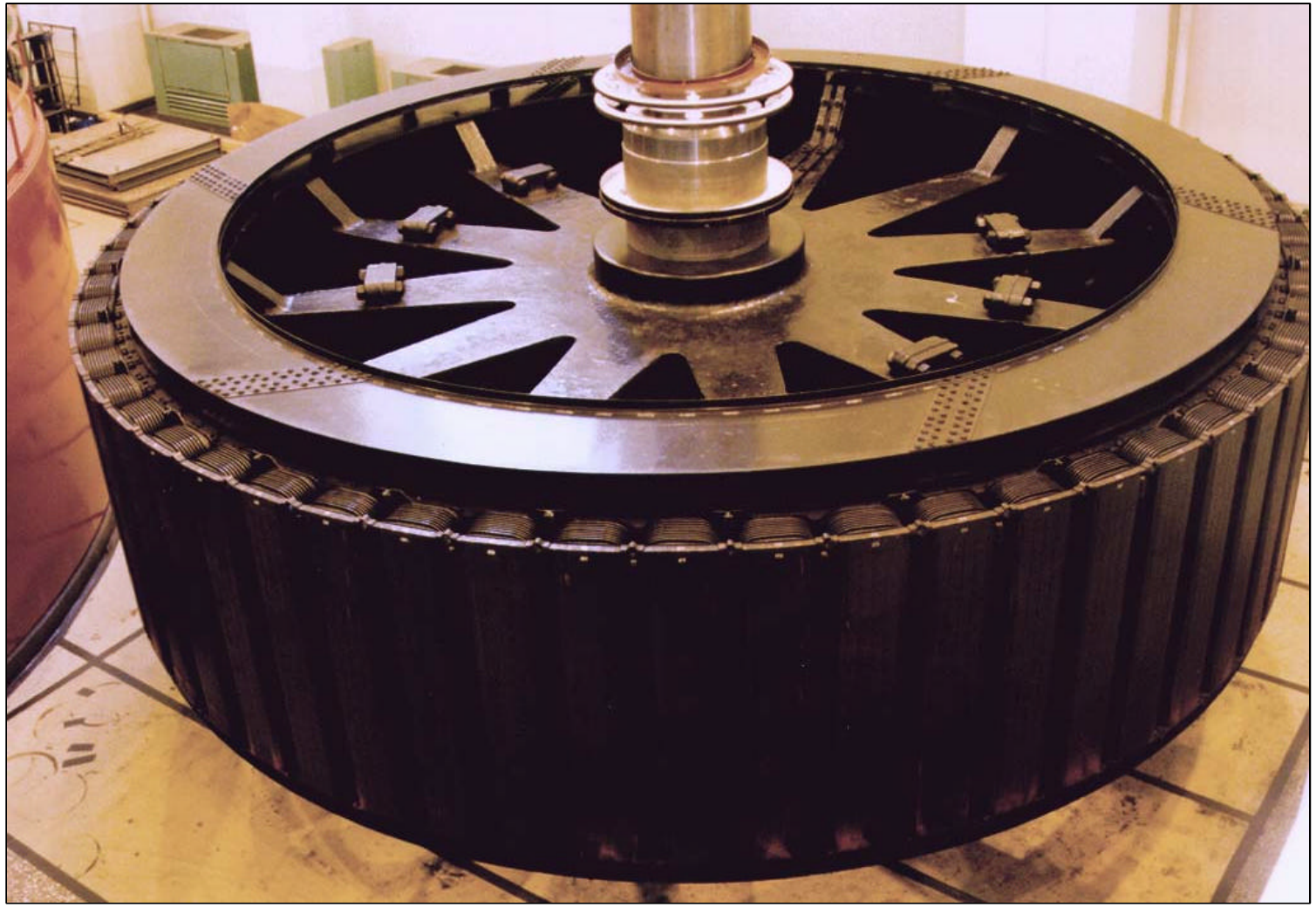
The turbine spins the rotor, producing electricity.

The whole thing can be quite large.



Source: Grand Coulee Dam.

One rotor at Grand Coulee Dam is 18 feet tall and 31 feet in diameter.



Source: Grand Coulee Dam.

Grand Coulee Dam, in Washington. Largest dam in US (6480 MW)

Source: Grand Coulee Dam.

A *low* dam, on the Mississippi River

Source: FERI.

Hydroelectric dams can also be tiny

Source: NREL..

Dams can destroy: Hetch Hetchy valley was the twin of Yosemite National Park. Now it’s under water.

Source: FERI.

Photovoltaics: Energy from the Sun

PV produces electricity directly from light, using silicon.

Silicon gives off electricity naturally when hit with light.

Source: NREL..

PV powers lots of things...

Burger Kings

Churches

Source: NREL..

Houses

A School in South Africa

Source: NREL..

Bikes!

Race cars!

Source: NREL..

Toy cars

from the Junior Solar Sprint
a Department of Energy-funded
contest for kids.

The Hubble Telescope

Source: NREL..

Even whole cities!

The city of Sacramento shut down their nuclear power plant in favor of renewable energy and efficiency, like this 2 MW solar power plant.

Source: NREL..

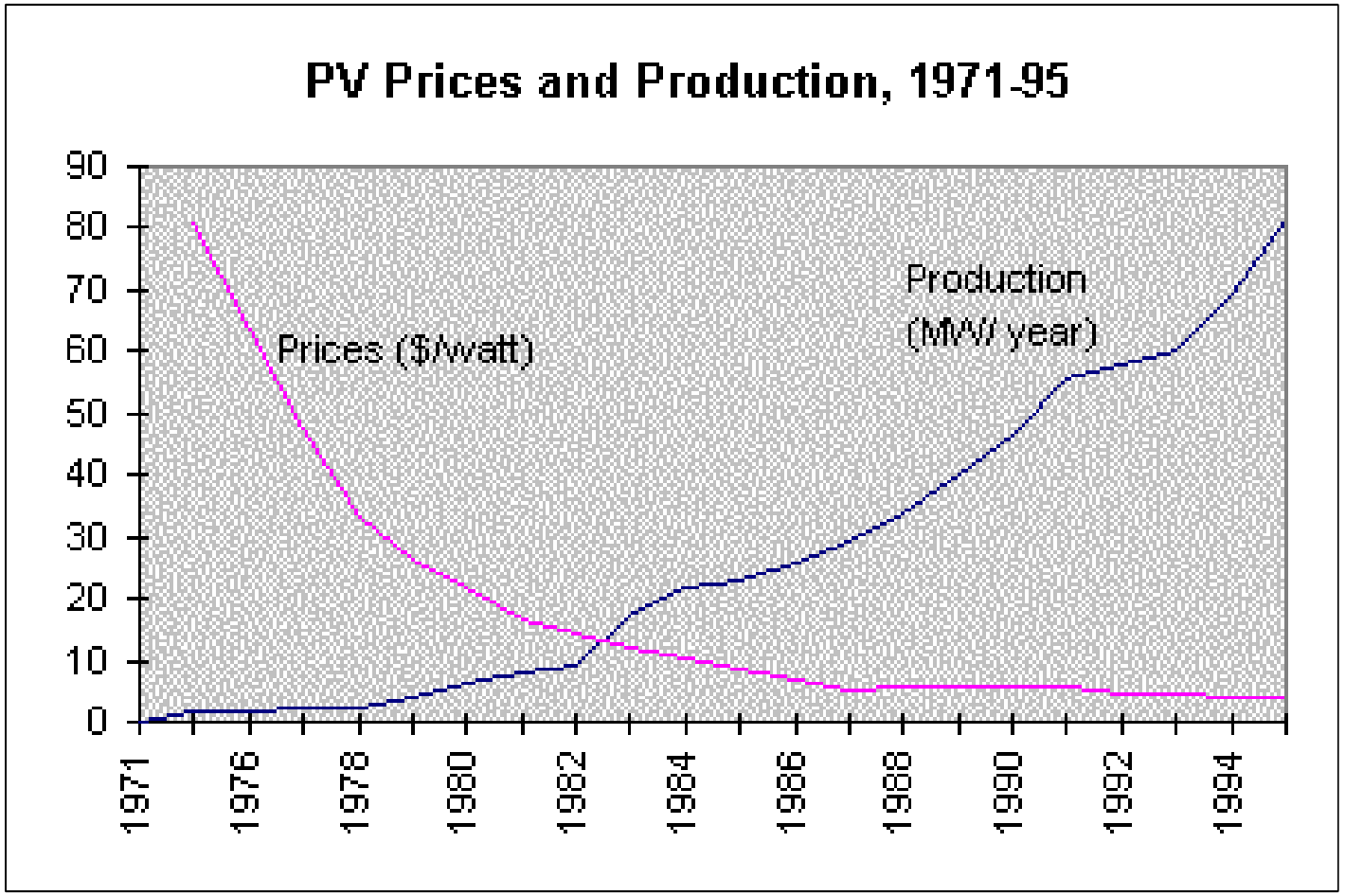
PV can be made into roof shingles

Shingles blend right in on a roof.

This building is in Atlanta, GA.
See the PV shingles?

Source: NREL..

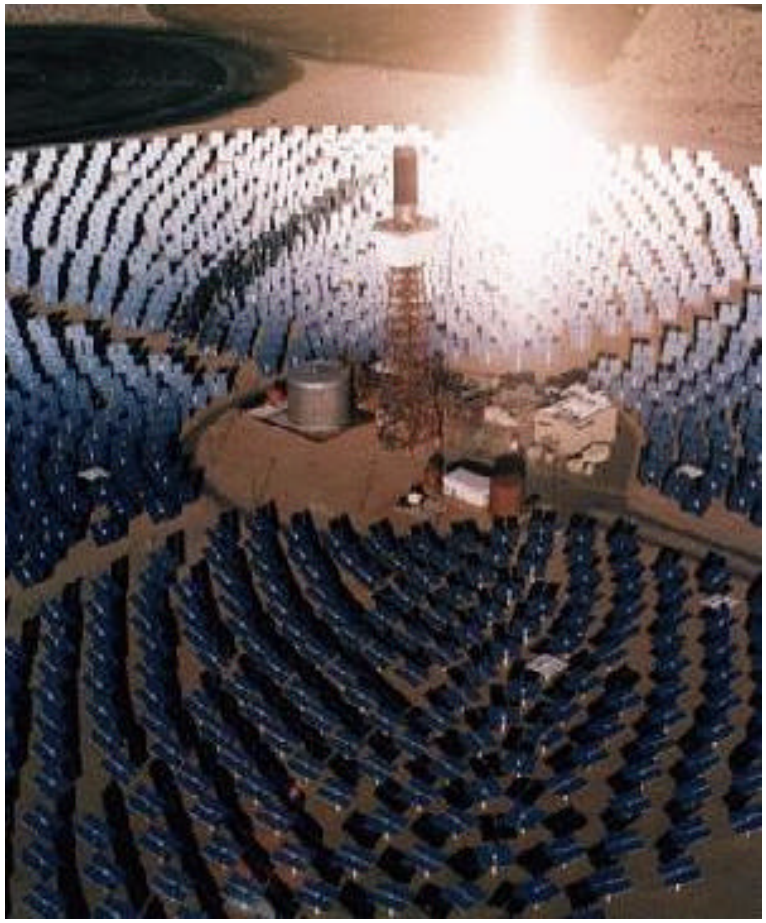
Photovoltaics get cheaper as more are made



Source: Worldwatch Institute.

Solar Thermal Electricity

Reflected light boils water into steam, to run a turbine, producing electricity.



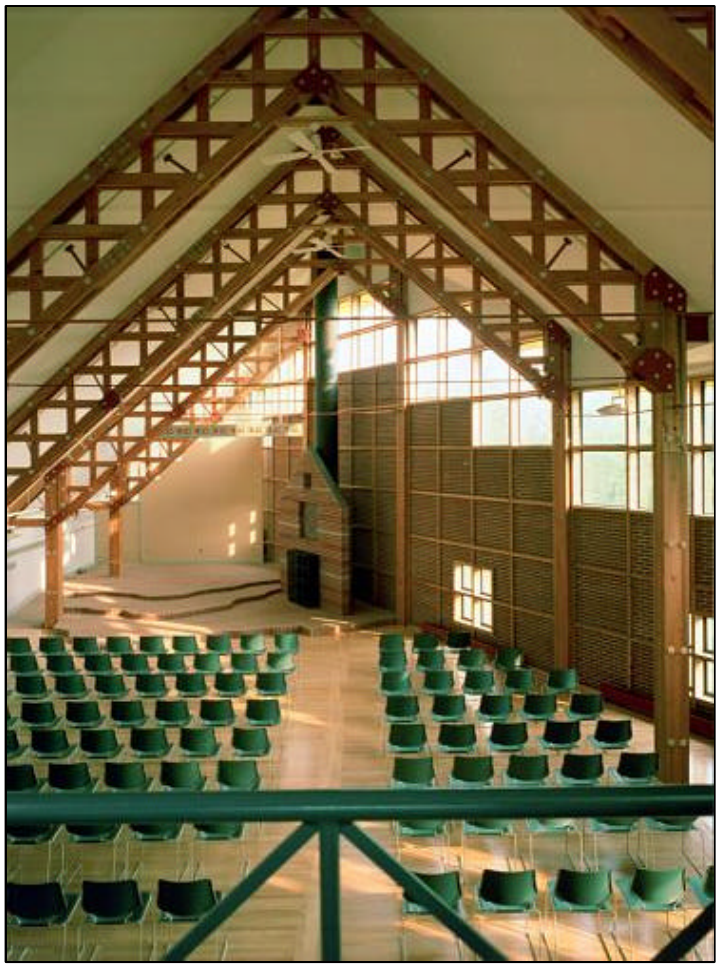
Source: NREL..

Dish Stirling Engine

Reflected light
powers a “heat engine,”
like a car engine but with
the heat on the outside.
The engine runs to
produce electricity.

Solar Buildings: Light and Heat

Buildings can be designed to use daylight instead of electric light, like this school auditorium in Colorado. This saves electricity and makes the building a nicer place to be.

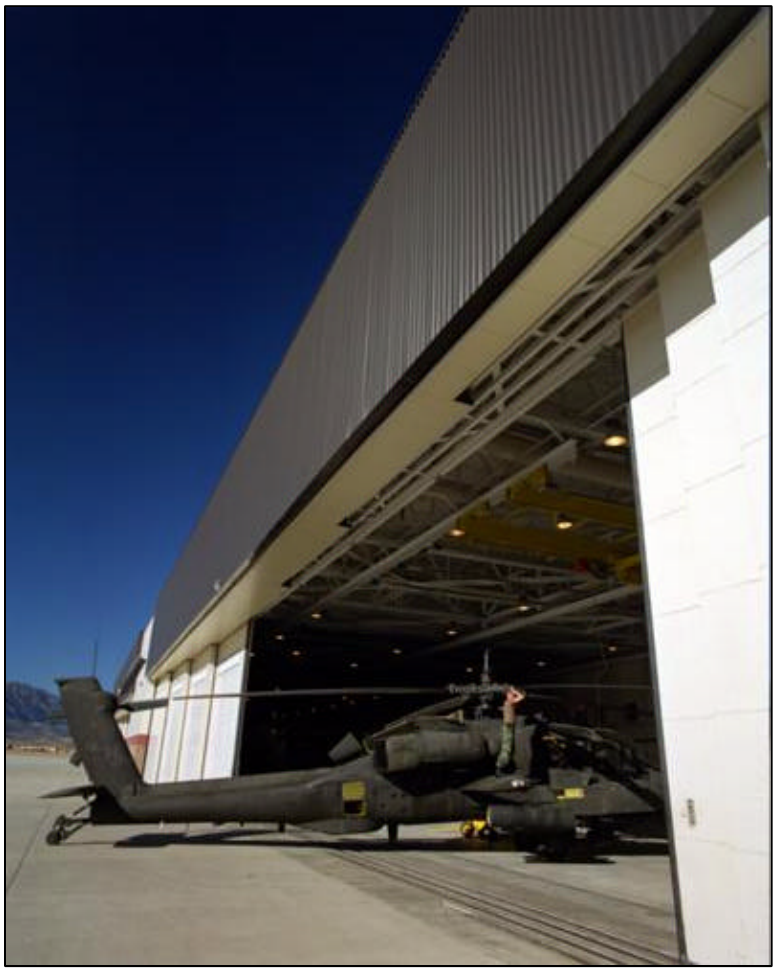


Source: NREL..

Solar Heating for Buildings

The black metal wall on this aircraft hanger in Colorado provides heat for the building.

It gets hot in the sun, sucks in cold outside air through tiny pin holes in the wall, heats it up and sends it into the building.



Source: NREL..

Geothermal: Energy from the Earth

Geothermal heat occurs naturally in the earth. Steam comes up through deep wells and turns power turbines. Then the steam is sent back down the hole.

Source: NREL..

The Geysers: World's Largest Geothermal Power Plant, in Northern California

The Geysers was the first big geothermal power plant. Since they don't send the steam back into the earth after they use it, they are "running out of steam."

Source: NREL..

Geothermal means lots of pipes

Source: NREL..

Biomass: Energy from Plants

Fast growing plants make a good source of biomass to use for energy. This is a willow plantation in New York state. The wood is cut every few years and burned with coal in power plants.

Source: NREL..

Prairie grasses for power and ethanol

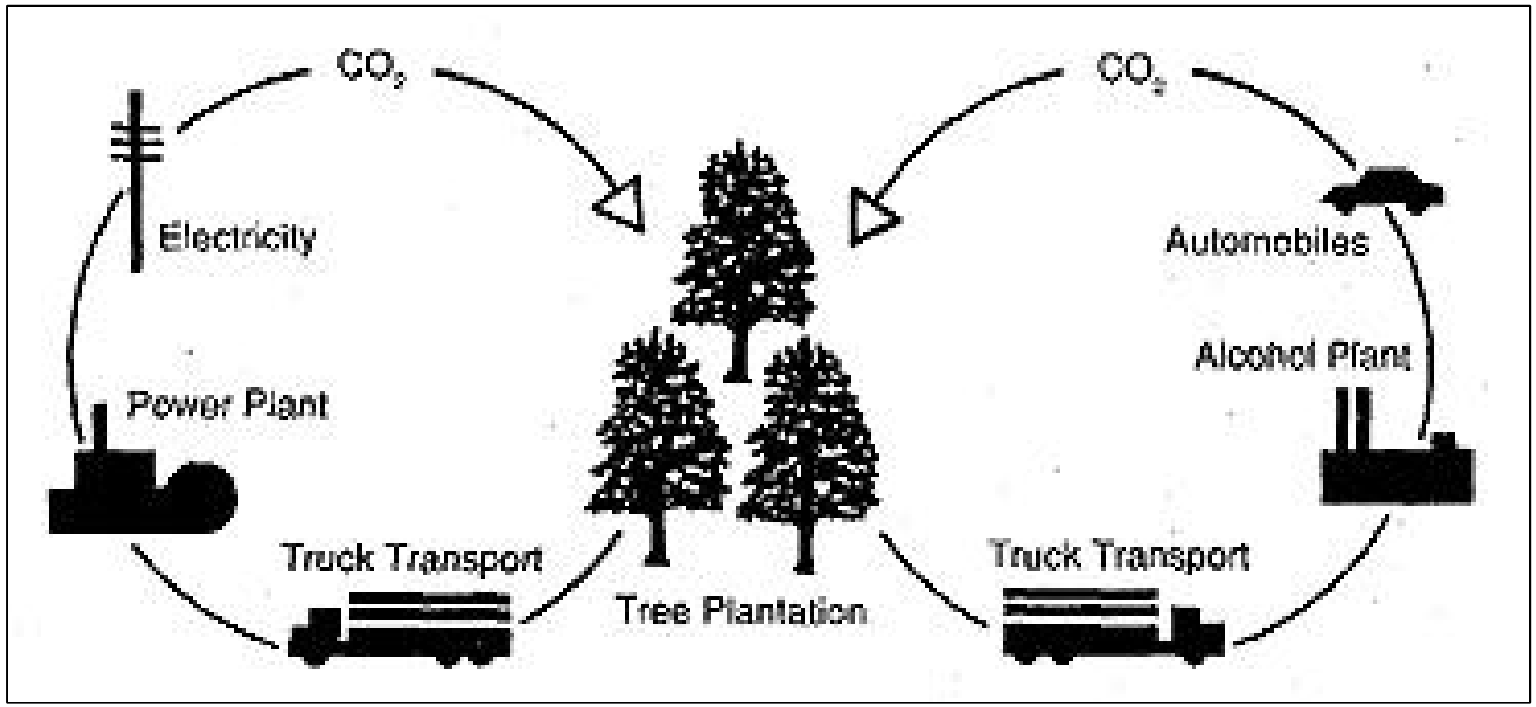
Biomass is also used to make ethanol, which is mixed with gasoline to become gasohol. Most ethanol comes from corn, but it can also come from wood or grass.

Source: NREL..

This Hawaiian power plant burns sugar cane waste.

Source: NREL..

Riding the Carbon Cycle



Source: Cool Energy.

When trees are burned they give off carbon dioxide. But the carbon dioxide is absorbed by new trees when they grow. So it's a round trip, and doesn't make global warming worse.

Wind Power

Wind power is the fastest-growing source of electricity in the world.

When the wind blows, the blades spin like an airplane propellor. The blades turn a generator to make power.

Source: Danish Wind.

Does wind power use a lot of land?

Some people argue that wind power uses too much land. Wind turbines have to be spread out to capture the wind. But the land can still be used for other things.

Source: Danish Wind.

Does wind power use a lot of *water*?

Denmark is very crowded but has lots of wind turbines, so they are putting wind turbines out in the ocean now.

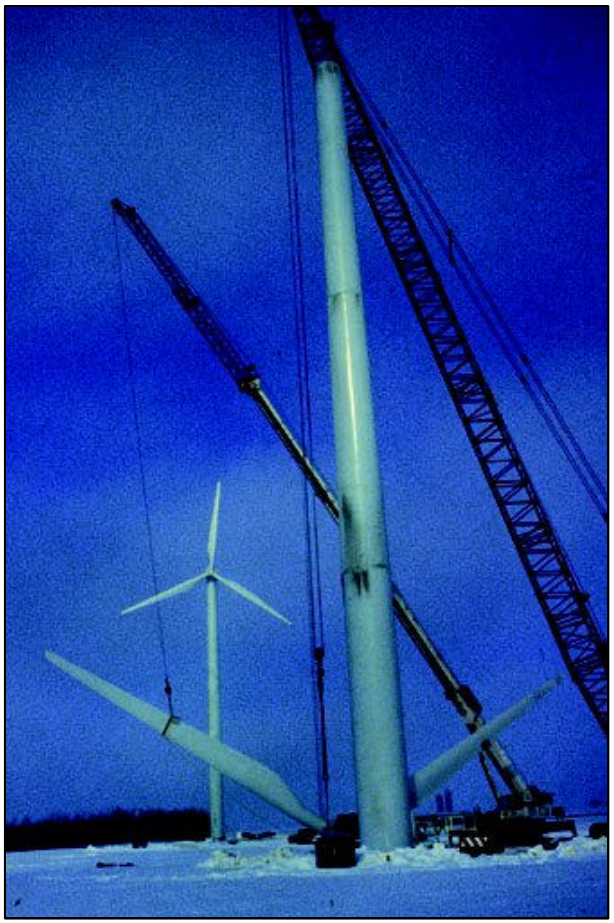
Source: Danish Wind.

Most US wind power is in California...

Source: NREL.

…but now we have some in Wisconsin.

These two turbines are near Green Bay. More are coming soon.



Source: Ben Paulos.

Photo Sources

- FERI: Franklin and Eleanor Roosevelt Institute's New Deal Network, newdeal.feri.org.
- NREL: National Renewable Energy Lab, Pix database, www.nrel.gov/data/pix.
- Grand Coulee Dam home page, www.grandcouleedam.com.
- Danish Wind Turbine Manufacturers Association, www.windpower.dk.
- *Cool Energy*, by Michael Brower, MIT Press, 1992.
- Worldwatch Institute, Washington DC, www.worldwatch.org.