

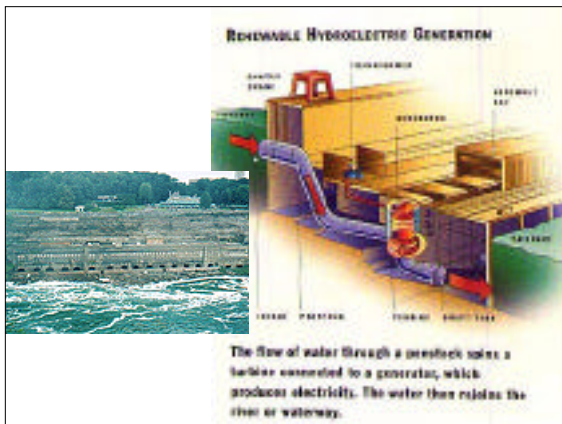
Renewable Energy Sources

- Hydroelectric power ~ 5% - 10%
- Solar energy - not large scale here
- Geothermal Energy - used in CA
- Wind Energy - various places (~1.3% of CA use)
- Tidal Power - not in US (used in Canada)

Hydroelectric Power

Flowing water creates energy that can be captured and turned into electricity. This is called hydropower. Hydropower is currently the largest source of renewable power used in the United States.

- The most common type of hydropower plant uses a dam on a river to store water in a reservoir. Water released from the reservoir flows through a turbine, spinning it, which, in turn, activates a generator to produce electricity
- Certain natural areas like Niagara Falls, don't require an impoundment area.



Hydroelectric Power in the US 1990

State	Total electricity produced, in mWh	Electricity produced by hydroelectric plants, in mWh	Percent of total electricity coming from hydroelectric	Water used for hydroelectric purposes, in Mgal/d	Gallons of water to produce 1 kilowatt-hour
Alabama	70,798	31,500	44%	2,000	2,225
Alaska	4,775	900	19%	1,000	5,275
California	394,000	23,000	6%	75,000	1,510
Florida	74,300	7,800	11%	47,000	8,500
Illinois	724,000	4,000	0.5%	11,700	18,200
Indiana	25,000	21,700	87%	60,000	2,100
Iowa	12,200	2,200	18%	40,000	3,800
Massachusetts	114,400	204,000	180%	400,000	1,900
Michigan	400,000	400,000	100%	301,000	2,300
Montana	6,000	4,200	70%	41,000	9,700
Nevada	70,100	11,000	16%	140,000	4,300
New York	4,700	1,100	23%	75,000	1,570
North Carolina	302,000	32,500	11%	170,000	2,400
United States	2,300,000	240,000	10%	1,200,000	3,300

Pluses

- Renewable
- Clean
- No long term fuel costs
- Can produce large amounts of energy
- Can adjust output

Minuses

- Significant ecological damage
- Water loss
- Only viable in certain areas

Solar Energy

- Sunlight—solar energy—can be used to generate electricity, provide hot water, and to heat, cool, and light buildings.

Passive Solar Heat Systems

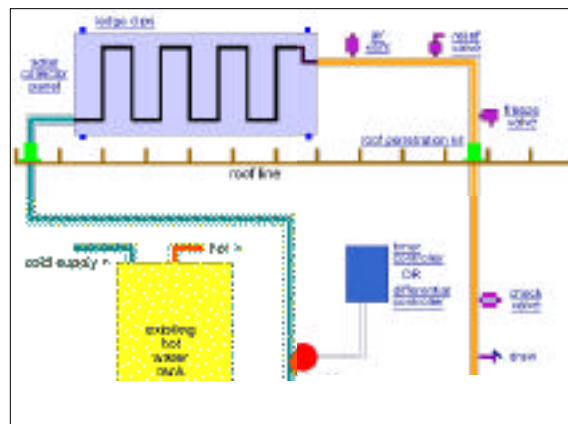
- Passive solar heat systems have been used since prehistoric times

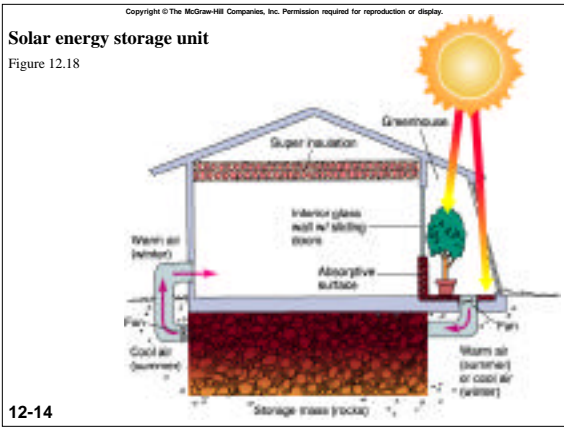


- The **south side of a building always receives the most sunlight**. Therefore, buildings designed for passive solar heating usually have large, south-facing windows.
- **Materials that absorb and store the sun's heat** can be built into the sunlit floors and walls. The floors and walls will then **heat up during the day and slowly release heat at night, when the heat is needed most**.

Active Solar Heat

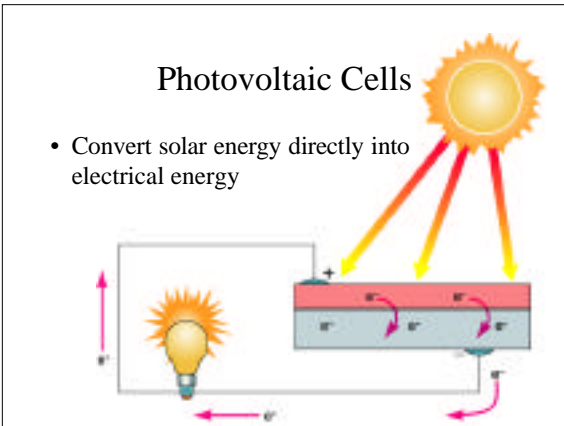
- Systems where a heat-absorbing fluid is pumped through a collector



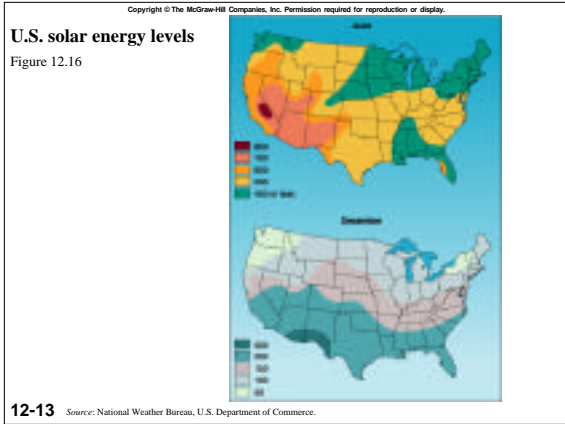


High-Temperature Solar Energy

- Parabolic Mirrors
- “Power Towers”



<p style="text-align: center;">Pluses</p> <ul style="list-style-type: none"> • Renewable • Clean <ul style="list-style-type: none"> – low emissions – low water use – low pollution • No long term fuel costs • safe 	<p style="text-align: center;">Minuses</p> <ul style="list-style-type: none"> • High up front investment • Storage problems • Only viable in certain areas of the world • astatically displeasing • toxins used in manufacturing • high land requirements
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Wind energy

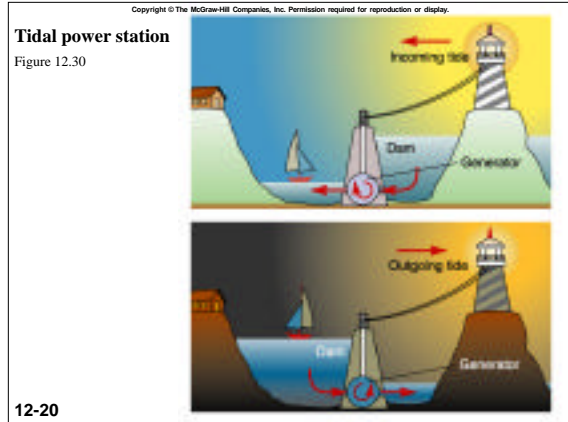
- Wind turbines capture the wind's energy with two or three propeller-like blades, which are mounted on a rotor, to generate electricity. The turbines sit high atop towers, taking advantage of the stronger and less turbulent wind at 100 feet (30 meters) or more aboveground.



<p style="text-align: center;">Pluses</p> <ul style="list-style-type: none"> • Renewable • Clean • No long term fuel costs • Land can still be used for crops or cattle • safe 	<p style="text-align: center;">Minuses</p> <ul style="list-style-type: none"> • High up front investment • Storage problems • Only viable in certain areas of the world • bird mortality • astatically displeasing
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Tidal Power

- Similar concept to Hydroelectric power using the natural rise and fall of the tides to create the potential energy needed for generating electricity



Pluses

- Renewable
- Clean
- No long term fuel costs

Minuses

- Technically very complex
- Only viable in very select, unique areas of the world
- highly variable and low duty

