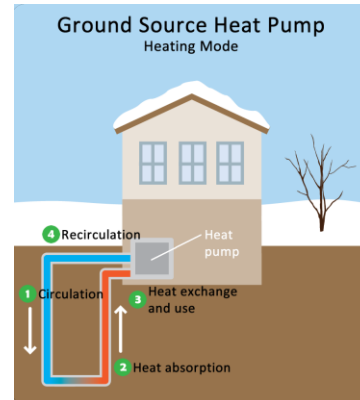


Renewable Energy Systems

Renewable Energy



Renewable Energy

- ▶ Maine is endowed with plentiful bioenergy, wind, hydropower, ocean, and other renewable energy resources.
- ▶ Non-hydro renewables are responsible for 32% of in-state generation, a higher percentage than in any other state in the nation.

Renewable Energy

- ▶ Maine is home to the country's first tidal energy device to generate electricity for the power grid and first working offshore wind turbine (as of 2014).



Solar Energy

We use solar thermal energy systems to

- ▶ heat water for use in homes, buildings, or swimming pools
- ▶ heat the inside of homes, greenhouses, and other buildings
- ▶ heat fluids to high temperatures in solar thermal power plants

Solar photovoltaic devices, or solar cells, change sunlight directly into electricity.

Solar Energy



Solar Energy

The two main benefits of using solar energy are

- ▶ Systems do not produce air pollutants or carbon dioxide.
- ▶ Systems on buildings have minimal impact on the environment.

The main limitations of solar energy are

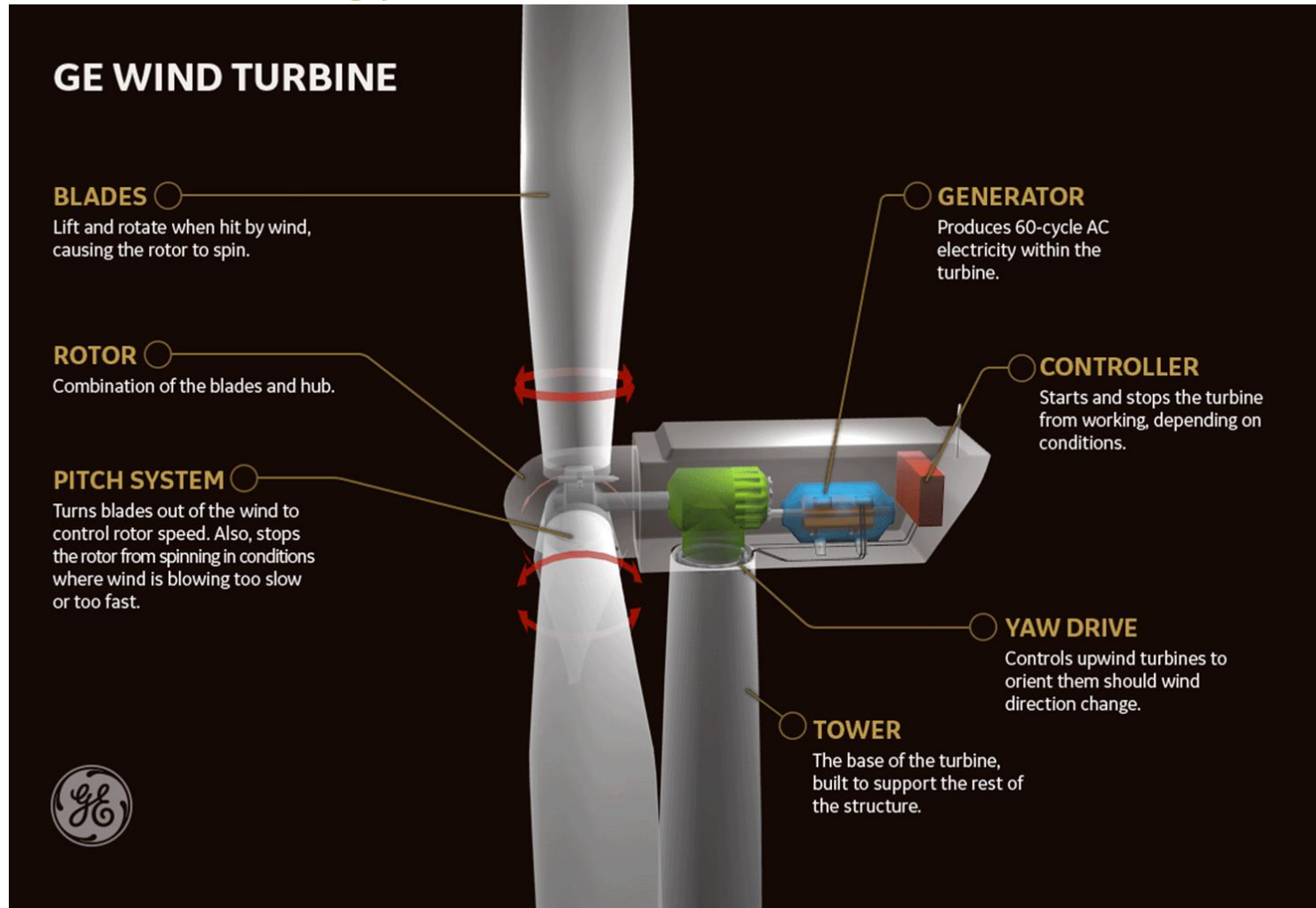
- ▶ The amount of sunlight that arrives at the earth's surface is not constant. The amount of sunlight varies depending on location, time of day, season of the year, and weather conditions.
- ▶ The amount of sunlight reaching a square foot of the earth's surface is relatively small, so a large surface area is necessary to absorb or collect a useful amount of energy.

Wind Energy

- ▶ Wind turbines operate on a simple principle. The energy in the wind turns two or three propeller-like blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity



Wind Energy



Wind Energy

- ▶ Wind turbines are mounted on a tower to capture the most energy. At 100 feet or more above ground, they can take advantage of faster and less turbulent wind.
- ▶ Wind turbines can be used to produce electricity for a single home or building, or they can be connected to an electricity grid for more widespread electricity distribution.

Wind Energy

- ▶ Advantages of Wind Energy
 - ▶ Clean and renewable source of power
 - ▶ Cost effective
 - ▶ Rapid growth of industry, large potential
- ▶ Disadvantages of Wind Energy
 - ▶ Wind reliability
 - ▶ Threat to wildlife
 - ▶ Noise and visual pollution



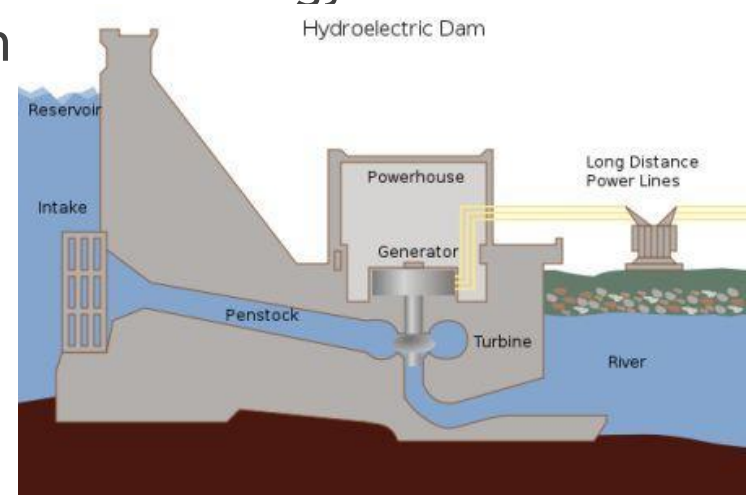
Tidal Energy

► Tidal Stream Generator

- Makes use of the kinetic energy of moving water to power turbines, in a similar way to wind turbines that use wind to power turbines.

► Tidal Barrage

- Tidal barrages make use of the potential energy in the



Tidal Energy

► Advantages

- Clean fuel source compared to fossil fuels
- Domestic source of energy

► Disadvantages

- Tidal power can have effects on marine life.
 - The turbines can accidentally kill swimming sea life with the rotating blades.
 - Some fish may no longer utilize the area if threatened with a constant rotating or noise-making object.
 - Installing a barrage may change the shoreline within the bay or estuary, affecting a large ecosystem that depends on tidal flats.

Wave Energy

- ▶ Ocean waves contain tremendous energy potential.
- ▶ Wave power devices extract energy from the surface motion of ocean waves or from pressure fluctuations below the surface.



Wave Energy

► Advantages

- Renewable
- Environmentally friendly compared to fossil fuel energy
- Variety of designs to use
- Less energy dependence from foreign governments

► Disadvantages

- Can affect the marine environment
- May disturb private or commercial shipping
- Dependent on wavelength for best operation
- Poor performance in rough weather
- Visual/noise issues



Geothermal Energy

- ▶ (geo = earth and thermal = heat), geothermal energy comes from heat produced by the Earth.

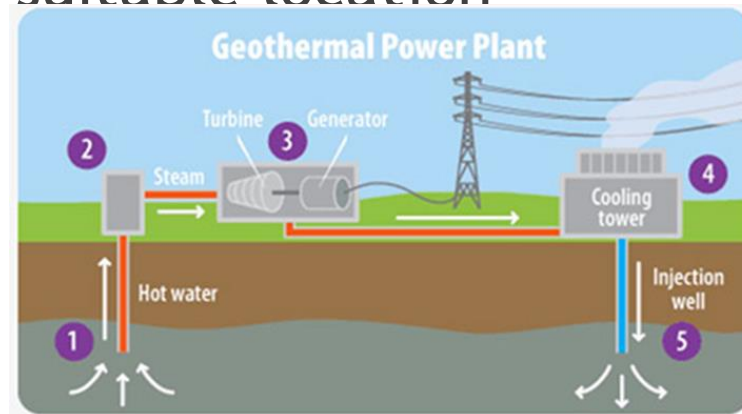


Geothermal Energy

- ▶ **Direct geothermal energy** can be accessed in areas where hot springs/geothermal reservoirs are near the surface of the Earth.
- ▶ **Geothermal heat pumps** utilizes a series of underground pipes, an electric compressor and a heat exchanger to absorb and transfer heat.
- ▶ **Geothermal power plants** also harness the heat of the Earth through hot water and steam. In these plants, heat is used to generate electricity.

Geothermal Energy

- ▶ Advantages
 - ▶ Renewable energy
 - ▶ Cleaner than burning fossil fuels
- ▶ Disadvantages
 - ▶ Cost of drilling, researching proper areas
 - ▶ Requires a suitable location



Biofuels

- The two most common types of biofuels are **ethanol** and **biodiesel**.



Biofuels

- ▶ Ethanol is an alcohol.
- ▶ Ethanol is mostly used as a fuel additive to cut down a vehicle's carbon monoxide and other smog-causing emissions.

Biofuels

- ▶ Biodiesel is made by combining alcohol (usually methanol) with vegetable oil, animal fat, or recycled cooking greases.
- ▶ It can be used as an additive to reduce vehicle emissions (typically 20%) or in its pure form as a renewable alternative fuel for diesel engines.

Biofuels

► Advantages

- Easy to source
- Renewable
- Reduces greenhouse gases
- Reduced dependence on foreign energy

► Disadvantages

- Higher cost of production (lower supply than gasoline)
- Monoculture
- Shortage of food
- Water Use



RENEWABLE ENERGY SYSTEMS

S.No	Topic	Weblink
1	Renewable energy	https://www.youtube.com/watch?v=Y2HwjHwdmSU&t=26s
2	Renewable energy Basics and pollution	https://www.youtube.com/watch?v=Ik6jw6dU71s&t=46s
3	DIY wind turbine	https://www.youtube.com/watch?v=qSWKoPGfx3w
4	Solar irrigation in India	https://www.youtube.com/watch?v=QMoHB2BcZGw
5	Solar pumping system	https://www.youtube.com/watch?v=bPvPJuvLw9Q
6	Solar cell manufacturing and solar panel production	https://www.youtube.com/watch?v=fZ1SC-vUe_I
7	Solar power manufacturing process	https://www.youtube.com/watch?v=yXxfw03ZaHE
8	Solar system installation (off grid)	https://www.youtube.com/watch?v=pZi4Bh6kYQM
9	Future applications of solar pv technology	https://www.youtube.com/watch?v=8S5hNYepw14
10	Growing forest using geothermal energy	https://www.youtube.com/watch?v=pnRNdbqXu1I&t=193s
11	Growing fruits using geothermal energy	https://www.youtube.com/watch?v=9XIGyvA1Cg0
12	16 inventions getting us off fossil fuels	https://www.youtube.com/watch?v=zfz52w7znEw
13	Ultra-small water power generator	https://www.youtube.com/watch?v=XjEgFIngZ04
14	Blue energy - ocean power (piston pump & racks)	https://www.youtube.com/watch?v=fYfs-qYGzvs
15	Underwater turbines	https://www.youtube.com/watch?v=CIYA6Jwwp4s