TeachEngineering

STEM Curriculum for K-12

Renewable Energy: Sail Cars

Question: What Is Energy?

Answer: Energy is the ability to do work.

Energy comes in many forms: chemical energy, electrical energy, heat energy, light energy, mechanical energy and nuclear energy.

Conservation of Energy

“Energy is neither created nor destroyed.”

The amount of energy in a system is conserved over time.

Renewable vs. Nonrenewable

Examples of renewable energy:
solar, biofuel, wind, geothermal, hydropower
LIMITLESS

Examples of nonrenewable energy:
fossil fuels (coal, oil, natural gas)
LIMITED

Wind Energy

A type of renewable energy provided by the wind.

Wind turbines

DAY TIME

NIGHT TIME

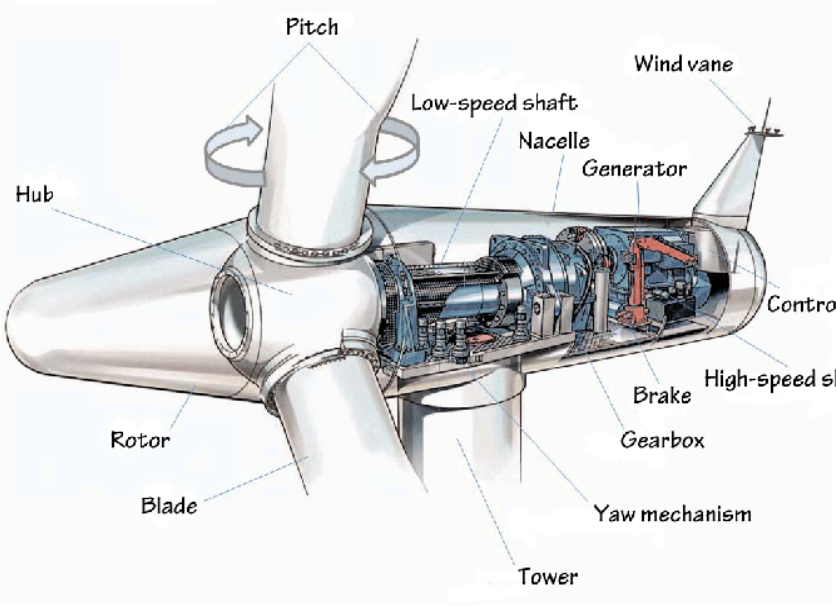
Wind Energy

PV Cells

Concentrated Solar

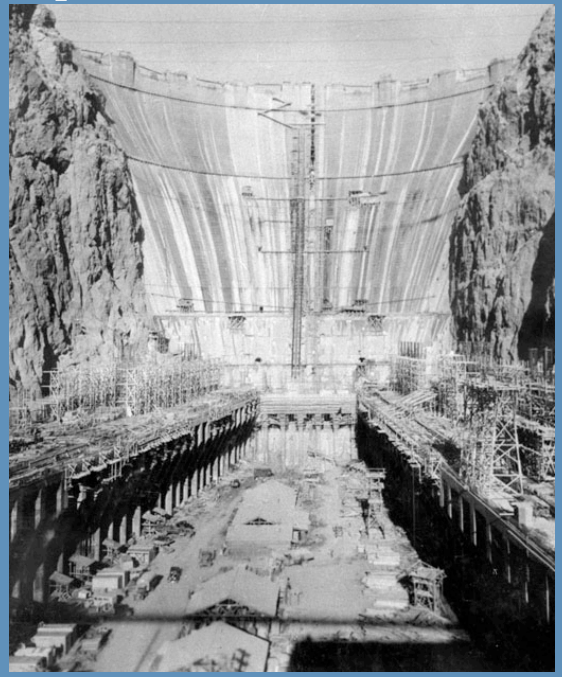
Wind Turbines

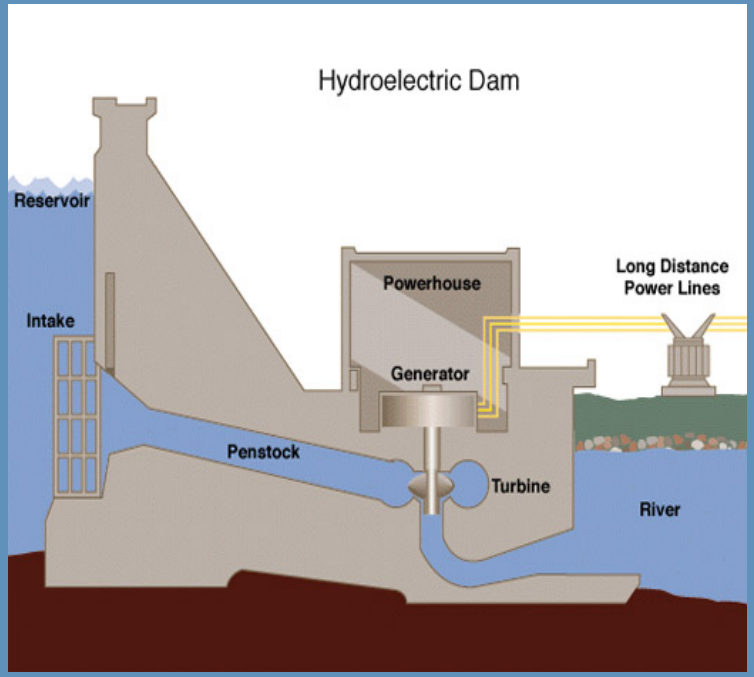
The major components of a wind turbine



SOURCE: Center on Globalization, Governance, and Competitiveness, Duke University

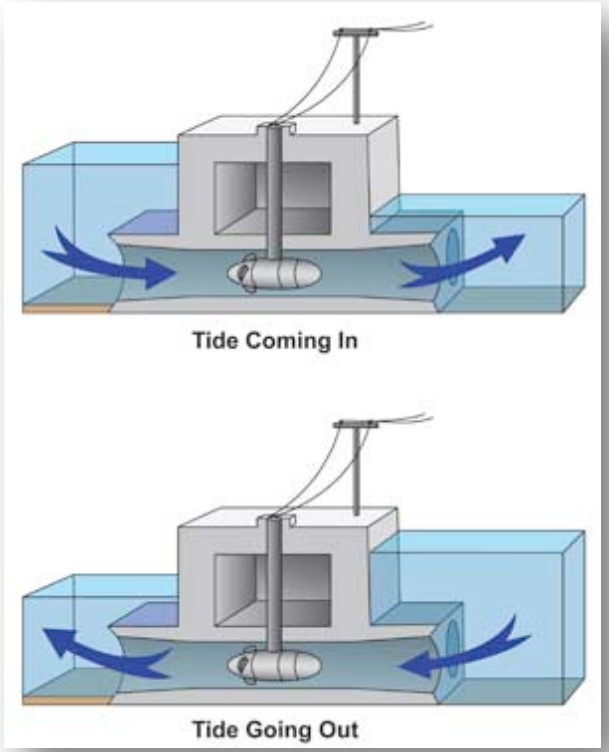
Hydropower




Hydroelectric Dam
Reservoir
Intake
Powerhouse
Long Distance
Power Lines
Generator
Penstock
Turbine
River

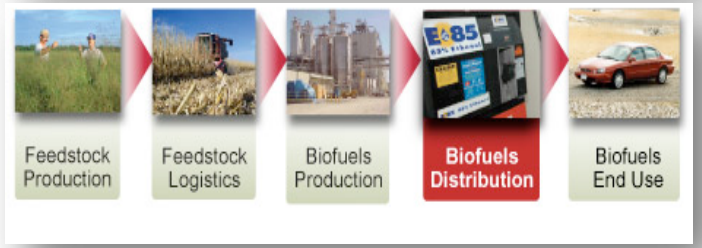
Other Types of Renewable Energy

hydro / tidal



geothermal

biofuels



Sail Car Challenge

In groups of two, design a sail to propel your car forward using the wind from a box fan!

- **Each group receives a base with axles and wheels.**
- **Use the given materials to design a mast and sail that propels your “sail car” forward.**
- **Be creative and don’t give up!**

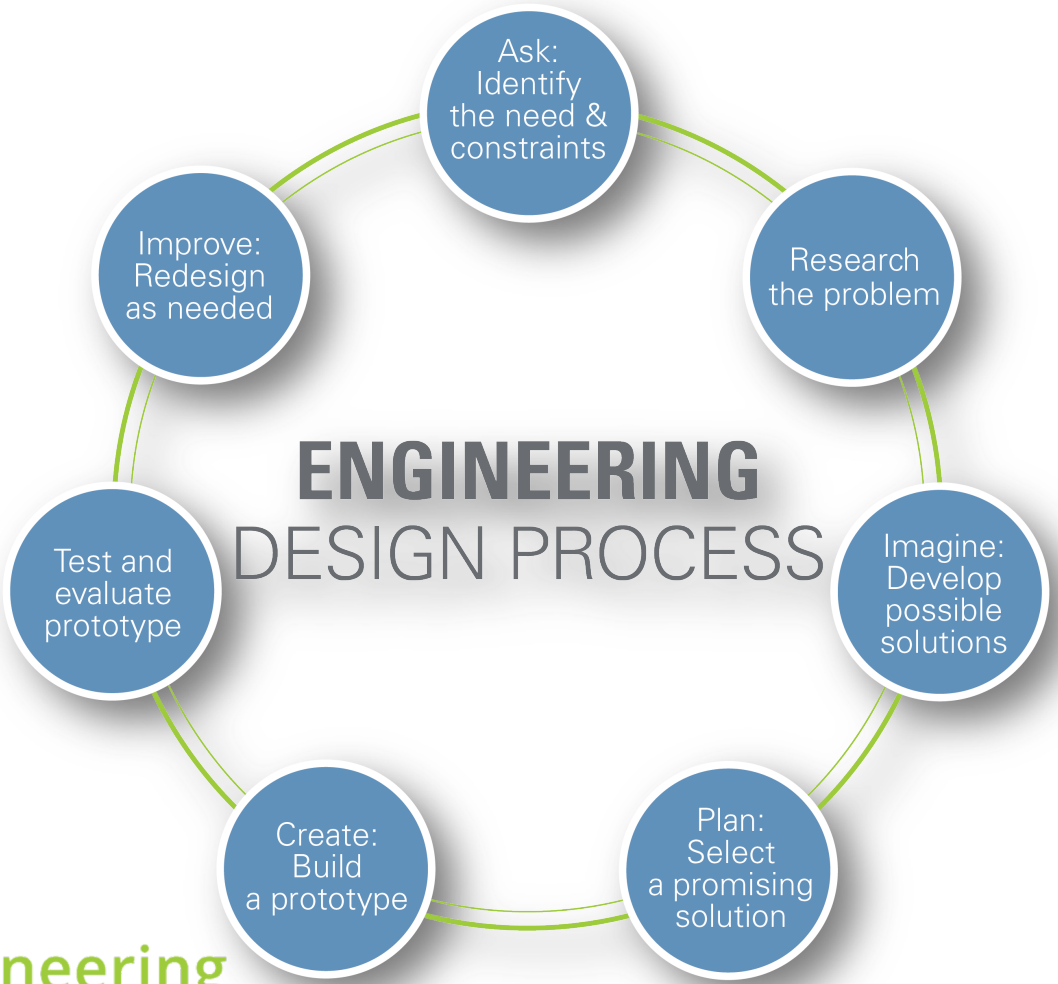
Sail Types

Scientific Method

- What are our *constants*?
  - car base – cardboard rectangle of the same size and shape
  - axles – coffee stirrers
  - wheels – Lifesavers mint candies

- What are our *variables*?
  - sail material
  - sail design
  - mast material
  - mast design

- Can you think of any other constants?
- Can you think of any other variables?


Ask: Identify the need & constraints
Research the problem
Imagine: Develop possible solutions
Plan: Select a promising solution
Create: Build a prototype
Test and evaluate prototype
Improve: Redesign as needed
ENGINEERING
DESIGN PROCESS