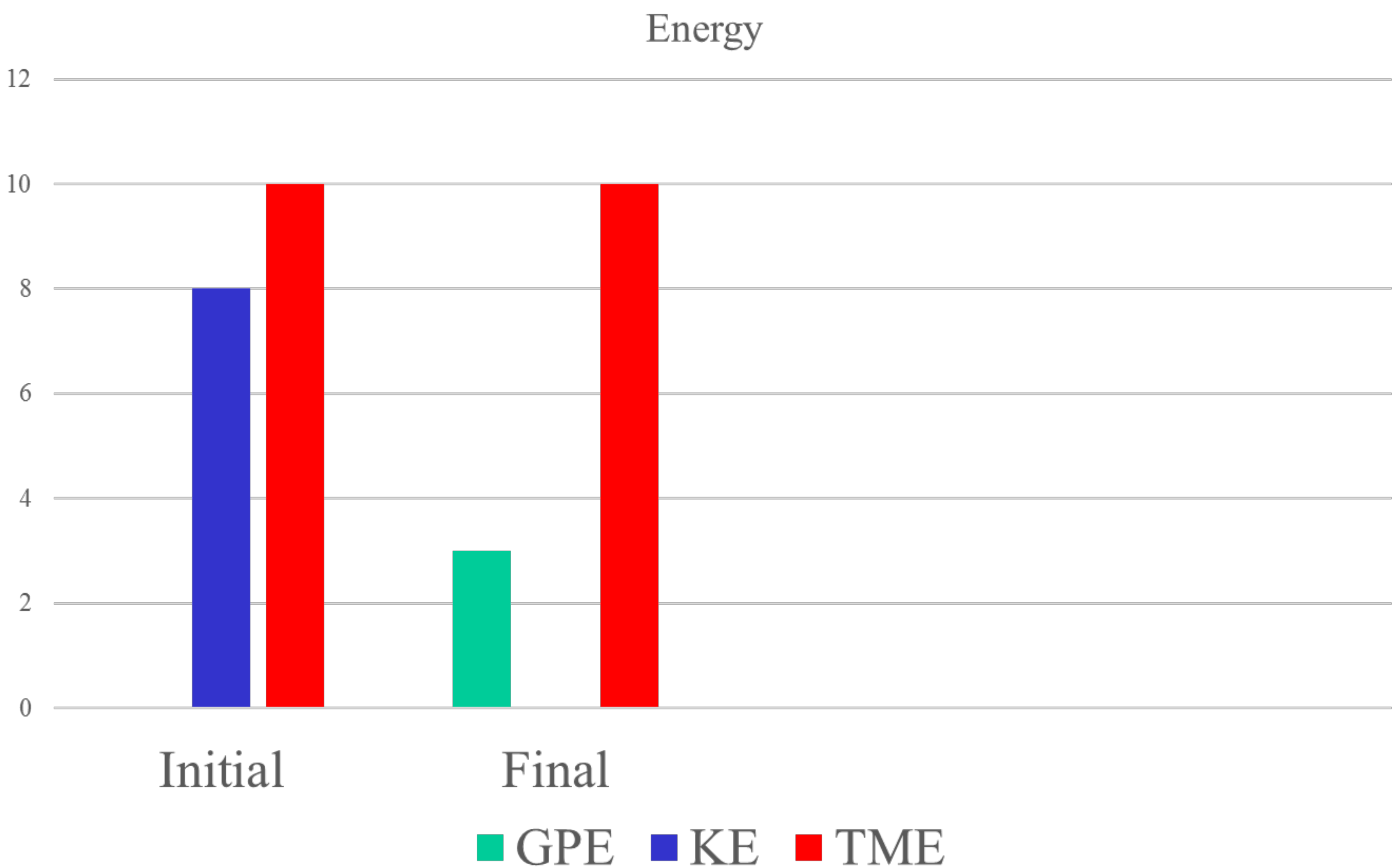
POD 3.12.19

Copy this chart and complete the missing information…



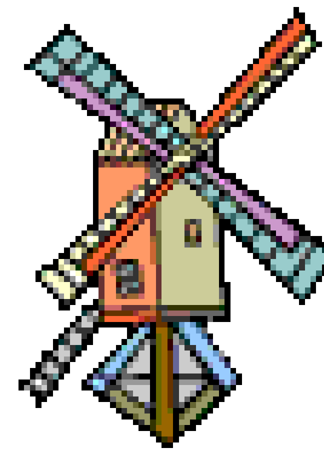
Energy Forms and Transformations

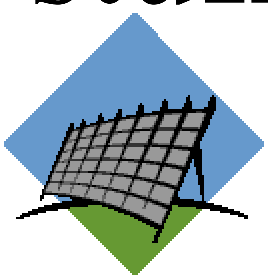
Essential Question:

How do we identify energy transformations taking place around us?

Energy

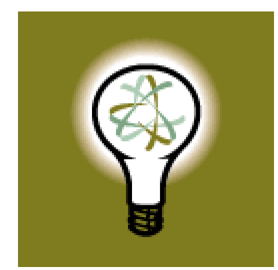
- the “stuff” that makes “stuff do stuff”





OR

- the ability to do work. (W=F x D)



(F=force d=distance)

Law of Conservation of Energy

- Energy can not be created or destroyed but is transformed from one form to another.

Example

Lighting a match

Chemical energy transforming into radiant (light) and thermal (heat).

Types (kinds) of Energy

- PE (potential energy)
- KE (kinetic energy)

Potential Energy

- Energy due to height of an object.
- Stored energy

Examples

Books on a desk

At the top of a mountain

At the top of a slide

Water at the top of the falls

Kinetic Energy

- Energy from motion. The faster an object is, the higher the kinetic energy.

Examples

Books falling

Skiing down a mountain

Sliding down a slide

Water going over the falls

Forms of energy

- Mechanical
- Heat/Thermal
- Chemical
- Electrical
- Electromagnetic
- Nuclear

Mechanical Energy

- Energy of motion or position
- Not 100% efficient much lost to heat
- Sound, wind, waterfall, compressed spring, moving machine parts

Electrical Energy

- Moving electrical charges.
- Electricity from batteries, power lines, lightning

Electromagnetic (Radiant) Energy

- energy that travels in waves; have electrical and magnetic properties

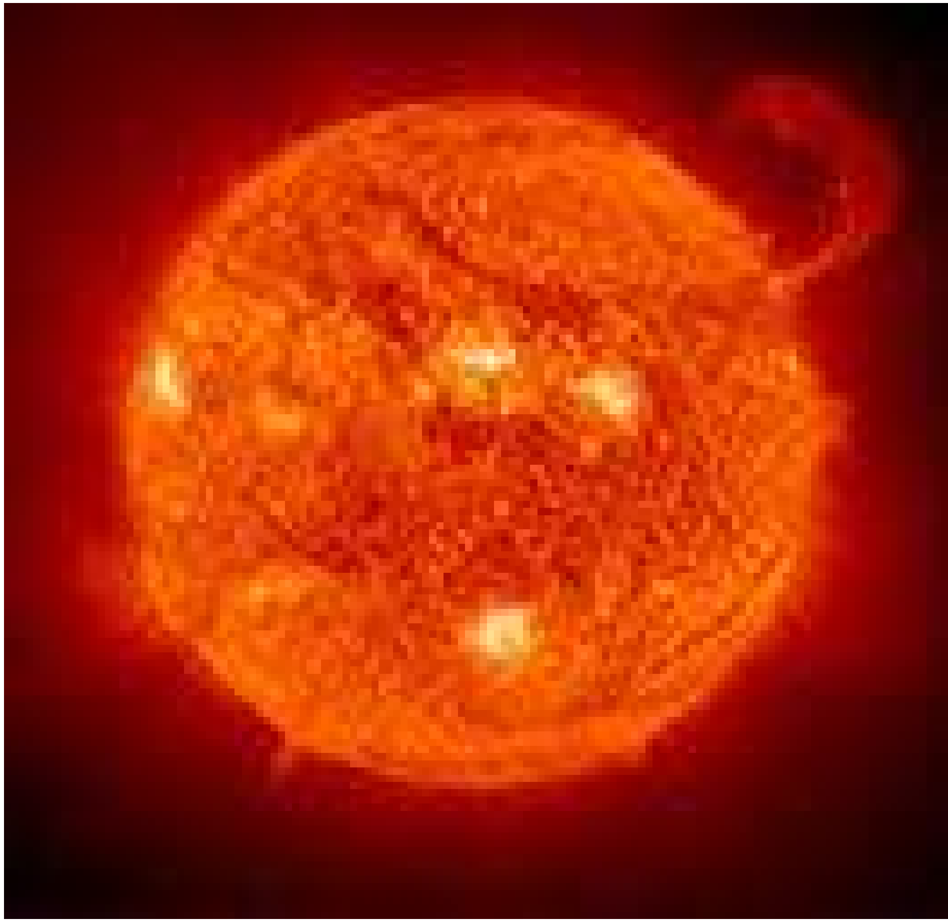
- Light, Magnetism, X-Rays, Radio waves, microwaves, ultraviolent and infrared radiation

Heat/Thermal Energy

- The internal motion of an objects atoms and molecules.
- Measured by temperature.
- The faster particles move, the more thermal energy they have.
- Fire

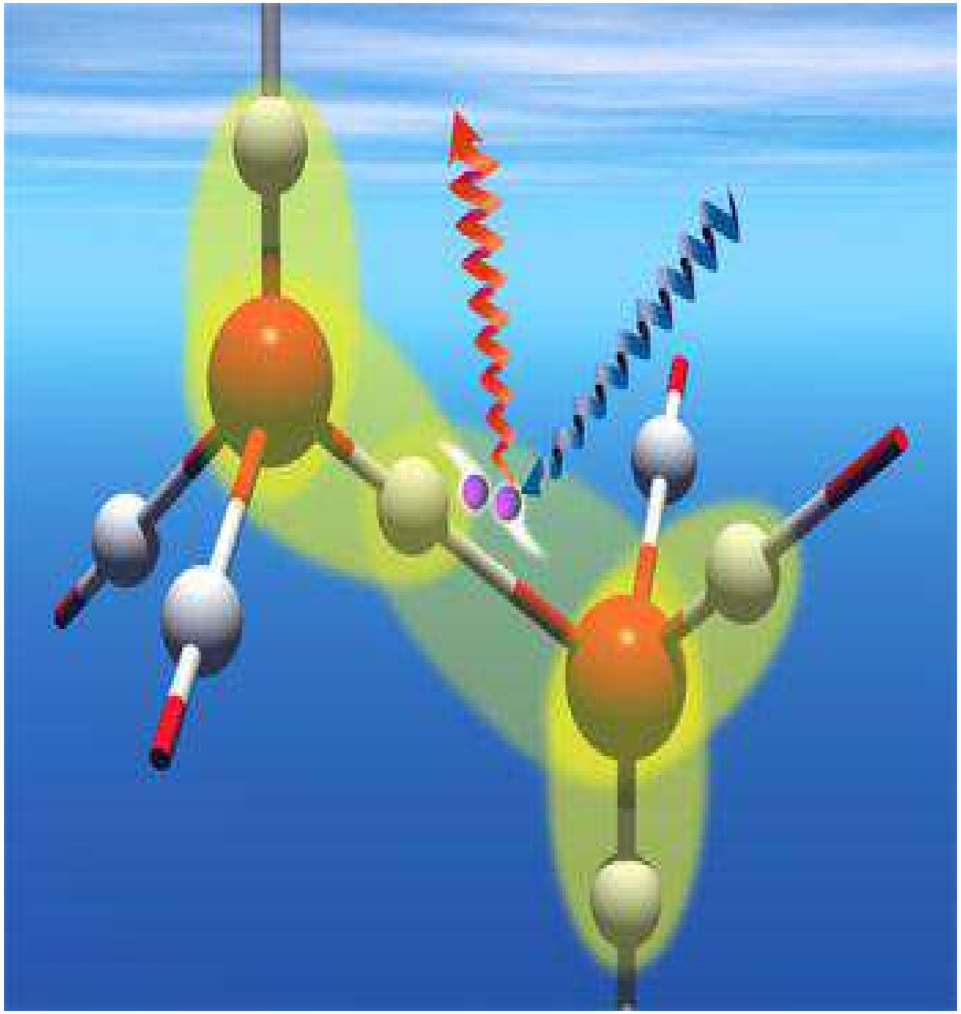
Nuclear Energy

- Energy stored in center (nucleus) of an atom
- Most powerful
- PE only
- Fission (breaking apart), Fusion (forming), Sun



Chemical Energy

- Energy stored by chemical bonds in an object.
- When bonds are broken, energy is released.
- gasoline, food, coal, wood



Try the following:

Windmill –

Flashlight –

Microwave –

Firecracker –

Bicycle –

Battery –

Windmill – Mechanical (wind) → Mechanical (turning blades)

Flashlight – Chemical & Electric (batteries) → Radiant (light) & Thermal (heat)

Microwave – Electric (outlet) → Radiant (light), Mechanical (Sound) & Thermal (heat)

Firecracker – Chemical → Thermal (heat), Radiant (light), Mechanical (sound)

Bicycle – Chemical (cells in body) → Mechanical (legs peddling) & Mechanical (bicycle)

Battery – Chemical & Electrical → nothing until it is used

Try the following:

Electrical to Thermal –

Chemical to Thermal –

Electrical to Mechanical –

Electrical to Thermal – electric blanket, hair dryer, electric heater, electric stove top, toaster

Chemical to Thermal – chemical digestion, burning fossil fuels, a lighter

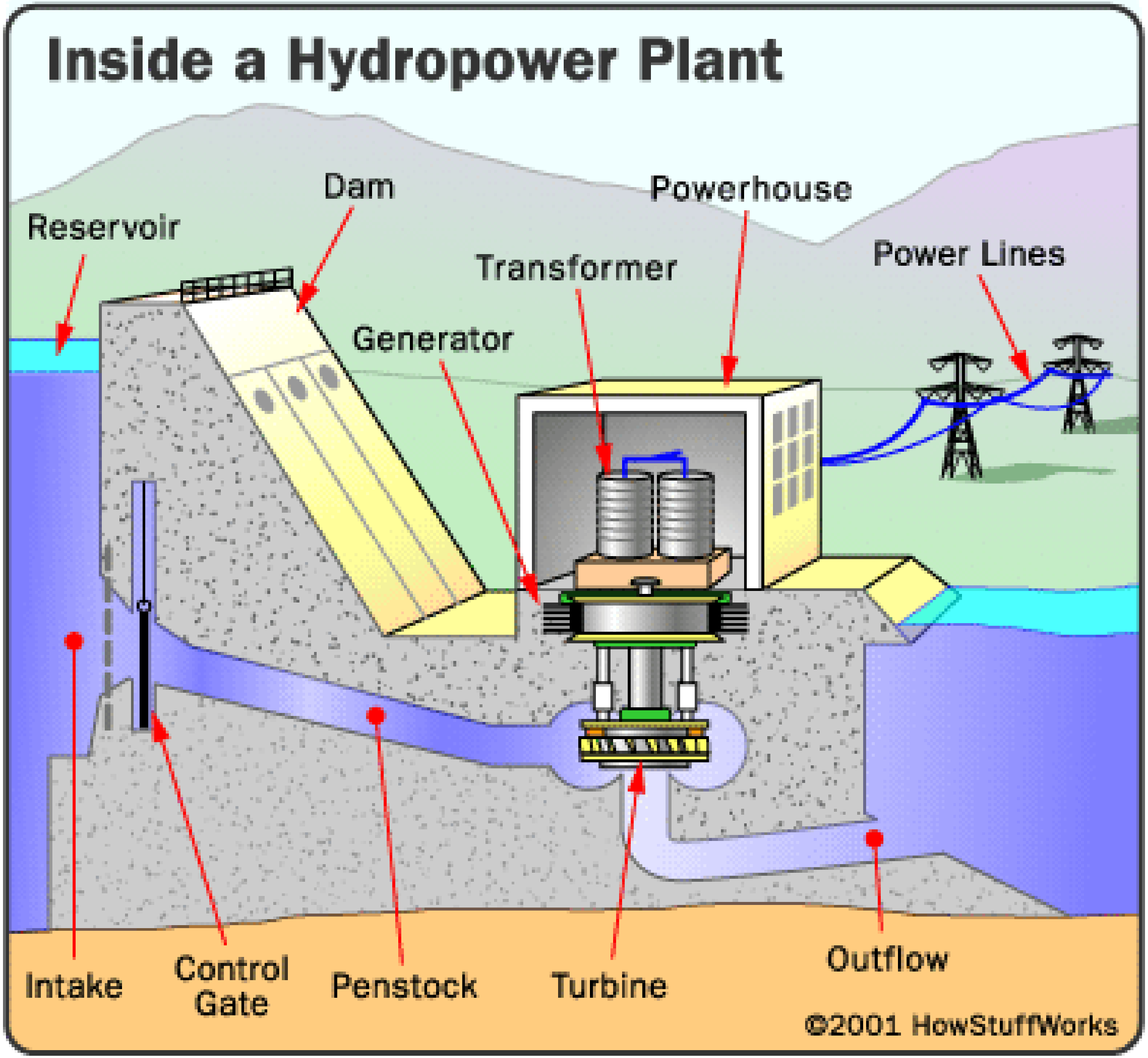
Electrical to Mechanical – blender, mixer, baby swing, ceiling fan

The End--

How did you do?

How Hydropower Plants Work

- Worldwide hydropower plants produce 24% of the world's electricity
- A combined total of 675,000 megawatts is produced
- Energy equivalent of 3.6 billion barrels of oil
- More than 2,000 hydropower plants in the US


Inside a Hydropower Plant
Dam
Powerhouse
Reservoir
Transformer
Power Lines
Generator
Intake
Control
Gate
Penstock
Turbine
Outflow
©2001 HowStuffWorks

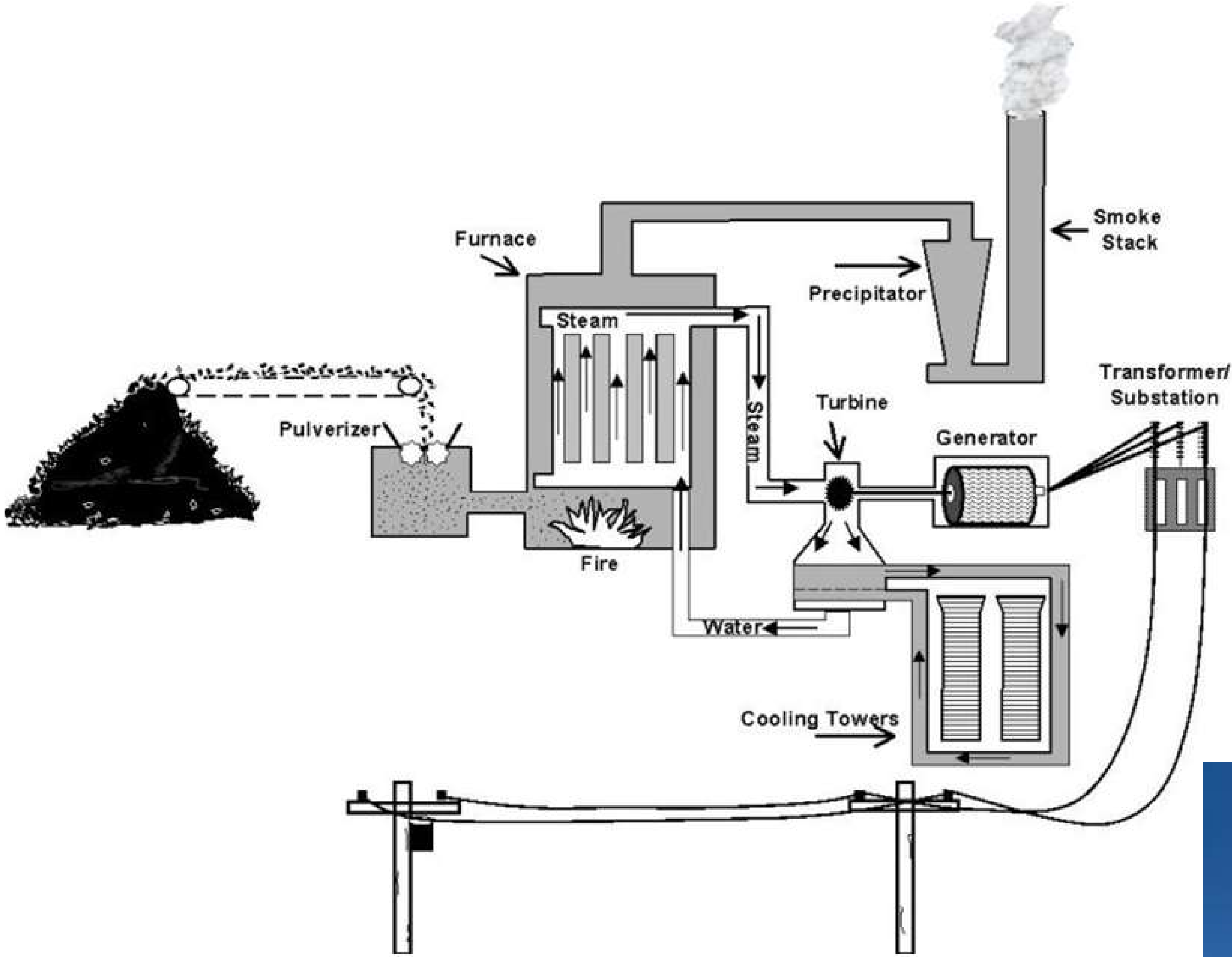
Description of Process

Production of electrical power through the use of the gravitational force of falling or flowing water

Energy Transformation

Mechanical (water) $\rightarrow$ Mechanical (turbine) $\rightarrow$ Electrical (electricity)

Coal Fired Electrical Generation



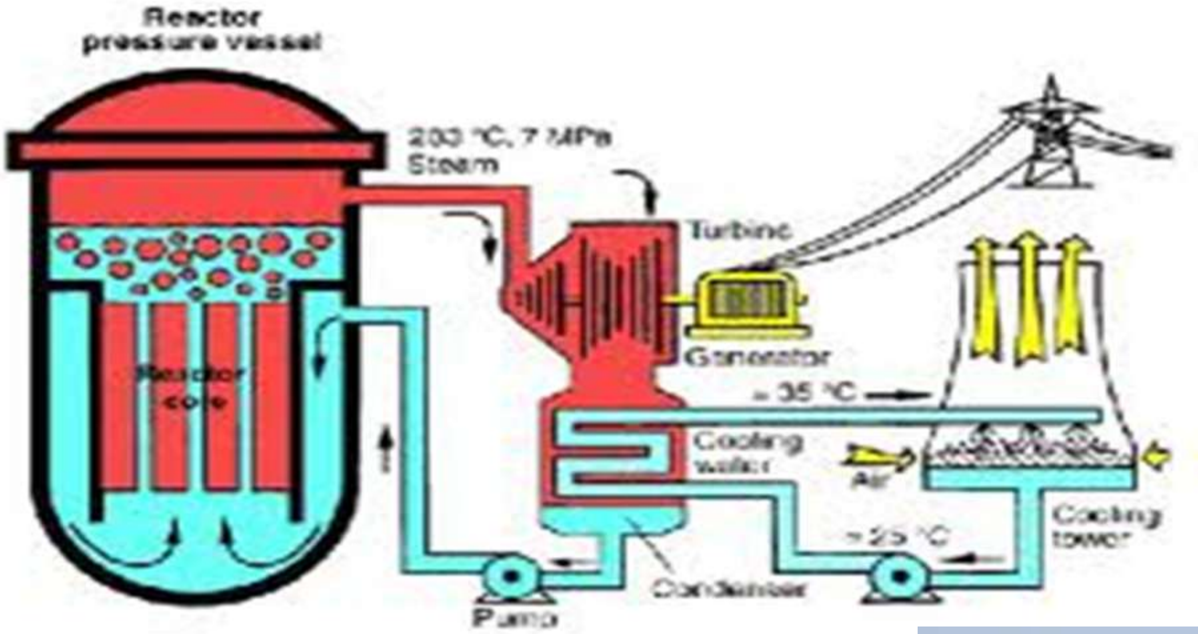
Description of Process

Coal is burned to produce heat which turns water into steam and the steam turns the turbine to produce electricity

Energy Transformation

Chemical (coal) → Thermal (heat) → Mechanical (turbine) → Electrical (electricity)

Nuclear Reactor



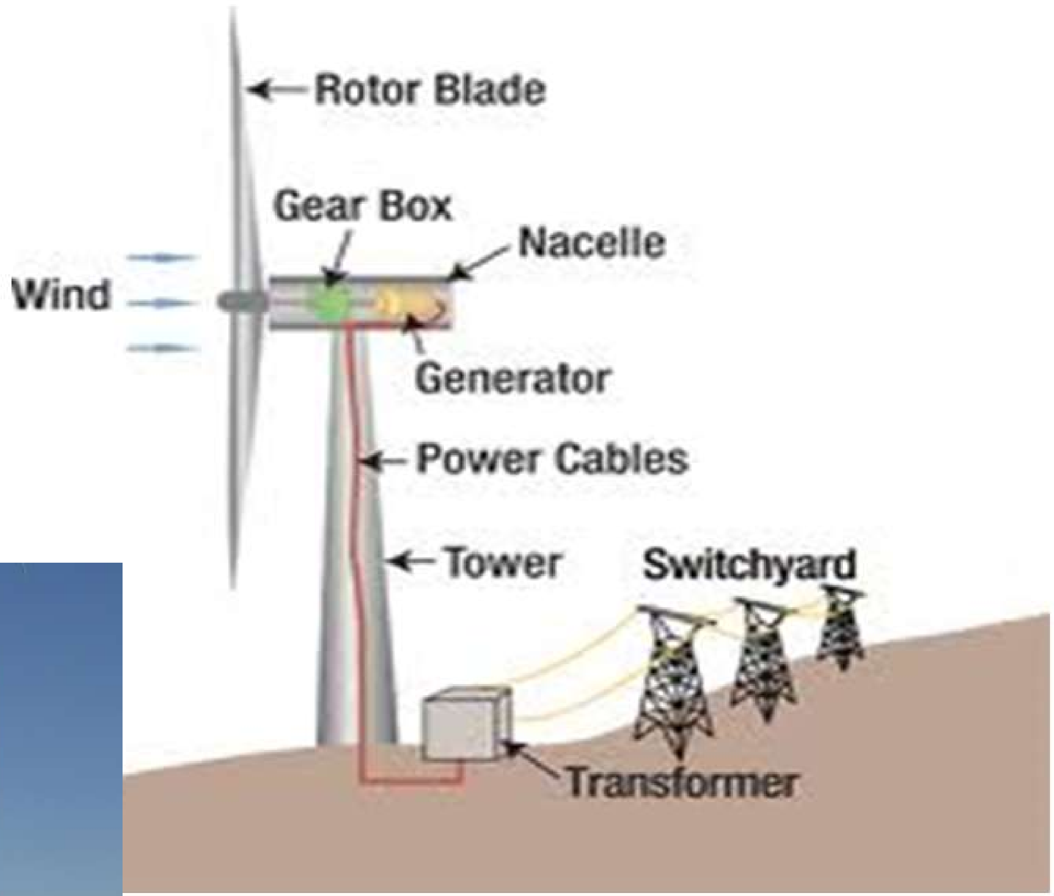
Description of Process

A device in which nuclear fission initiates a controlled chain reaction, producing heat energy typically used for power generation

Energy Transformations

Nuclear (atoms) → Thermal (fission heat) → Mechanical (turbine) → Electrical (electricity)

Wind Turbine



Description of Process

The mechanical motion of the wind turns the blades, which turns the generator and produces electricity

Energy Transformation

Mechanical (wind) → Mechanical (blade) → Mechanical (turbine) → Electrical (electricity)

Who is Rube Goldberg?

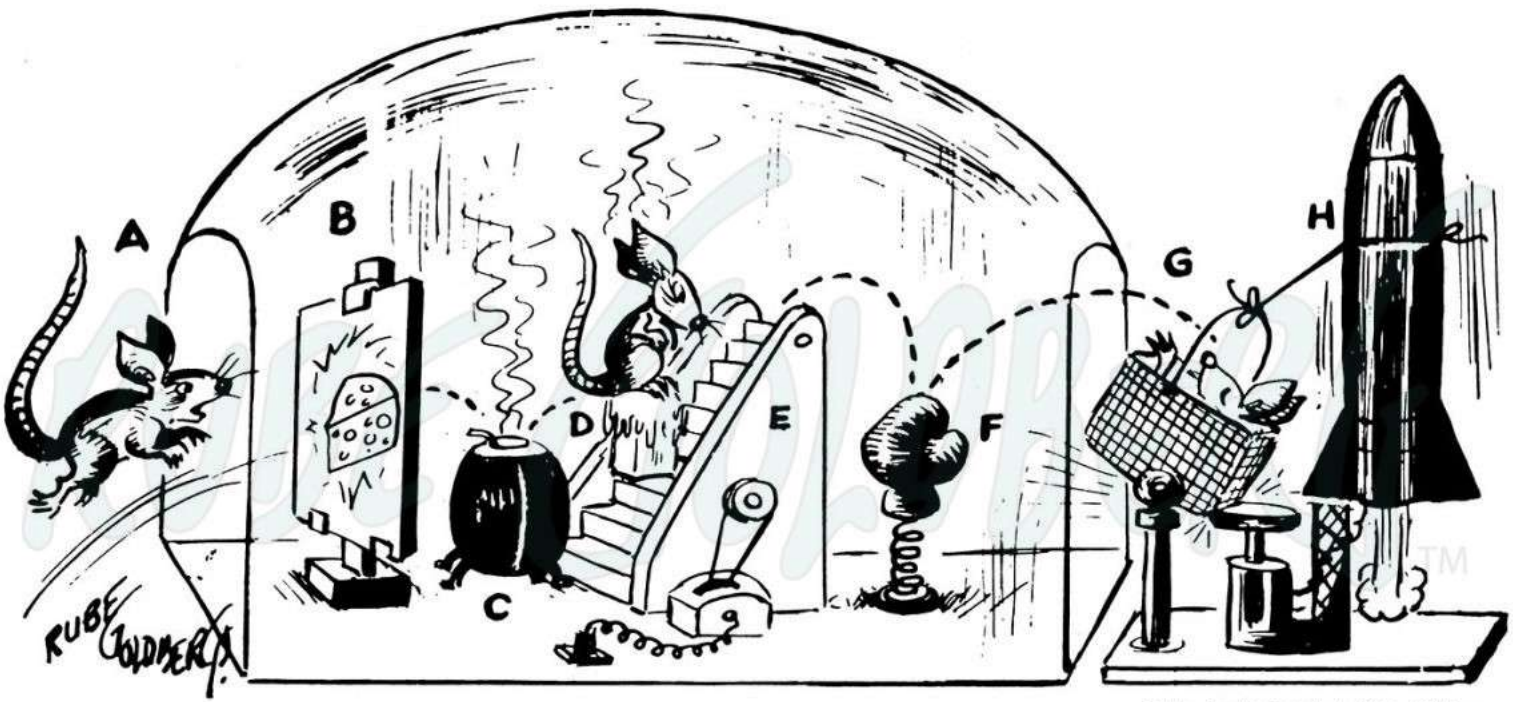
- Reuben Lucius Goldberg
- Born July 4, 1883
- Was an engineer for 6 months designing sewers
- Left engineering to become a cartoonist
- Pulitzer Prize winning cartoonist, sculptor, and author
- Created satirical cartoons of machines and gadgets that he saw as excessive

What is a Rube Goldberg Machine?

"A symbol of man's capacity for exerting maximum effort to achieve minimal results."

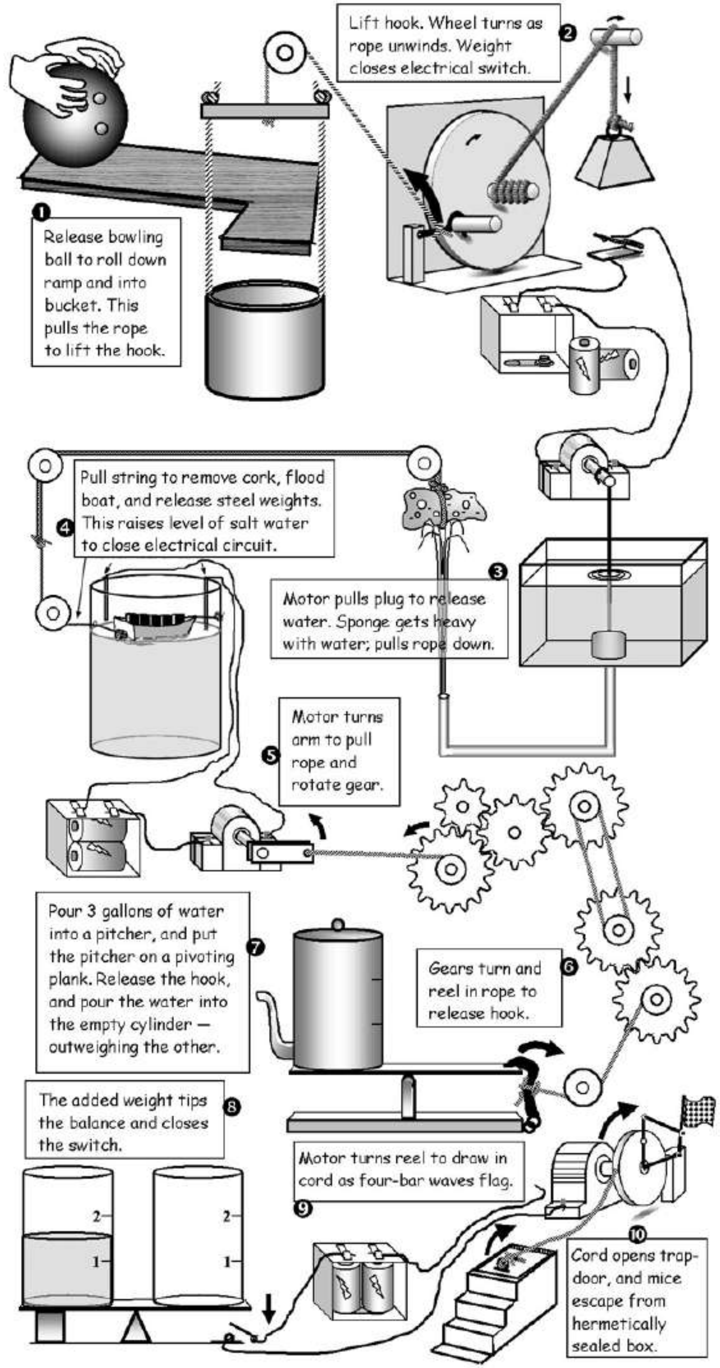
~Reuben Lucius Goldberg

How to Get Rid of a Mouse



Drawn for **Newsweek** by Rube Goldberg

The best mousetrap by Rube Goldberg: Mouse (A) dives for painting of cheese (B), goes through canvas and lands on hot stove (C). He jumps on cake of ice (D) to cool off. Moving escalator (E) drops him on boxing glove (F) which knocks him into basket (G) setting off miniature rocket (H) which takes him to the moon.


1
Release bowling ball to roll down ramp and into bucket. This pulls the rope to lift the hook.
2
Lift hook. Wheel turns as rope unwinds. Weight closes electrical switch.
3
Motor pulls plug to release water. Sponge gets heavy with water; pulls rope down.
4
Pull string to remove cork, flood boat, and release steel weights. This raises level of salt water to close electrical circuit.
5
Motor turns arm to pull rope and rotate gear.
6
Gears turn and reel in rope to release hook.
7
Pour 3 gallons of water into a pitcher, and put the pitcher on a pivoting plank. Release the hook, and pour the water into the empty cylinder — outweighing the other.
8
The added weight tips the balance and closes the switch.
2
1
2
1
9
Motor turns reel to draw in cord as four-bar waves flag.
10
Cord opens trap-door, and mice escape from hermetically sealed box.

Assignment

Sketch a “Rube Goldberg” on the paper provided to demonstrate a ridiculous system of energy transformations of your choosing.

- Minimum of 6 different types of energy and 9 transformations.
- Use the entire paper and make it presentable!