



# TeachEngineering

STEM Curriculum for K-12

**ENERGY INNOVATOR: POWER YOUR OWN GENERATOR**



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# What are some methods we use to create electricity?

## Renewable resources:

- Wind
- Water
- Sun
- Geothermal

## Issues:

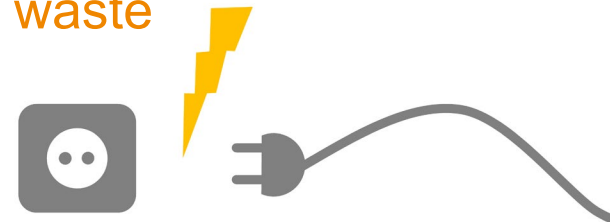
- More expensive, especially initially
- May not be available 24/7
- Storage issues
- Geographical limitations

## Non-renewable resources:

- Oil
- Natural gas
- Coal
- Biomass
- Nuclear

## Issues:

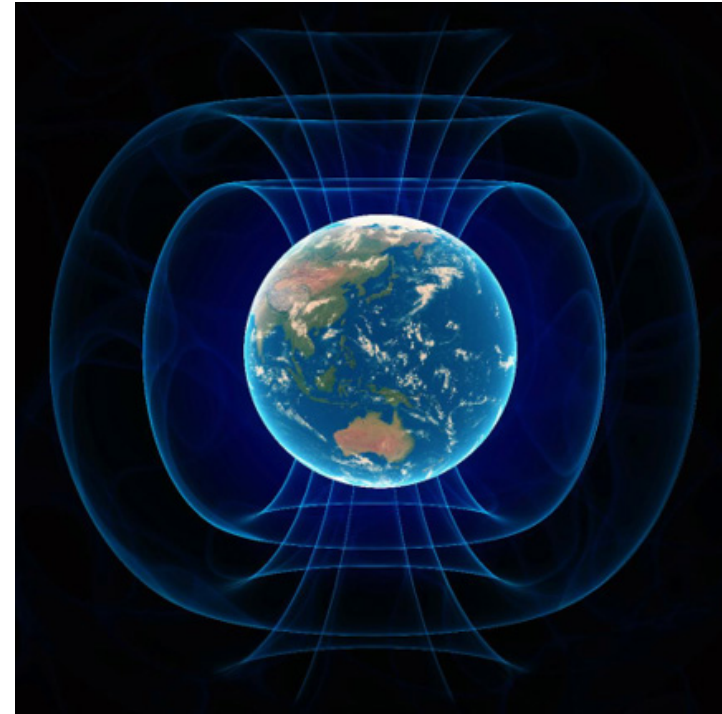
- Hazardous byproducts
- Environmental pollution
- Limited amount
- Radioactive waste



# What can we do to minimize the use of non-renewable sources without using wind or water?

We can create circuits through the use of magnets to help!

Magnets create currents, which we call magnetic fields. We can harness this power in the form of electromagnetism.

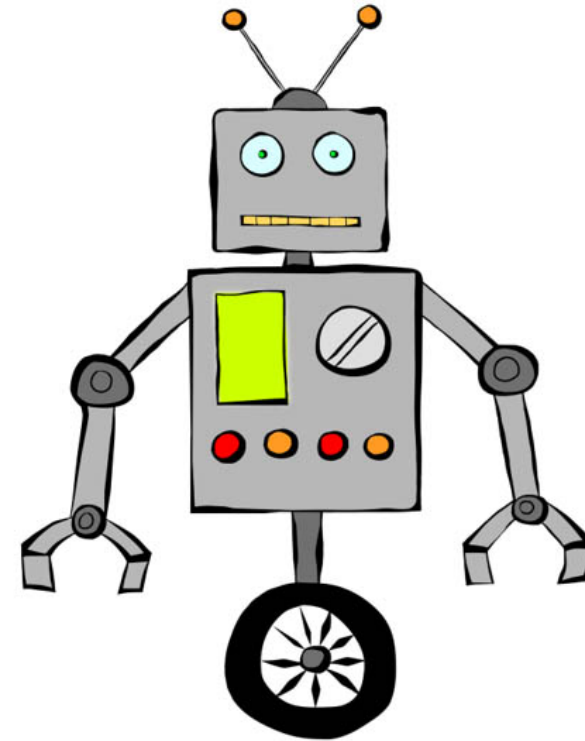


# Why do we want to design and develop new products?

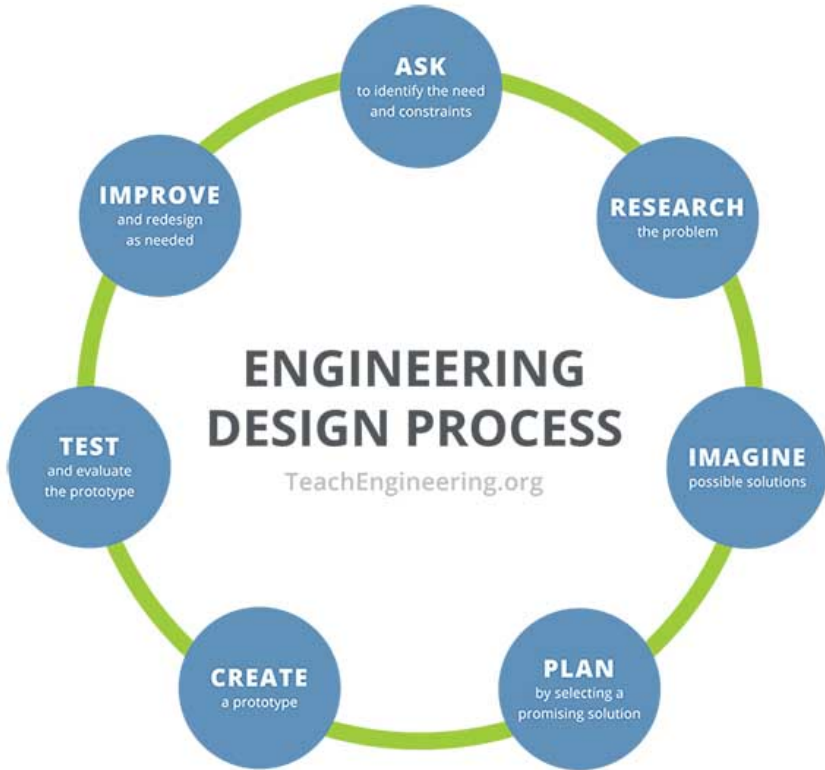
To solve a problem,  
Help or benefit someone or a group of people,  
Create a better solution,  
Create a more cost-effective solution,  
Or to discover more environmentally-friendly solution!

## What are some issues with new products?

They might be expensive at first.  
They take time to design and develop.  
There could be competition from other companies.  
You must convince consumers to use your product.  
You have to find a way to scale your product.



# Let's look at the Engineering Design Process and discuss what we notice



Let's go over each step:

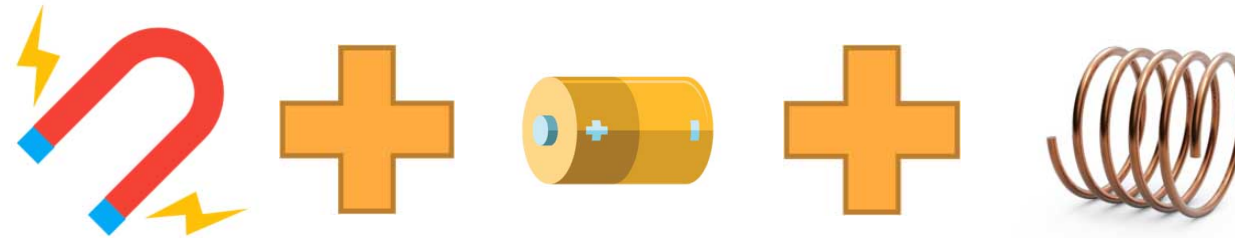
- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

## Demonstration of Magnetic Currents

Magnets

Batteries

Copper wire



Note your observations on your student handout!

# Today's Goal!

We will think like engineers to help create a generator that can be reused and reduce waste products.

You will have to create an advertisement indicating why someone should buy your product:

Selling points must include cost, design, optimal location (who are you trying to sell this product to?) and longevity of use (predict how long your product will be sustainable and how will you replace parts).

Provide a cost/benefit analysis of replacing vs. buying new.

## Building a Magnetic Circuit

You will work in a group of 3-4 students.

You will have to design and implement your generator.

Each supply you choose to use will have a "cost", so try to not overspend!





## **Costs of Equipment – Remember, Cost-Effectiveness is Key!**

Neodymium magnets (\$40 / magnet)

LED Indicator lights (\$5 / light)

Circular discs (\$10 / disc)

Wooden base (\$10)

Superglue (\$5)

Copper coils (\$10 / coil)

## Short on cash? Exchange the following for refunds and rebates!

Return of film canister (complete refund of \$15)

Return of superglue (\$2 refund)

If you bring your own CD, bottle cap, and/or decorations you can save money!

# Constraints

Cannot overspend! Budget is \$550.

Minimum of 2 LED lights and 2 magnetic coils

Magnets have to be one less than the coil (ex: if using 3 coils, use 2 magnets)

LED Lights have to light up & the generator must spin

Coils are secure

Generator must have at least one colored paper/decoration

Must make an advertisement video

What you are selling

Why you are selling your product

Who is your target audience

# Design Time!



## **Results!**

**Did your generator work?**

**Why did you think it did/did not work?**

**What are some improvements that could be made?**

**What generator performed the best?**