

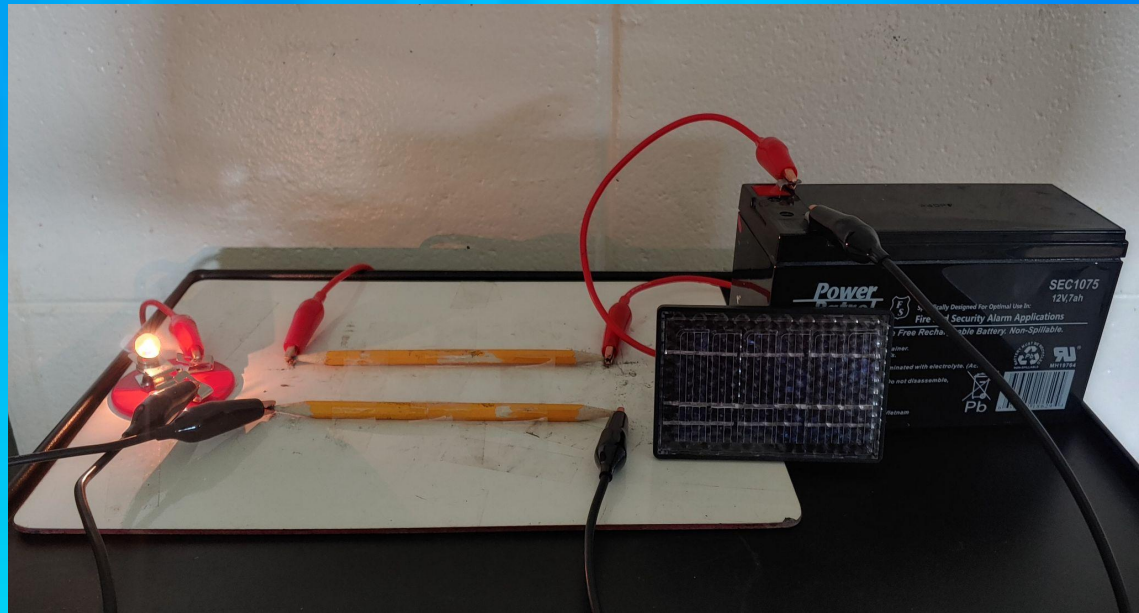
**Voltage Drop** across **2 wooden pencils** using a 12 volt battery to power 6.3 volt light bulb; uses for natural disasters, houses, energy poverty

**Our innovation creates a new weatherproof step-down transformer which reduces Electricity Flow by 75%.**

Capitol Magnet Middle School  
Advisor: Donald Esteen

**Project:** **Voltage Drop Across 2 wooden Pencils - creating a new weatherproof STEP-DOWN TRANSFORMER**

**Team members**  
Selina the Scientist  
Devohn the Engineer

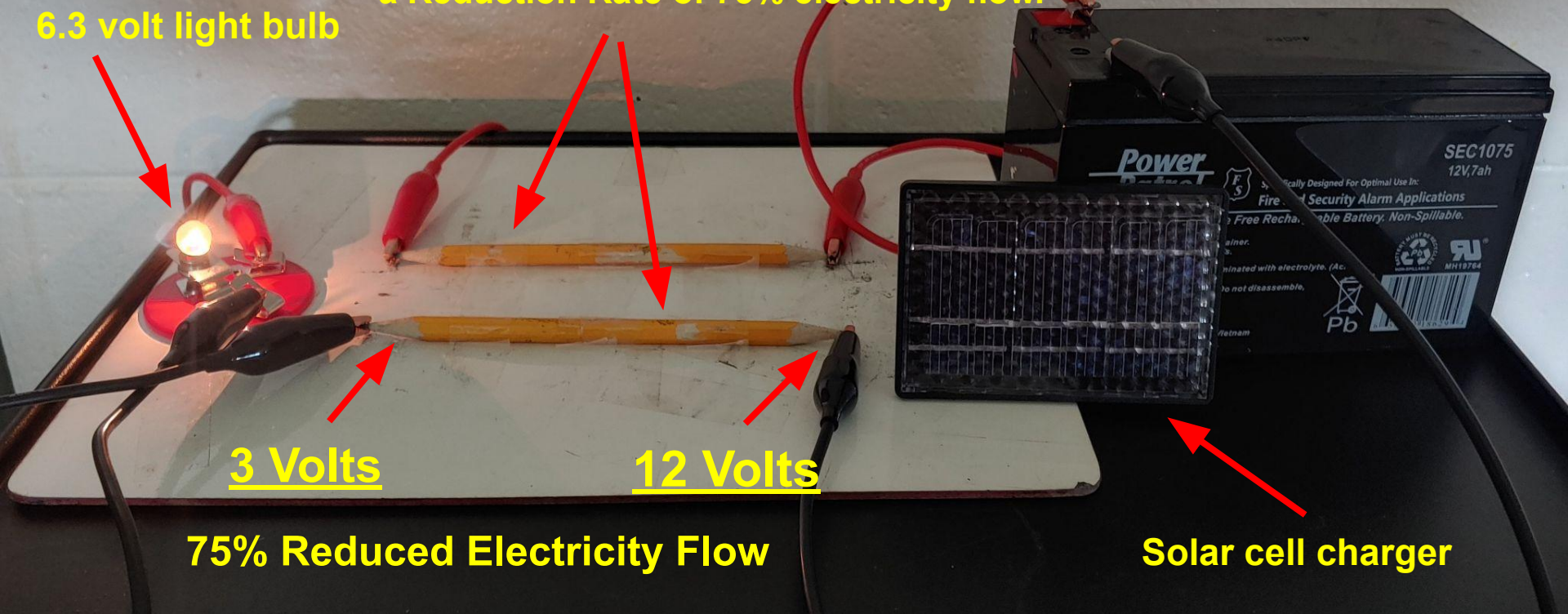


**Project: our INNOVATION: Voltage Drop across (2) 11 cm #2 pencils sharpened on both sides creating a new step down transformer. Reduction Rate is 75% of electricity flow.**

11 cm #2 Sharpened Pencils on both sides creating a new step down transformer with a Reduction Rate of 75% electricity flow.

12 volt rechargeable battery

6.3 volt light bulb



3 Volts

12 Volts

**75% Reduced Electricity Flow**

**Solar cell charger**

## **Who Could This Help? - Applications**

- 1. Natural Disaster Victims**
- 2. The United States Electricity Grid**
- 3. Energy Poverty - 1.2 billion people in underdeveloped countries**
- 4. Campers**

## How Does It Work? - **The Science**

Voltage drop across 2 (#2 - type) wooden 11 cm pencils sharpened on both ends works by using the trapped cellulose inside the cells of the wooden pencils which cools the pencil as electricity flows from one end to the other end of the pencil using the convection current method. For Example: A pot of boiling water - When water boils the hot water rises to the top of the pot away from the heat source then cools and descends towards the heat source.

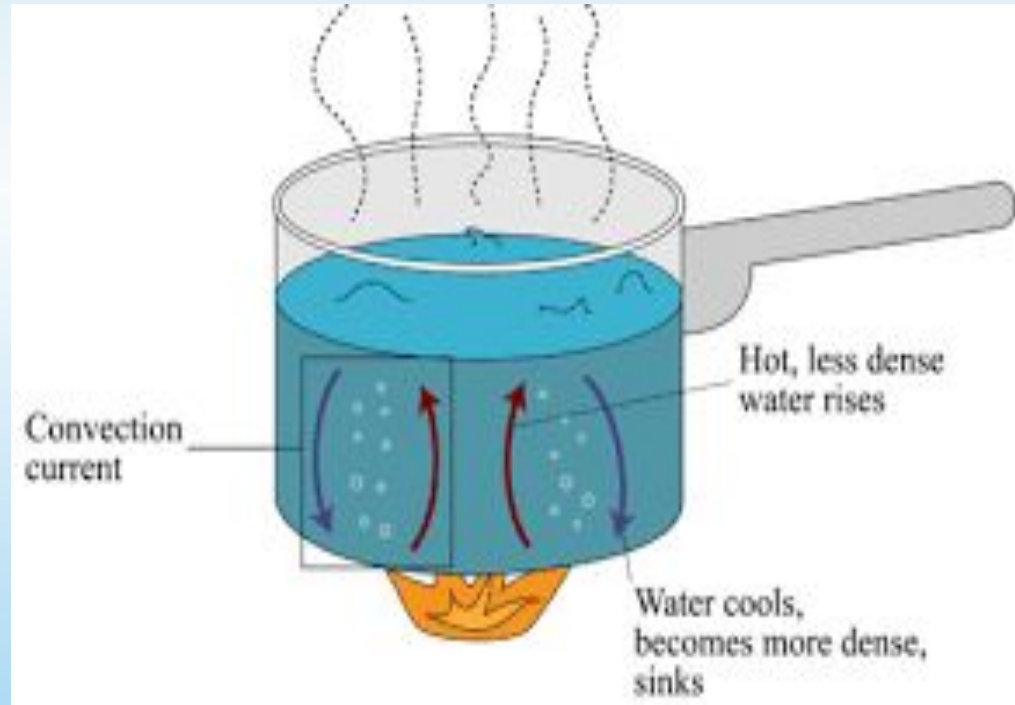
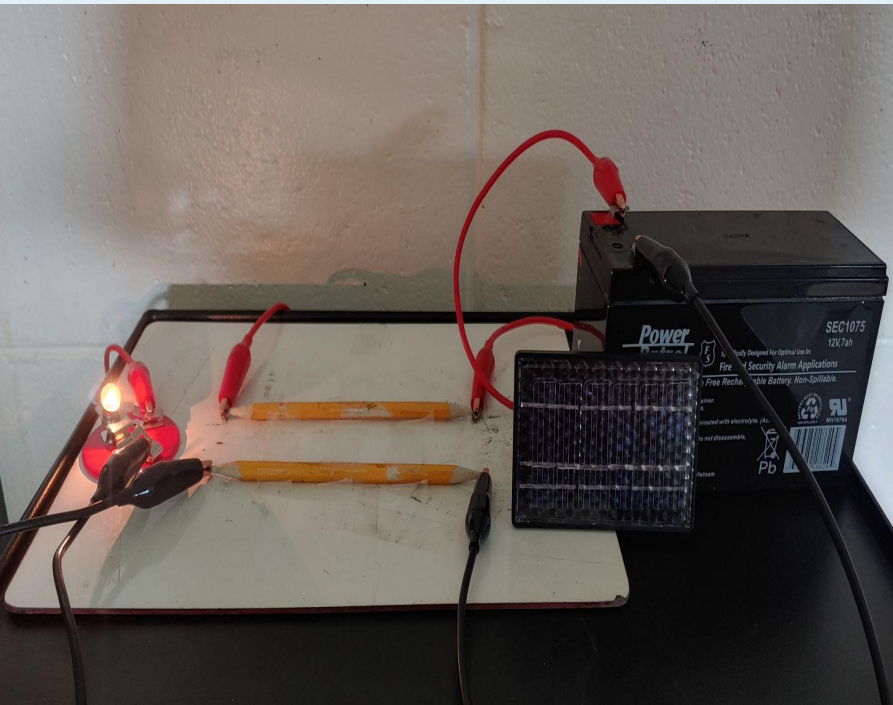
**Using a 12 Volt Rechargeable Battery our innovation created an inexpensive weatherproof Step-Down Transformer for only 0.50 cents that reduces the electricity flow by 75%.** Our weatherproof innovation output is 3 volts after receiving an input of 12 volts which is strong enough to power our 6.3 volt light bulb exactly like high voltage Electricity from the Electrical power plant arrives at your home via a step down transformer as low voltage of usable electricity.

**Step-Down transformers that are attached to telephone poles (inside the Gray Buckets) cost \$3,000 - \$7,000 each.**

**Our innovation is scalable to different sizes and has many applications.**

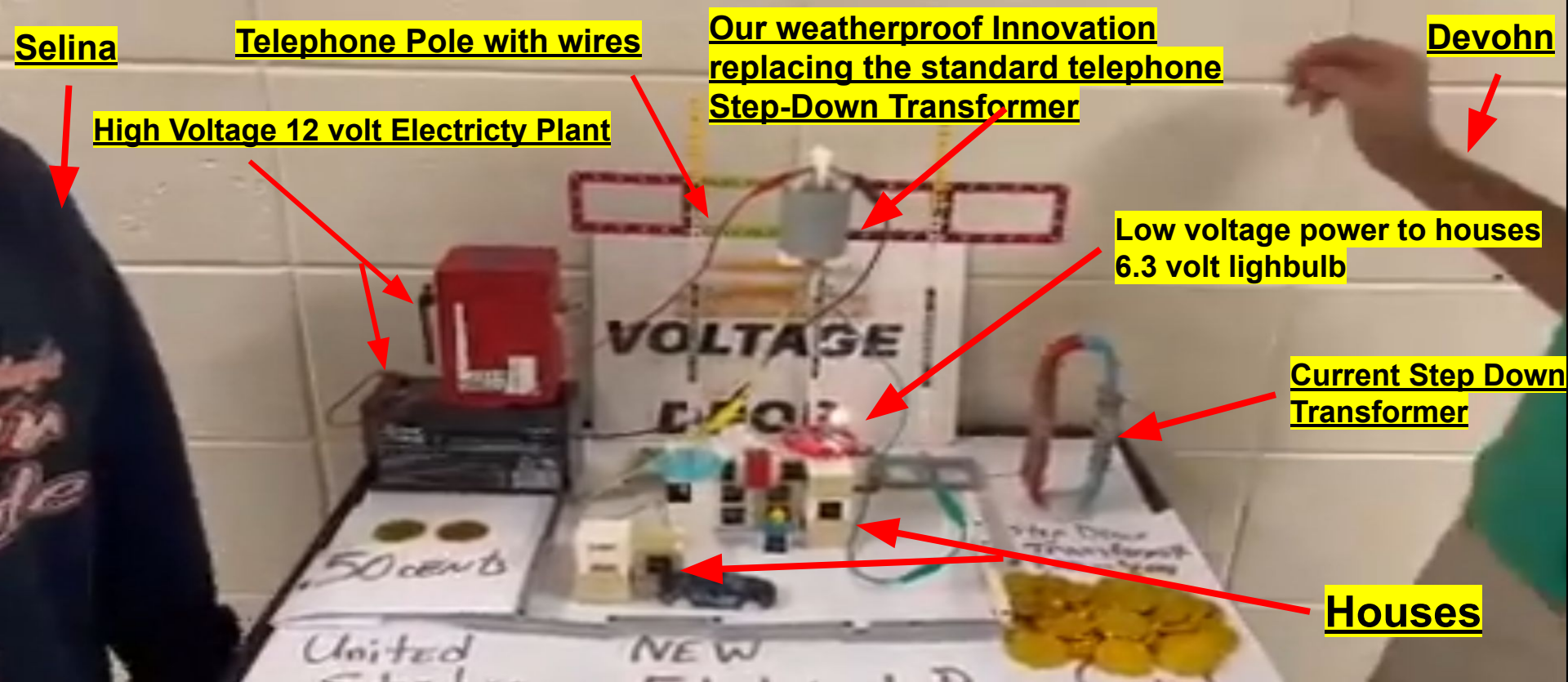


The boiling water diagram is a visualization of the **Convection** that occurs in the cellulose of both pencils when electricity flows from the 12 volt battery thru the wooden pencils sharpened on the both sides to power the 6.3 volt light bulb.



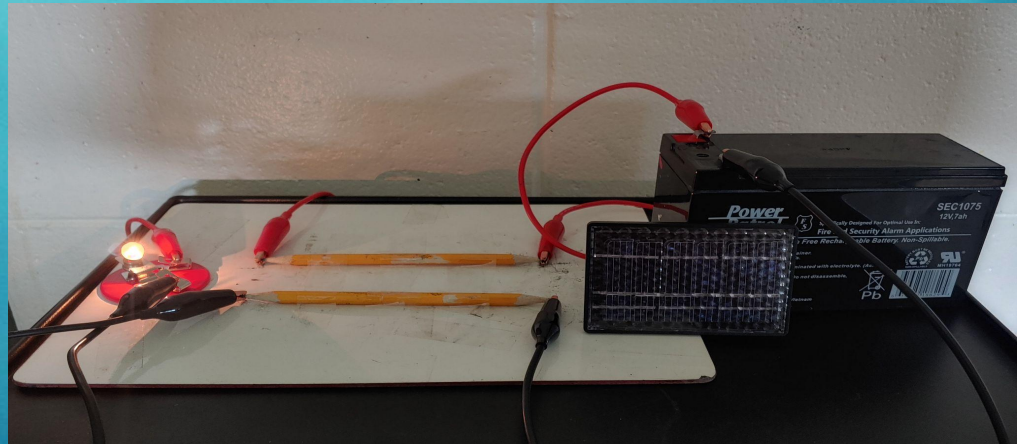
# Model of United States New Electrical Power Grid

Our weatherproof innovation can be used to replace Step-Down transformers on telephone poles that cost \$3000 - \$7,000 each. Our scalable weatherproof Innovation can reduce the flow of electricity by 75% from the High Voltage Electrical Plant to a Low Voltage to safely power houses.



## How Did We Get To This Point ? – **Our History**

We started with trying to make a Natural Disaster proof light bulb with pencil lead (**Carbon - Graphite**) which was successful but only lasted 2 minutes. Then we tried having energy from a regular battery travel through the wooden pencils since wooden pencils contain carbon-graphite. We tried different pencil lengths until we finally optimized at 11 cm. Finally we used the 12 volt rechargeable battery which is recharged using a solar cell or plugging it into a electrical socket.

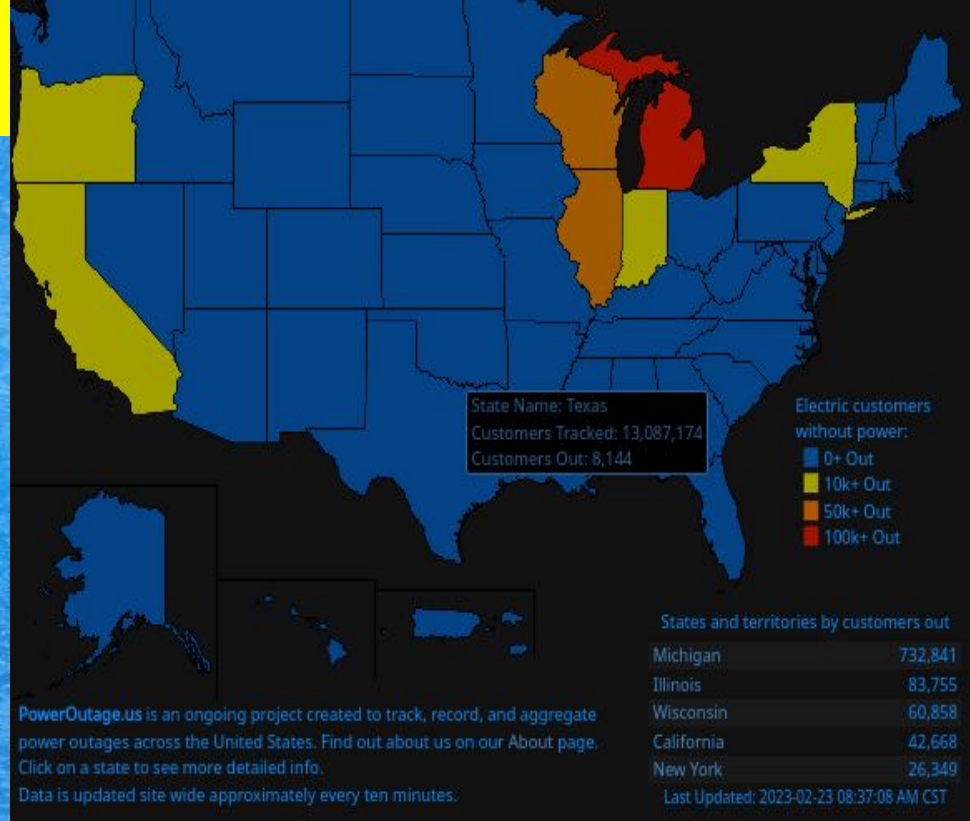
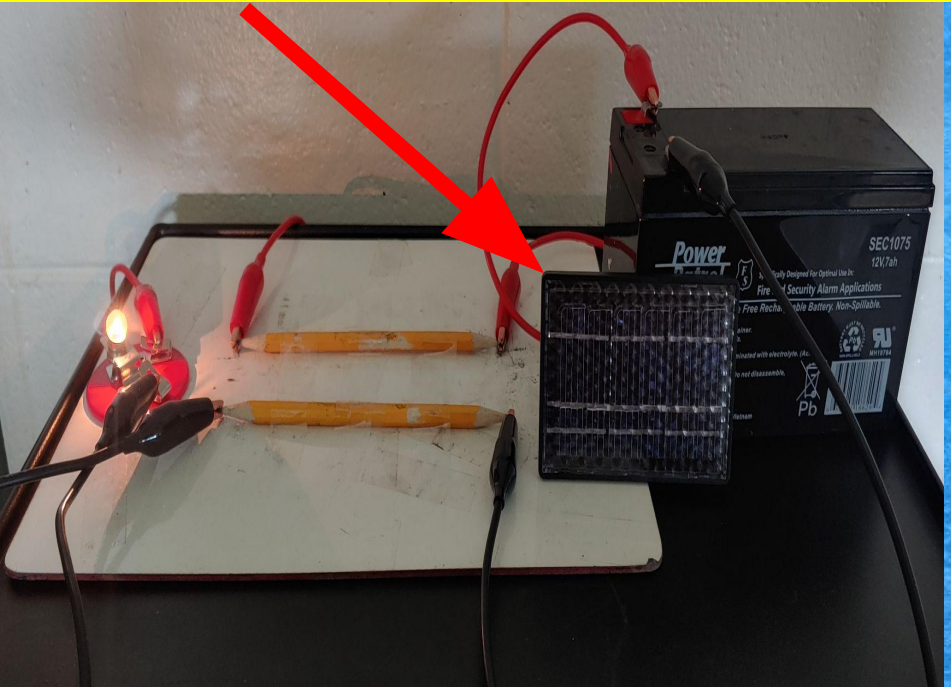




We decided on this photo because our product could be beneficial with this type of situation. When power outages occur in the United States our solar powered weatherproof innovation can provide light.

Photo from [poweroutage.us](http://poweroutage.us)

**Our weatherproof Innovation with a Solar Power Cell**





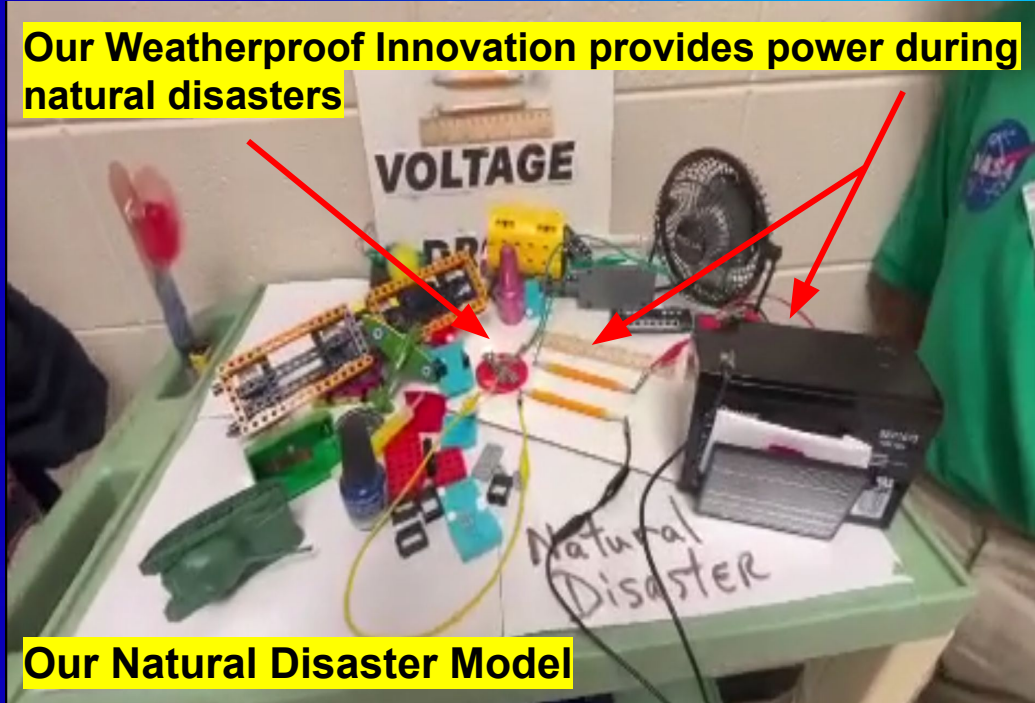
# Natural Disasters - Provides the First Night's Light and more...

Our project is amazing for those in need of lights during natural disasters.

Our weatherproof innovation can be powered using solar power to

recharge the 12 volt battery and provide light the entire night.

**Our Weatherproof Innovation provides power during natural disasters**



**Our Natural Disaster Model**



# **Energy poverty? - Innovation built to light the world**

## **What is Energy Poverty?**

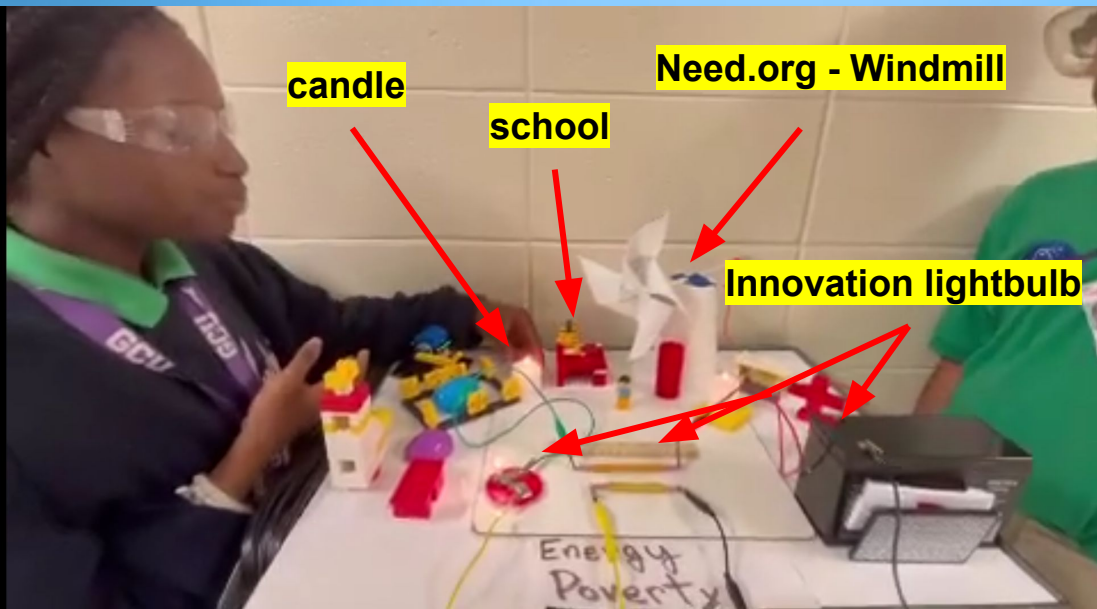
**Energy poverty is a lack of access to electricity. Energy poverty is an economic hindrance as it prevents people from participating in the modern economy. Access to electricity is now an afterthought in most parts of the world, so it may come as a surprise to learn that 16% of the world's population an estimated 1.4 billion people are still living without this basic necessity of Electricity. Our weatherproof innovation could help bring light to those 1.4 billion people in underdeveloped countries. Energy poverty is a problem for kids in these countries because they only have candles to do their homework. Their indoor schools are without electricity with little sunlight and dark on most sides of the room.**

**Our weatherproof innovation is a game changer in these underdeveloped countries.**

**Honduras, Peru Guatemala, Haiti, Niger, Myanmar, Nepal, Colombia, Cambodia, Rwanda, Afghanistan, Laos, Liberia, Botswana, South Sudan, Madagascar, Bhutan, Sierra Leone, Ethiopia, Burundi, Dominican Republic**

This is how most of the 1.2 billion students in underdeveloped countries attend school. Sunlight to no light in schools.

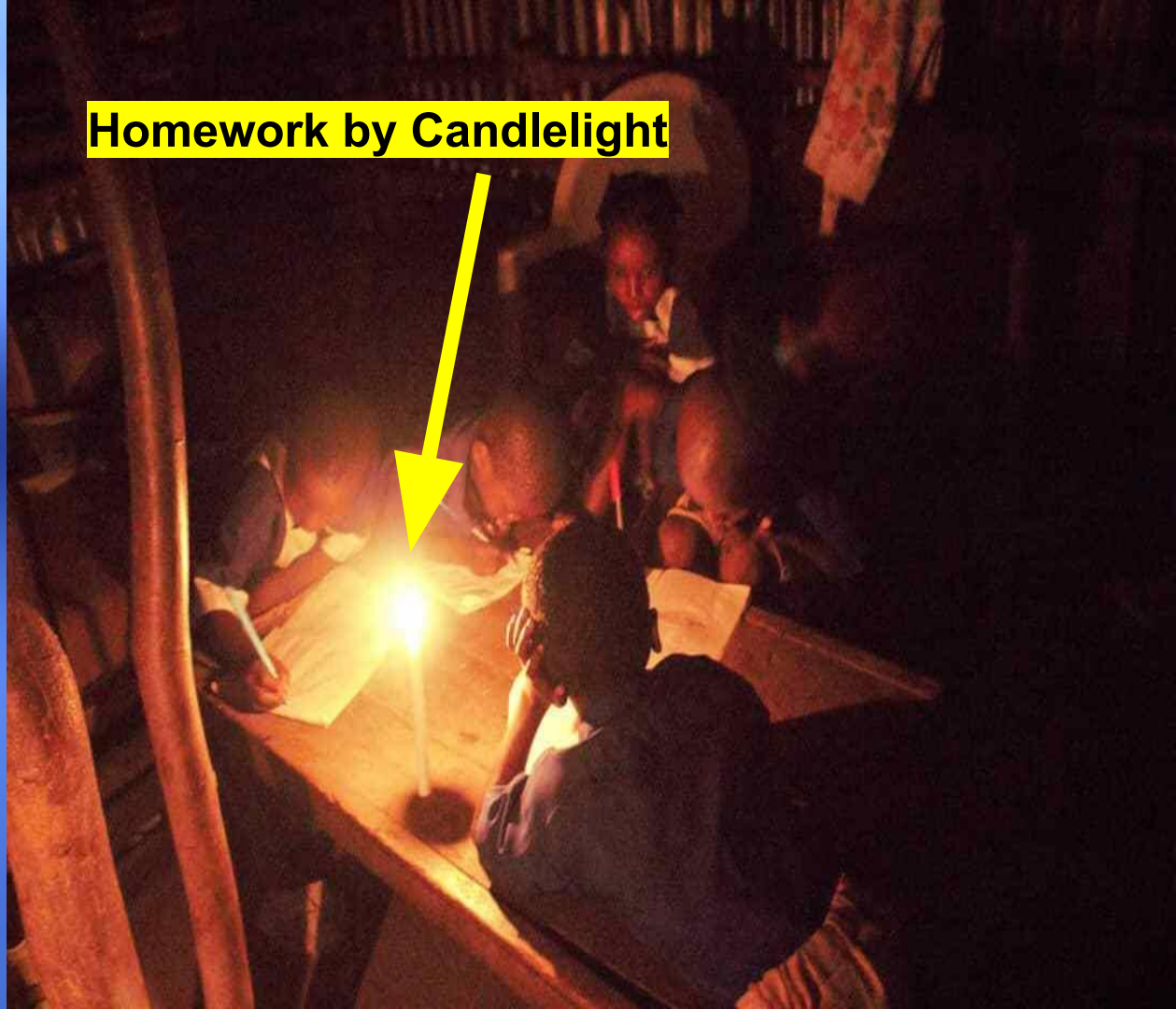
### Our ENERGY POVERTY Model





In underdeveloped countries they don't have electricity so they use candles. When the candles go out they don't have anymore light. These kids in the picture are doing homework and when this candle goes out they won't be able to continue.

## Homework by Candlelight





# Camping - outdoor camping application of Innovation

Not only is our innovation weatherproof project beneficial for Natural disasters, energy poverty, U.S. electricity grid, but it can also be used for those who like to camp. Most animals are afraid of light. So with our kit it gives you a chance to have memorable camping trip by scaring away nocturnal animals.



# Conclusion - Voltage Drop across 2 pencils (New Step-Down Transformer) 75% Reduced Energy Flow

- We started by only trying to provide light after a natural disaster.
- We ended by being able to provide light to 16% of the world population.
  - 1.2 billion people
- We developed a way to drastically improve the U.S. Electricity Grid
- We developed a campers night light.
- We developed a successful light for NATURAL DISASTERS.

The applications are limitless and the weatherproof innovation is scalable and cost effective

