

## 6<sup>th</sup> grade – Solar Energy Lesson

45 min

**Objective** – Students will understand how solar energy fuels all life on earth, thanks to plants, and learn why Haldane has installed solar panels on the roof and why the transformer needs to be updated (and the garden ‘uprooted’ as a result!)

20 min

(students gather beside compost bin near current transformer)

Today we’re going to talk energy in the garden. Think back to elementary science... how do plants harness energy from the sun? (brief review of **photosynthesis**: green chloroplast cells in plant leaves take solar energy (sunlight) plus CO<sub>2</sub> (taken in through stomata openings in leaves) plus water (roots) and transform it into starch/sugar the plant uses as food (accessible energy) and in process give off oxygen. Why is this important for people? Energy cycle: plants give us air to breathe but also food to eat and animals by eating plants are also food for us etc. Without plants no people on earth. Without sun – no life, no plants – no people!

Now, people can almost ‘be’ plants – we’ve figured out a way to harvest energy from sun too! Solar energy converted into usable electricity to power and heat our homes! But even with all our technology and progress we **STILL** rely on plants – story of **pokeweed** dye increasing absorbency of solar panels (see article).

Because of solar panels, Central Hudson must replace this old **transformer** with a new one to be able to handle a greater energy load – Haldane will produce more energy than it needs and so put extra energy back to the ‘grid’. This old transformer can’t handle/transform or ‘convert’ this new higher level of energy for transport over the wires. A transformer takes in electricity and then increases it to super high voltage so it can travel faster and more efficiently over longer distances/wires. OR it reduces/transforms the high voltage electricity received from power plants to the lower voltage electricity used by factories, offices, and homes.

20 min –

### **Doing work uses energy!**

Now you’re going to use your own body’s energy (from sun from plants from food you ate today!) to do some work in garden to save plants from imminent destruction! Break students into several groups:

1. Students clear 6<sup>th</sup> grade bed of plants (transplant and compost) then move good soil to compost bin
2. students move tire planters to safe location, remove begonias/geraniums
3. students pot up plants along bed edges (aloe etc.) and move heavy border rocks back along brick wall

5 min

Students **clean up**/return tools to shed.

## Photosynthesis

**Carbon Dioxide + Water + Light ----> Sugar + Oxygen**

<http://photosynthesisforkids.com/>

## transformers

Transformers usually step voltages up for transmission purposes. On utility grid distribution and transmission systems, electrical energy will be produced at lower voltages and then stepped up to higher voltages in increments such as 128, 230, 345, 500 and 765 kV. Higher voltages minimize the losses from the inductance or resistance in the wire during the transmission process. Transformers are used mostly on AC electrical systems to move electrical energy from the power plants to the substations to individual businesses, houses or loads. This transmission of energy would require a step down from the higher voltages in the power plant to the lower voltage of 120 V typically found in U.S. residential homes. This voltage step down is done through the use of a transformer and the ratio of how much the voltage is decreased depends on the number of turns in the transformer. Let's look at the theory behind the ideal transformer.

<http://www.explainthatstuff.com/transformers.html>

<http://www.blueoakenergy.com/blog/transformers-basics-blue-oak-energy-tech-talk-2>

## pokeweed!

One of its newest uses is in the field of [solar energy generation](#). It seems a red dye made from the mature berries can be used to coat fiber-based solar cells, increasing their efficiency in converting sunlight into electricity. Who knew?

<http://nadiasyard.com/our-native-plants/american-pokeweed/>

<http://www.eattheweeds.com/can-be-deadly-but-oh-so-delicious-pokeweed-2/>

<http://www.yuvaengineers.com/poke-berries-enlighten-the-world/>

[http://www.labspaces.net/103364/Purple\\_Pokeberries\\_Hold\\_Secret\\_to\\_Affordable\\_Solar\\_Power\\_Worldwide](http://www.labspaces.net/103364/Purple_Pokeberries_Hold_Secret_to_Affordable_Solar_Power_Worldwide)