Electron Excitement

Equipment:
Wiffle balls in container
5 orange cones
Length of rope
Empty buckets

Objective: to explain how photons from the sun excite electrons in photovoltaic panels to create electricity

Set up:
- create 2 lines parallel with each other approximately 10 feet apart with the orange cones
- from the end of one of the line start the rope by laying it on the ground and put the other end of the rope at the end of the other line. Position rope so it forms a triangle at the end of the lines and put an orange cone and empty bucket at the top
- put container of wiffle balls in middle of lines about 10 feet away

Game:
- explain to students they will be acting out how electricity is made using energy from the sun
- Explanation: energy from the sun travels to the Earth as photons. Solar panels contain thin wafers of silicon and are manufactured to have a positive side and a negative side. As the photons hit the solar panels, they excite the electrons (with a negative charge) in the silicon layer by transferring the energy from the photon to the electron. The electron now has the ability to move and is attracted to the positive side of the solar panel. As more and more electrons move to the positive side, they repel each other. If the positive side is attached to a circuit, the electrons can move along that circuit. Electricity is electrons moving along a circuit and anything plugged into the circuit (called a load) can now be powered. The circuit must be closed (electrons returned to panels) in order to create the electric current.

- Choose 2 students to be the sun, 1 student to be the IPOD (who doesn’t mind singing!) and everyone else is an electron. The sun students stand facing the two parallel lines with the wiffle balls (representing the photons). The IPOD student stands at the cone at the triangle made with the rope. The electron students line up along the line closest to the sun (the negative side of the solar panel).

- when the game begins, the sun will gently toss the photons (wiffle balls) towards the electrons. If the photon is not caught and drops to the ground, it is left there to be gathered up by an adult helping with the game. If the photon is caught by an electron, the electron is now ‘energized’ and runs to the positive side of the solar panel.

- the electrons then run along the positive side of the solar panel. They leave the solar panel by following the circuit (rope on ground). When they get to the IPOD, they drop their photon in the bucket, representing transferring their energy to the appliance. The electron then follows the rope back towards the negative side of the solar panel and gets ready to catch another photon.
-each time a photon is transferred to the IPOD, the student sings one word of a song (‘You are My Sunshine’ is an easy choice).

-challenge the students to be efficient at catching photons and running quickly in order to keep the IPOD singing!

Other Options:
-the panels at the solar farm are 14% efficient (out of 100 photons that hit the panels, 14 of them will energize an electron). How efficient can the students be? Let the sun through 100 wiffle balls and count how many out of 100 the students can catch.