



## CLEAN ENERGY INSTITUTE

UNIVERSITY of WASHINGTON

### Clean Energy Ambassadors- Outreach Menu

The following set programs presented by Clean Energy Ambassadors are available for visitation to Washington Schools.

**Solar Energy Exploration-** (Time: 40 Minutes middle school or high school) This introductory presentation explores current trends in solar energy research and technology. The presenter comes with a set of desktop displays which lets students look at learn about the different kinds of solar cells and compare their energy generation with spinning wheels, electric meters. Students can also see examples of colored quantum dots, fluorescent dyes and emerging technologies.

Objectives:

- Describe the scope of the energy challenge and where solar fits in.
- Compare examples of existing and emerging solar cell technology such as silicon, CIGS, CZTS, and plastic solar cells.
- Define what efficiency is, why it is important and how it measured.
- Map the parts of a home solar energy system
- Understand how cells are combined in circuits to produce a solar panel.
- Discuss the advantages and disadvantages of solar energy as a power source

Solar Car

**Solar Car Derby-** (1-2 hours – middle school or elementary) Students choose a variety of cells to add to pre-built solar car chassis and then race them in the sun. This can be conducted indoors using our portable high power work lights but it better in the sun. Also students can assemble their own kits if ordered ahead of time.

Objectives:

- Experience a concrete experience with solar to mechanical energy conversion.
- Develop a model of power dependence on collection area, angle, and device type.
- Explore series and parallel circuits and effects of polarity.
- Explore the use of reflectors to concentrate energy.
- Troubleshoot simple electromechanical devices.

**Smart Grids and Energy Storage Challenge** (1 hour middle school or higher) Students explore the need for energy storage in our renewable supply system using a simulation. Then look at various battery technologies.

- Describe patterns of energy demand
- Describe patterns of renewable energy production.
- Explain role of storage and smart grid in the complete energy system.
- Balance variables of energy density, recharge time, and power for various battery applications.
- Explain various types of batteries and storage system.
- Experiment with hydrogen fuel cell powered vehicle.
- Demonstrate a supercapacitor
- Construct a galvanic cell and measure its voltage and current.

**Solar Panel Workshop-** (Time: 2 - half days high school) In this workshop students design and build their own solar panel from individual cells. They learn to solder and predict the voltage and amperage of their solar charger.

Objectives:

Aware that individual cells and panels have different outputs depending on the materials and the wiring

Distinguish voltage, amperage and power and relate to common electrical needs

Apply knowledge of properties of series and parallel circuits to achieve a desired resultant

Apply an engineering design process to define requirements, design and test prototype and refine the design.

Cost: \$5-10 per panel for cells and plastic sheet (1 square foot)

**Berry Solar Cell Lab-** (4 hours- high school chemistry) Students construct a working Graetzel style solar cell from nano-crystalline titanium dioxide, conductive glass slides, and using berry juice as the absorbing pigment.

Light absorption and charge transfer

Measuring power output from a solar cell

Cost: Nanocrystalline solar cell kit- \$56 for kit

**Solar Cell Characterization-** (1 hour- high school chemistry or physics) Students measure current and voltage from a solar cell under various loads to create a current – voltage (I-V) curve and determine peak power output.

Using probeware to measure and graph current and voltage

Determining peak power point for solar cell output

Comparing efficiency of various solar cell technologies

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