

Electricity Unplugged (Teacher Notes)

(Investigating the Parts, Process, and Products of Making Electricity)

Part 1 Notes

- **Prior Knowledge Assessment.**

This assessment tool is not meant to be graded; it may prove to be useful as students transition into learning about electricity production systems and is a way for teachers to find out what initial conceptions students hold before diving into any activities. The questions have been written to be both straight-forward and also discussion-stimulating. When using this assessment, you are encouraged to allow students to grapple with misconceptions or pose questions, but refrain from correcting students until they have had an opportunity to struggle with the concepts individually and collaboratively.

Part 2 Notes

- **Electricity Production Systems Website Links.**

- Coal Plant: <http://www.its-about-time.com/investinesart/coalplantvirtualtour.swf>
- Nuclear:
 - <http://www.science.uwaterloo.ca/~cchieh/cact/nuctek/fissionreactor.html>
 - <http://science.howstuffworks.com/nuclear-power3.htm>
- Hydroelectric: <http://fwee.org/walktour>
- Wind: http://www1.eere.energy.gov/windandhydro/wind_how.html

Part 3 Notes

- **Environmental, Economic, and Social Products**

One thing to make sure that your students understand is that the variety of fuels used to generate electricity all have some type of impact on the environment. Fossil fuel power plants release air pollution, require large amounts of cooling water, and can mar large tracts of land during the mining process. Nuclear power plants are generating and accumulating large quantities of radioactive waste that currently lack any repository. Even renewable energy facilities can affect wildlife (fish and birds), involve hazardous wastes, or require cooling water.¹

The following Power Scorecard website is a great resource for specific information on specific air, water and land use impacts: <http://www.powerscorecard.org/issues.cfm>. Students are also guided to this site for reference in the student handout. A synopsis of environmental products students may generate is included below (Each underlined phrase links directly to the associated Power Scorecard site.)

Air impacts	Water impacts	Land use impacts
Climate change Acid rain Ozone (smog) and fine particulates Air toxics (mercury)	Consumption of water resources Pollution of water bodies	On-site land impacts Off-site land impacts

Part 4 Notes

¹ <<http://www.powerscorecard.org/issues.cfm>>

- **Electric Choice in Pennsylvania.** In this section, students should have completed the homework assignment from Part 3, which asked them to search their zip code at the EPA's website to find out the electricity that is being used in their area and the amount of emissions being produced. Students will benefit from a short lecture on the deregulation of electricity providers in PA. The Clean Air.org site is a great source for deregulation information: <http://www.cleanair.org/Energy/deregulation.html>.

Part 5 Notes

- **Social Action: Writing a recommendation for an EP system to an agency of local government.** From the knowledge gained from the previous parts of the lesson, students will be able to write an informed letter to a town council person recommending the selected electricity production system choice. By addressing the positive and negative implications of the different electricity production methods, students should gain an understanding of the implications of their actions. However, by completing the social action step, students will also understand that they have the power of choice. Empowerment through social action can produce change.

Notes on Additional References

Electricity Basics. Websites.

How electricity works

<http://science.howstuffworks.com/electricity.htm>

Power distribution grid

<http://science.howstuffworks.com/power.htm>

How power works and US power production map

<http://science.howstuffworks.com/power1.htm>

Nice diagram of turbine and generator - oh the magic!

<http://www.eia.doe.gov/kids/energyfacts/sources/electricity.html#Generation>

Parts, Process, and Production of electricity production Websites.

How nuclear power works

<http://science.howstuffworks.com/nuclear-power3.htm>

How hydropower plants work

<http://people.howstuffworks.com/hydropower-plant1.htm>

Simplified model of hydropower plant

<http://www.eia.doe.gov/kids/energyfacts/sources/renewable/water.html>

Advantages and disadvantages of all power sources. Website.

Electricity resources listed with their advantages and disadvantages

<http://www.nucleartourist.com/basics/why.htm>

Pennsylvania Electricity Production Websites.

Pennsylvania wind and solar potential

http://www.eere.energy.gov/states/alternatives/resources_pa.cfm

Pennsylvania wind map

http://www.eere.energy.gov/windandhydro/windpoweringamerica/maps_template.asp?stateab=pa

Nice diagram of electricity distribution

http://www.eia.doe.gov/basics/electricity_basics.html