

## Virginia Water Resources and Desk Fan Generator

### Overview

Students will repurpose old desk fans to make generators that mirror the function of hydroelectric plants and wind farms. They will explore Virginia's watersheds through Google Satellite imagery and consider the environmental implications of how we use Virginia's freshwater supply and the trade-offs of alternative energy sources.

### Objectives

1. Students will be able to identify advantages and disadvantages of hydroelectric power.
2. Students will be able to identify the location of VA watersheds and a geological explanation for their location.
3. Students will discuss cost benefit trade-offs to usage of VA fresh water supply.
4. Students will be able to construct a generator from existing parts from a desk fan.

### Possible Standards of Learning

Earth Science:

ES.6b. Advantages and disadvantages of various energy sources

ES.6c. Resources found in Virginia; and

ES.6d. Environmental costs and benefits.

ES.8f Identification of the major watershed systems in Virginia, including the Chesapeake Bay and its tributaries.

### Next Generation Science Standards

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

Disciplinary Core Idea ETS2.B: Influence of engineering, technology, and science on society and the natural world.

### Materials

Computers or tablets

iFixit Toolkits

Multimeters

Desk fans and generator materials

### Safety

Students should wear appropriate safety attire including safety glasses. If at any point a student feels unsafe, they should stop and ask for help from an instructor.

([https://www.iFixit.com/Info/Device\\_Safety](https://www.iFixit.com/Info/Device_Safety))



**Procedure (50 min)**

1. Using Google Satellite and web research, students will identify the major watersheds and how they developed. The class will discuss water resources and usage in Virginia.
2. The instructor will present alternative energy sources including hydroelectric power and discuss advantages and disadvantages with the class (e.g. the impact on waterways).
3. The teacher will present the activity of converting a desk fan to a generator that would be functionally similar to that in a hydroelectric plant or wind farm. A brief discussion of the electrical-mechanical aspects of the generator can be part of this introduction to the activity.
4. In small groups, students will work to convert a desk fan to a generator using the iFixit toolkits and a conversation guide.
5. Once complete, students may test their devices using a multimeter.

**Differentiation/Variation**

Fans can be deconstructed beforehand to save time or simplify the activity. Facilitators can physically assist some groups in constructing the generator. Students who finish taking apart items more quickly than others can test their device using items like a small lightbulb or a radio clock. Instead of requiring students to navigate Google Satellite imagery and identify watersheds through web research by themselves, the instructor can highlight the watersheds on map screenshots ahead of time.

