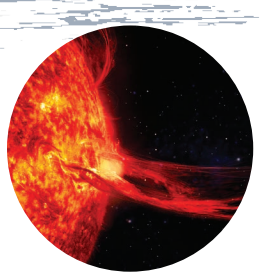
ACTIVITY 3



SOLAR FLARES AND OUR POWER GRID

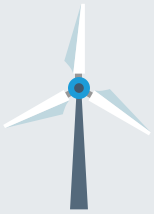
Our vast communication networks – and the electrical power grid that supports them – are essential to ensuring that human civilization runs smoothly. However, a massive solar event could destroy our technological existence in one fell swoop!

PART 1: ELECTROMAGNETISM AND HOW IT CAN AFFECT OUR POWER GRID

Electromagnetism is the invisible force that makes electricity flow and magnets stick. The movement of a magnet can generate electricity and the flow of electricity can generate a **magnetic field**. The Sun and Earth have magnetic fields that interact with each other. Earth's magnetic field protects our atmosphere from being stripped away by the **solar wind** (a powerful stream of charged particles ejected from the Sun) by deflecting most of the particles into space. The interaction between the Sun and Earth's magnetic fields sometimes causes geomagnetic storms that can affect Earth. When energy stored in the Sun's magnetic fields is suddenly released, it can cause an eruption on the Sun, called a **solar flare**. Minor solar eruptions happen regularly and usually don't affect Earth. However, large-scale solar events like a **coronal mass ejection** (CME), a super powerful explosion on the Sun, can send a massive shockwave of radiation toward Earth. If a solar shockwave were to hit Earth directly, the resulting magnetic storm could overwhelm our power grid and shut down life as we know it.

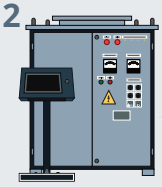
How does electricity get to our homes?

1



Power plants use turbines powered by coal, natural gas, wind, or water to generate electricity.

2



Transformers increase the voltage of the electrical current so it can travel long distances.

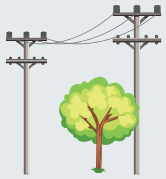
3

Transmission lines carry high voltage electricity across the country.

4

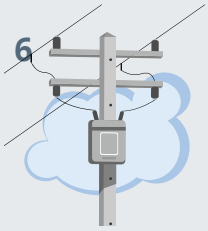
A **substation** receives electricity from transmission lines and lowers the voltage.

5



Distribution lines carry electricity to your neighborhood.

6



Smaller **transformers on poles** lower the voltage again so power is safe to use in our homes.

7

Electricity travels through wires inside the walls to **outlets** and **switches**.

PART 2: IMAGINING THE WORST-CASE SCENARIO

Think about it! Small storms can bring down local distribution lines or blow out smaller transformers, leading to a temporary loss of power in your home or neighborhood. A major solar event can create electrical surges that could deactivate power plants around the world simultaneously. Choose one of the following writing prompts to think through the direct aftermath and long-term consequences of a total power grid shutdown.

Option 1: Write two journal entries imagining the fallout of an electrical grid shutdown. One should describe the immediate aftermath and one should describe the long-term consequences (no internet, no heat, no electricity, no factories, etc.).

Option 2: Write a persuasive speech from the perspective of a concerned citizen to political leaders and/or the public about the importance of investing in electrical infrastructure (independent power grids, automated safeguards, more efficient distribution, etc.).