For students & educators

Camp Fire
MINNESOTA

My nature connection

NEW AGE NUCLEAR

GRADES: 4-12
TIME: 30 min.

NUCLEAR ENERGY

For over 100 years, people have been studying the power of nuclear energy. Nuclear Energy may be the most polarizing source of energy on earth. Complete this activity to understand how nuclear power is generated and its benefits and drawbacks.

WHAT YOU'LL NEED:

- Pencil or Pen

HOW NUCLEAR POWER WORKS

Everything in the universe is composed of super small units of matter called *atoms*. They're so small that if you lined up 100 million atoms, they would only be as long as your fingernail!

Atoms themselves are composed of even smaller parts called protons, neutrons, and electrons. The protons and neutrons are held together by the strong nuclear force. Even though protons and neutrons are small, the force that holds them together is powerful.

To generate nuclear power, neutrons are shot at uranium atoms (contained in fuel rods). This causes the uranium atoms to split and release the energy of their strong nuclear force. This process is called n*uclear fission*. The neutrons released from these split uranium atoms then collide with more uranium atoms and cause them to split and release energy. This process continues in a chain reaction releasing more and more energy.

Nuclear power plants use the energy from splitting atoms to boil water, which creates steam that turns turbines and creates electricity.

Students will:

1. Understand nuclear power as an energy source.
2. Decide if they would build a nuclear power plant in their hometown

SETTING

Indoors

1. Power Plant Proposition

In this activity, you are the mayor of your hometown. There is an opportunity to build a nuclear power plant within your town, but you are unsure if you should allow it. Read the opinions of the citizens of your town and then make your final decision.

"Nuclear power is great! The 94 nuclear power plants across the United States generate 20% of all the electricity we use. It can generate electricity without producing any carbon dioxide as a byproduct, and this means that nuclear energy doesn't contribute to climate change! And unlike other renewable energy sources, like solar and wind, nuclear power can be generated every day without interruption. Plus, nuclear power plants are very efficient when it comes to size. A nuclear power plant that takes up one square mile generates as much power as 360 industrial wind turbines! If you're looking for a source of clean, renewable energy, then nuclear power is the answer!"

Dave
Urban Planner

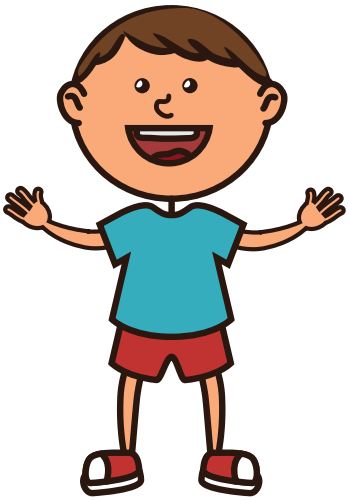
"I've lived in this town for 70 years. We've done fine without nuclear power, and we'll keep doing fine without it. Plus, I think nuclear power plants look ugly, and they would ruin our town's natural beauty."

Blanche
Retired Air Force Pilot

Dorothy
Professor of Environmental Science

"Nuclear power is not a perfect energy source. It may not produce any carbon dioxide, but it does create **nuclear waste**. After uranium atoms are split to generate power, the fuel rods remain and are extremely toxic. Exposure to nuclear waste can cause cancerous growths and genetic problems for plants and animals that contact them. The law dictates that nuclear waste must be stored, but nuclear waste remains dangerous for 50 years after it's produced, but to me, that sounds like 50 years where something could go wrong! Nuclear power plants aren't foolproof either. As recently as 2011, a meltdown at a nuclear power plant in Japan caused 154,000 people to evacuate their homes due to potential nuclear radiation exposure! I'd hate to see that happen in our town."

"I know a ton of superheroes that got their superpowers from nuclear-related accidents. Maybe I'd get superpowers if he had a nuclear power plant in town!
Hmmm... but then again, many supervillains also got their powers from nuclear accidents. I guess I'm not the best person to ask about this."



Bart
3rd Grader

Reflect on the statements above. When you have made your decision, answer the questions on the next page.

1. Will you build a nuclear power plant in your town? Why or Why not?

_____

_____

2. Did you find Dave or Dorothy more convincing? Why?

_____

_____

3. What other professional opinions would you want to hear about this topic (doctors, firemen, teachers, etc.)? Why?

_____

ADDITIONAL RESOURCES

World Nuclear Association: https://world-nuclear.org/

Nuclear Energy Explained: https://www.youtube.com/watch?v=rcOFV4y5z8c

TELL US WHAT YOU THINK!

Take a short survey at: campfiremn.org/mynatureconnection

Or here: Kids Survey - click here | Teachers/Parents Survey - click here

EDUCATION STANDARDS

Social Emotional Learning Competency: Social Awareness, Responsible Decision-Making

Grade Level	Science Education Standard
Grade 4	4.1.2.1.1 Describe the positive and negative impacts that the designed world has on the natural world as more and more engineered products and services are created and used.
	4.2.3.2.1 Identify several ways to generate heat energy. For example: Burning a substance, rubbing hands together, or electricity flowing through wires.
Grade 5	5.1.3.2.1 Describe how science and engineering influence and are influenced by local traditions and beliefs. For example: Sustainable agriculture practices used by many cultures.
	5.1.3.4.2 Create and analyze different kinds of maps of the student's community and of Minnesota. For example: Weather maps, city maps, aerial photos, regional maps, or online map resources.
Grade 6	6.1.2.1.1 Identify a common engineered system and evaluate its impact on the daily life of humans. For example: Refrigeration, cell phone, or automobile.
	6.1.2.1.2 Recognize that there is no perfect design and that new technologies have consequences that may increase some risks and decrease others. For example: Seat belts and airbags.
Grade 7	7.2.1.1.1 Recognize that all substances are composed of one or more of approximately one hundred elements and that the periodic table organizes the elements into groups with similar properties
Grade 8	8.1.1.1.1 Evaluate the reasoning in arguments in which fact and opinion are intermingled or when conclusions do not follow logically from the evidence given. For example: Evaluate the use of pH in advertising products such as body care and gardening.
	8.1.3.3.3 Provide examples of how advances in technology have impacted how people live, work and interact.
Grade 9-12	9.2.4.1.1 Compare local and global environmental and economic advantages and disadvantages of generating electricity using various sources or energy. For example: Fossil fuels, nuclear fission, wind, sun or tidal energy.
	9.2.4.1.2 Describe the trade-offs involved when technological developments impact the way we use energy, natural resources, or synthetic materials. For example: Fluorescent light bulbs use less energy than incandescent lights, but contain toxic mercury.