

NUCLEAR

What is nuclear energy?

Nuclear energy is energy in the nucleus (core) of an atom. Atoms are tiny particles that make up every object in the universe. There is enormous energy in the bonds that hold atoms together.

What types of nuclear energy are there?

There are two ways to release energy from an atom:

- nuclear fusion
- nuclear fission

Nuclear fusion: In nuclear fusion, energy is released when atoms are combined or fused together to form a larger atom. This is how the sun produces energy.

Nuclear fission: In nuclear fission, atoms are split apart to form smaller atoms, releasing energy. Nuclear power plants use nuclear fission to produce electricity.

How is electricity generated from nuclear energy?

Nuclear power reactors or nuclear power plants create electricity by combining chemical reactions and heat.

Nuclear fission: The fuel most widely used by nuclear power plants for nuclear fission is uranium. Uranium is non-renewable, though it is a common metal found in rocks around the world. Most nuclear plants use a certain kind of uranium (U-235) as fuel, because its

atoms are easily split apart.

During nuclear fission, a small particle called a neutron hits the uranium atom and it splits, releasing a great amount of energy as heat and radiation. As more neutrons are released they bombard other uranium atoms, and the process of nuclear fission repeats itself over and over again. This is called a chain reaction.

Nuclear plants use the heat given off during fission as fuel. Fission takes place inside the reactor of a nuclear power plant. At the center of the reactor is the core, which contains the uranium fuel.

The uranium fuel is formed into ceramic pellets. The pellets are about the size of your fingertip, but each one produces the same amount of energy as 567 kilograms of coal.



THE GUNDEMMINGEN NUCLEAR POWER PLANT IN GERMANY.
SOURCE: ENCARTAMSN.COM



These energy-rich pellets are stacked end-to-end in 3.6 metre metal fuel rods. A bundle of fuel rods is called a fuel assembly.

In the same way that burning coal generates heat in a steam boiler, fission generates heat in a reactor. This heat boils water to make steam. The steam turns huge turbine blades, driving generators that make electricity.

What are the advantages of nuclear energy?

In comparison to burning fossil fuels, nuclear energy is a cleaner way to create electricity. Nuclear energy doesn't emit carbon dioxide or other pollutants while in use.

What are the disadvantages of nuclear energy?

The process of nuclear fission creates radioactive waste. Radioactive waste is extremely toxic and harmful to humans and the environment. It currently must be stored safely underground.

How is nuclear energy used in New Zealand?

Nuclear energy is not used in New Zealand as we have a nuclear-free policy. There is a lot of controversy about using nuclear energy. Some experts think it's a cleaner more efficient way to generate electricity, while environmental groups and a lot of the public are against using nuclear power.

The United States of America produces the most nuclear energy in the world but it only provides for 20% of its electricity. While France uses nuclear energy to create 80% of its electricity.

ACTIVITIES

ACTIVITY ONE DEBATE

Divide the class into groups. Each group selects the advantages or the disadvantages of using nuclear energy. Using classroom resources, the library, and the Internet, groups research their topic and prepare a five minute presentation. Each group delivers their presentation to the class and answers questions afterwards.

ACTIVITY TWO

Students write down ten key words that they came across in the study of nuclear energy. Create a glossary with the key words and definitions.

SUPPORTING RESOURCES

- Andy Darvill's Science Site: www.darvill.clara.net
- World Nuclear Association: www.world-nuclear.org/education
- Organisation for Economic Co-operation and Development (OECD) Nuclear Energy Agency: www.nea.fr

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