Background sheet: Nuclear power

Is nuclear power the best solution to the climate crisis?

Overview: Nuclear power uses an atomic-level process called nuclear fission that generates heat, turning water into steam to drive electric turbines. Unlike 'fossil fuels' that produce carbon dioxide and other climate-heating emissions, nuclear energy releases almost no greenhouse gases during operation – leading some to consider it one of the 'cleanest' scalable energy sources available, and essential for helping us reach global net zero targets. Nuclear power also needs comparably small amounts of fuel to produce a lot of energy. It does, however, create radiation, which can be extremely damaging to people, animals and our natural environment when released. If a nuclear plant works well, it gives out only small doses of radioactive gases and materials, but accidents can lead to very destructive results.

Key facts:

- According to the Paris Agreement, countries must work together to reduce their carbon dioxide emissions by 45% by 2030, reaching net zero by 2050, or we may not be able to 'preserve a liveable planet'.
- While the mining and transport of uranium ore do give out significant volumes of greenhouse gases, nuclear power does not produce carbon dioxide in operation. It can also release one million times more energy per kilogram than the burning of coal, oil or gas.
- Nuclear power plants need access to abundant water supplies in order to keep their reactors cool, which can put them close to residential areas.
- Modern reactor designs are generally considered to be very safe, and large-scale accidents at nuclear power plants are rare. Those that have occurred – including at Chernobyl and Fukushima – caused catastrophic and long-term damage to health, the environment and the economy around them.
- Unlike solar, tide and wind power, the creation of nuclear energy is a finite and non-renewable process. It creates nuclear waste, which is highly radioactive and must be stored underground for a very long time until it decays and is safe again. In some cases, this could take up to a million years.

Ethical/social considerations:

- Protection: What could be more damaging to our planet – the potential of a future nuclear disaster, or the greenhouse-emitting energy we use now?
- Employment: How do we get the workforce we need to effectively run nuclear power plants, and – perhaps more importantly – decommission them safely when they reach the end of their lifespan?
- Future communication: What safeguards would need to be put in place to keep future generations away from nuclear waste as it decays, considering it will still be in the ground in hundreds of thousands of years' time?
- Location: Where are the best places to locate nuclear power stations, factoring in the safety and concerns of surrounding communities?
- Population: In a growing population that is reliant on electricity, is nuclear power the only dependable way to keep the lights on around the world?

Curriculum links:
Physics (energy and radiation),
Biology (environmental impacts on ecosystems and human health),
Geography (resource management, land use, sustainability)

Roles: Nuclear power

For example, in a class of 30 students, split them into five teams of six and assign each team one of the following roles.

Role 1: Nuclear engineer

- **Position:** Designing, building, running and decommissioning nuclear power stations
- **Consider:** Safety, short- and long-term operations of systems

Role 2: Climate activist

- **Position:** Seeking to tackle and solve the climate crisis
- **Consider:** Environmental impacts, carbon emissions, advocating for nature, urgency

Role 3: Community representative

- **Position:** Wanting low-cost energy while concerned about the public dangers of nuclear
- **Consider:** Proximity of power plant, perceptions, cost of living

Role 4: Nuclear lobbyist

- **Position:** Encouraging policymakers to switch the country's energy sources to nuclear
- **Consider:** Changing perceptions, backers, funders, policy

Role 5: Energy minister

- **Position:** Making policy recommendations that balance energy constraints, costs, public health, trust and safety
- **Consider:** Voter opinions, energy budgets, legacy, regulation