



THE MIGHTY ATOM

QUICK ACTIVITY

KS3

SAVE INK - don't print this first page!



Lesson overview

In this activity, students reinforce key learnings about how we generate electricity from renewable and non-renewable resources, with a particular focus on nuclear power.

Learning objectives:

- ▶ Understand what causes a nuclear reaction
- ▶ Appreciate how much we rely on electricity every day
- ▶ Learn about the nuclear generation process
- ▶ Distinguish between different energy resources
- ▶ Understand the difference between renewable and non-renewable resources
- ▶ Learn about careers and job prospects in the nuclear industry

Subjects:

Physics
Chemistry

Gatsby Benchmarks

2: Learning from career and labour market information:

Find out about jobs and career pathways in the nuclear energy industry.

4: Linking curriculum learning to careers:

An understanding of how we generate electricity from nuclear power is critical for a career in the nuclear industry.

Timings

- ▶ Warm-up: 5 mins
- ▶ Main activity: 30-45 mins
- ▶ Careers in nuclear: 10 mins

Materials and set-up

This **Activity Pack** contains the following materials:

- ▶ Teacher notes
- ▶ Student worksheet

This activity can be used in the classroom, led by a teacher. Or share the Worksheet with students for independent learning, with additional support provided in the Teacher notes.

WARM-UP (5 mins)

Shrink to the size of an atom!

Discover what happens inside the core of a nuclear reactor at atomic level in **this film** from EDF. It uses virtual reality, so move the screen around to get a 360° view.

Play the film and encourage students to pay close attention – they may want to take notes – or re-watch the film afterwards – to complete the activity.

THE MAIN ACTIVITY

(30-45 mins)

Part 1: Quiz time

1. Q. What's inside the fuel rods?

A. Uranium

2. Q. How many nuclear fissions take place in each pellet per second?

A. 5 million million.

3. Q. How hot does the water get in the reactor as a result of nuclear fission?

A. More than 300°C.

4. Q. How fast does the heated water travel through pipes out of the reactor vessel?

A. 35mph

5. Q. How much electricity is produced by the reactor in this film – and how many homes could it power?

A. A. More than 1000 MW of electricity – enough to power all the houses in Greater Manchester.

Part 2: One-minute challenge

In your Worksheet, list as many things as possible in one minute that you use every day which require electricity.

HPC Inspire

We're Hinkley Point C's Education Programme in Somerset and the wider South West region. And we're here to help young people take advantage of the huge opportunities that the construction and operation of HPC has to offer. We do this through a range of fun and innovative activities: including hands-on STEM workshops, careers assemblies and online learning resources.

Part 3: What happens next?

Re-watch **the film** – if necessary – so students can answer the following questions in their Worksheet.

1. Q. What's the first thing you can see in the reactor? (0.55 seconds)

A. Rows and rows of fuel pellets (2 million).

2. Q. When the neutron is fired into the nucleus of the atom, what happens next? (1.33 seconds)

A. It causes the nucleus to split into two. This process is called nuclear fission.

3. Q. What happens when the nucleus splits? (1.44 seconds)

A. It releases its own neutrons. Some of these hit other atoms, causing more nuclear fission. This is called a chain reaction and it creates a lot of energy, which is released in the form of heat.

4. Q. What does the energy released from nuclear fission cause to happen next? (2.10 seconds)

A. It heats up the fuel pellets, which heats up the water in the reactor. This heated water travels through pipes out of the reactor vessel. And in turn, it heats more water, which turns into steam.

5. Q. What does the steam do? (2.40 seconds)

A. It makes the turbines spin. This makes the generator spin, causing the energy from the movement to turn into electrical energy (this is electricity).

Part 4: Name that energy resource

Ask students to label each of the energy resources in their Worksheet. If they get stuck, they can use **BBC Bitesize** to refresh their knowledge about the different types of energy resources.



Part 5: Renewable vs. non-renewable resources

Ask students to complete the table in their Worksheet and categorise the energy resources as renewable or non-renewable.

RENEWABLE ENERGY RESOURCE	NON-RENEWABLE ENERGY RESOURCE
Solar	Coal
Wind	Oil
Tidal	Gas
Wave	Nuclear
Hydro	
Biofuel	
Geothermal	

CAREERS IN NUCLEAR

(10 mins)

The UK Government wants to achieve net-zero carbon emissions by 2050. This means we need to **reduce** the amount of electricity we generate from fossil fuels. Since these release significant amounts of carbon emissions to produce electricity.

And **increase** the amount of electricity we generate from low-carbon energy resources, like renewables and nuclear. Nuclear might use a non-renewable resource (uranium) but the nuclear reaction doesn't generate carbon emissions, so we call it a **low-carbon energy resource**.

The move to generate more electricity from low-carbon energy resources brings new job opportunities – particularly for future generations, like you!

At Hinkley Point C, we'll be training 1,000 apprenticeships during the build and operation of the new power station. Here are some of the job roles that will be available:

During the build:



Once the power station is operational:



Part 1: How many jobs are there in the nuclear industry?

Tell students to take a look at [this site](#) for the answer.

There are nearly **60,000 people** employed in the civil nuclear sector across the UK. This includes nearly 2,000 apprenticeships and over 900 graduates.

Part 2: What does a nuclear engineer do?

Use this [National Careers Service link](#) to answer the following questions.

1. Q. Nuclear engineers are responsible for what?

A. The safe running of nuclear power stations.

2. Q. How do you become a nuclear engineer?

A. Through a university course, an apprenticeship or a graduate training scheme.

3. Q. List four skills or knowledge you need to be a nuclear engineer.

A. Choose from one of the following:

- ▶ Knowledge of engineering science and technology
- ▶ Maths knowledge
- ▶ Knowledge of physics
- ▶ To be thorough and pay attention to detail
- ▶ Thinking and reasoning skills
- ▶ Design skills and knowledge
- ▶ Analytical thinking skills
- ▶ Excellent verbal communication skills
- ▶ To be able to carry out basic tasks on a computer or hand-held device

Part 3. Hear from young people working in the nuclear industry

Watch this [film](#) about the apprenticeships available at Hinkley Point C – and hear from real-life apprentices Megan, Callum and Sam, who work on the project. Then answer the following questions:

1. Q. What attracted Megan to the apprenticeship? (1 min)

A. Being able to develop a transferable skill through project controls. She's also furthered her personal development.

2. Q. What does Callum say are the benefits of the apprenticeship? (1.34 seconds)

A. Learning from other people and learning new skills. As well as being part of an amazing project.

3. Q. What does Sam say are the benefits of working at HPC? (1.43 seconds)

A. Learning a trade and getting paid. He thinks a degree apprenticeship is ideal for anyone who loves learning, but wants to get involved in the day-to-day operations too.

Useful links

BBC Bitesize – KS3 Science: <https://www.bbc.co.uk/bitesize/subjects/zng4d2p>

Hinkley Point C: <https://www.edfenergy.com/energy/nuclear-new-build-projects/hinkley-point-c>

Start Profile: <https://startprofile.com/hpc>

Nuclear Engineer Degree Apprenticeship: https://careers.edfenergy.com/content/Nuclear-Engineer-Degree-Apprenticeship/?locale=en_GB

Careers in nuclear: <http://www.sciencecareerpathways.com/nuclear-careers/>

Real-life engineering jobs: <https://www.tomorrowsengineers.org.uk/students/career-finder>

Interview with Dr Charlotte Levy, a nuclear safety engineer: <https://www.tomorrowsengineers.org.uk/real-jobs/safety-engineer-dr-charlotte-levy/>

Nuclear career pathways: <https://www.nssguk.com/nuclear-career-pathways/>

Apprenticeships at EDF: <https://www.edfenergy.com/energy/nuclear-new-build-projects/hinkley-point-c/jobs-and-training/apprenticeships>

Curriculum links

This activity meets the following criteria in England:

Science: Working scientifically; Physics – Energy; Chemistry – Earth and atmosphere

Find out more about **Hinkley Point C** and **careers in the nuclear industry**

WARM-UP

Shrink to the size of an atom!

Discover what happens inside the core of a nuclear reactor at atomic level in **this film** from EDF. It uses virtual reality, so move the screen around to get a 360° view.

MAIN ACTIVITY

Re-watch the **film** if necessary, to answer the following questions.

Part 1: Quiz time

1. Q. What's inside the fuel rods?

A. _____

2. Q. How many nuclear fissions take place in each pellet per second?

A. _____

3. Q. How hot does the water get in the reactor as a result of nuclear fission?

A. _____

4. Q. How fast does the heated water travel through pipes out of the reactor vessel?

A. _____

5. Q. How much electricity is produced by the reactor in this film – and how many homes could it power?

A. _____

Part 2: One-minute challenge!

List as many things as possible in one minute that you use every day which require electricity.

Part 3: What happens next?

Re-watch **the film** to answer the following questions. Pause at the relevant time codes, if necessary.

1. Q. What's the first thing you can see in the reactor? (0.55 seconds)

A. _____

2. Q. When the neutron is fired into the nucleus of the atom, what happens next? (1.33 seconds)

A. _____

3. Q. What happens when the nucleus splits? (1.44 seconds)

A. _____

4. Q. What does the energy released from nuclear fission cause to happen next? (2.10 seconds)

A. _____

Q. What does the steam do? (2.40 seconds)

A. _____

Part 4: Name that energy resource

Can you label each of these energy resources?

If you get stuck, take a look at [BBC Bitesize](#) to remind yourself about the different energy resources.



Part 5: Renewable vs. non-renewable resources

Fill in the table with each of the energy resources listed on the previous page, based on whether you think they're renewable or non-renewable.

RENEWABLE ENERGY RESOURCE	NON-RENEWABLE ENERGY RESOURCE

CAREERS IN NUCLEAR

The UK Government wants to achieve net-zero carbon emissions by 2050. This means we need to **reduce** the amount of electricity we generate from fossil fuels. Since these release significant amounts of carbon emissions to produce electricity.

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Take a look at [this site](#) to find out...

Part 2: What does a nuclear engineer do?

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1. Q. Nuclear engineers are responsible for what?

A. _____

2. Q. How do you become a nuclear engineer?

A. _____

3. Q. List four skills or knowledge you need to be a nuclear engineer.

A. _____

Part 3. Hear from young people working in the nuclear industry

Watch this [film](#) about the apprenticeships available at Hinkley Point C – and hear from real-life apprentices, Megan, Callum and Sam, working on the project. Then answer the following questions:

1. Q. What attracted Megan to the apprenticeship? (1 min)

A. _____

2. Q. What does Callum say are the benefits of the apprenticeship? (1.34 seconds)

A. _____

3. Q. What does Sam say are the benefits of working at HPC? (1.43 seconds)

A. _____

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