



WE'VE GOT THE POWER! QUICK ACTIVITY

KS4

SAVE INK - don't print this first page!



Lesson overview

This quick activity reinforces students' knowledge about the energy mix; how we generate electricity using renewable (wind, solar) and non-renewable (gas, nuclear) energy resources; and the impact of human activity on the environment.

Learning objectives

- ▶ Understand the difference between renewable and non-renewable energy resources
- ▶ Consider the factors that influence a country's energy mix
- ▶ Understand key definitions relating to national and global energy resources
- ▶ Develop awareness about the energy mix around the world
- ▶ Identify job opportunities in the low-carbon energy sector

Subjects

Combined science
Physics
Chemistry

Gatsby Benchmarks

- 2: Learning from career and labour market information:** Find out about the variety of jobs in the low-carbon energy industry – and HPC in particular.
- 4: Linking curriculum learning to careers:** Identify the career pathways into different roles in the energy industry.

Timings

- ▶ Main activity: 45 mins
- ▶ Careers in energy: 15 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 Student worksheet for students to use independently – with a link to the Teacher notes if they need further guidance.

This quick activity is a good follow-up to **The Mighty Atom activity**

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.

THE MAIN ACTIVITY

(45 mins)

Part 1: Renewable or non-renewable?

Do you know which energy resource is which?

Look at the pictures of the energy resources in your Worksheet. Use the table to categorise each as renewable or non-renewable.

Did you know... The Dinorwig hydro power station in Wales can power up from zero to 1,320 MW in 12 seconds!¹

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



¹ <http://www.electricmountain.co.uk/Dinorwig-Power-Station>

Part 2: How well do you know your energy resources?

Complete the table in your Worksheet – consider what additional information you can find out about each energy resource to include in the final column.

ENERGY RESOURCE	RENEWABLE/ NON-RENEWABLE?	IMPACT ON ENVIRONMENT	POWER OUTPUT	RELIABILITY	COST	OTHER CONSIDERATIONS
Nuclear	Non-renewable (it uses a metal called uranium)	Zero carbon emissions during generation	High	Good	Building a nuclear power station is a big investment project.	Nuclear waste remains radioactive, so the waste products require long-term management in special facilities.
Wind	Renewable	Zero carbon emissions produced from generation	Low	Variable	Relatively low cost to run. Offshore wind farms are more expensive to build due to the complications of building out at sea.	The UK is the windiest country in Europe. Limited development onshore due to available land space.
Solar	Renewable	Zero carbon emissions produced from generation	Low	Variable	Low	The UK gets enough sunlight to be a viable energy source. Development restricted by the amount of land space available.
Gas	Non-renewable	Produces carbon emissions during generation	High	Good	Fairly low-cost	Gas power stations can respond very quickly to increases in energy demand.

Part 3: Dictionary definitions

Define the following energy terms in your Worksheet:

Reliable: A power source that has a predictable output and can run constantly.

Variable: A power source with a changeable output. For instance, renewables such as wind and solar, which stop generating power when the wind stops blowing and the sun stops shining, respectively.

Renewable: An energy resource that will never run out, but which is constantly replenished (like wind, solar and hydro).

Non-renewable: An energy resource that will run out. Fossil fuels are non-renewable as they have a finite lifespan.

Low-carbon: An energy source that generates very little or zero carbon dioxide emissions.

Did you know... Just one kilo of uranium (the same weight as about two bags of sugar) makes enough electricity to power your home for almost 11 years? The same amount of coal could only power your home for about 4.5 hours!²

Part 4: 3x3 challenge

How quick can you complete the 3x3 challenge to test your knowledge of our energy needs?

1. Q. Broadly, we need energy for heating, transport and ?
A. Electricity generation – and our reliance on electricity is growing, as we switch to electric cars, electric heating etc.

2. Q. In the UK, the three main sources of energy for electricity in 2018 were gas, renewables and ?

A. Nuclear

3. Q. The three main greenhouse gases are carbon dioxide, water vapour and ?

A. Methane

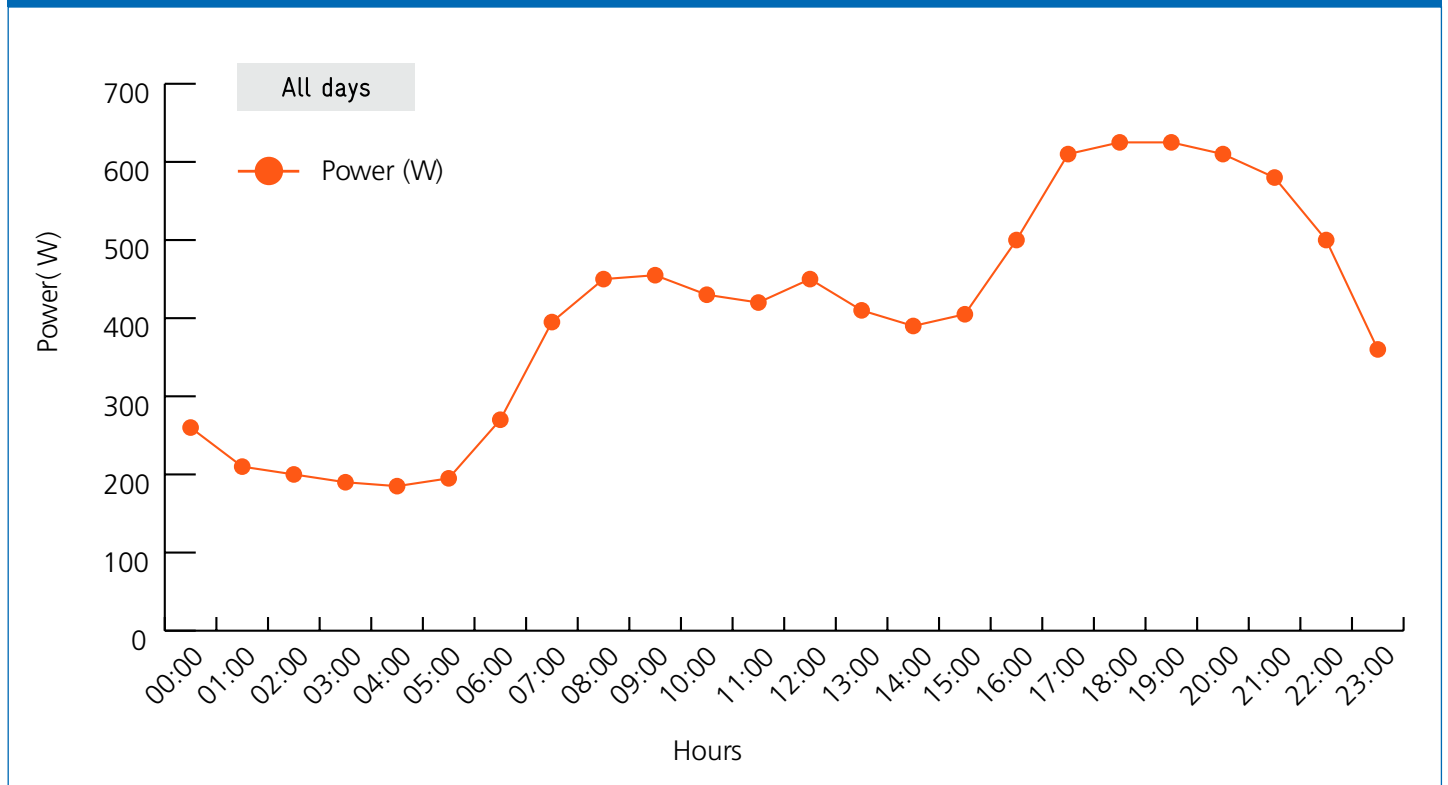
Do you know... It's now widely accepted that the main cause of climate change is human activity. While natural events – like volcanoes erupting – can release carbon dioxide into the atmosphere and cause climate change. Evidence shows that the increased amount of greenhouse gases in the atmosphere is due to man-made activities, like burning fossil fuels. Read more on the **Met Office website**.

² The Pod's How we make electricity from nuclear power poster: <https://jointhepod.org/teachers/posters/how-electricity-is-made-from-nuclear-power-poster>

Part 5: Daily habits

Take a look at the diagram in your Worksheet, then answer the questions below.

Daily profile for electricity use in all test households (excluding electric heating)



Source: <https://energysavingtrust.org.uk/sites/default/files/reports/PoweringthenationreportC0332.pdf>

1. Q. What's the time range for the three main peaks of electricity use over the day?

A. Approx 8-10am; 11.30am-1.30pm; 5.30-8.30pm.

2. Q. Give two reasons for these peaks:

A. Answers might include:

▶ These are the times when people are preparing and eating – cooking can involve the use of lots of appliances;

▶ These are the times when most people are in the home;

▶ There's demand for lighting mainly in the morning and evening, when it's dark;

▶ These might be the times people are relaxing e.g. playing on games consoles, online with friends, watching TV etc.

3. Q. Why do you think electricity is still being used at night?

A. Many household appliances are on all the time (e.g. fridge and WiFi router). Some people use the evenings to run wash cycles or charge their devices too (although these can be a fire risk).

Part 6: Globetrotters

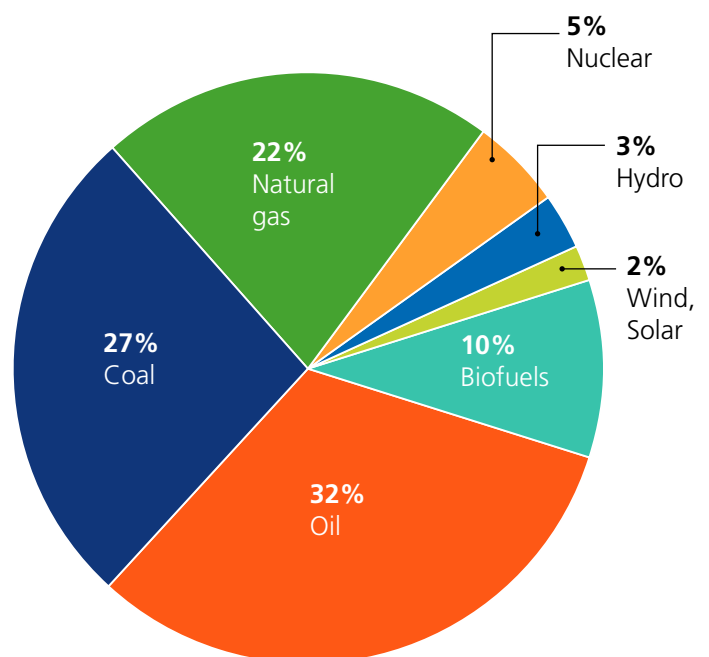
How much do you know about our global use of energy?

Direct students to the [Global Energy Statistical Yearbook³](#) and ask them to use this site to find out the answers to the questions in their Worksheet.

1. **Q.** Which countries are the three biggest consumers of energy in the world?
A. China, the US and India.
2. **Q.** Which countries are the three biggest consumers of electricity in the world?
A. China, the US and India (again).
3. **Q.** Which continent generated most of the growth in global electricity consumption this year?
A. Asia – up almost 80%, with China accounting for the lionshare (nearly 60%).
4. **Q.** What factors drove an increase in electricity in different countries?
A. Reasons might include economic growth; industrial demand; and increased electricity consumption for appliances and air-conditioning.
5. **Q.** Which three countries generate the most electricity from renewables?
A. Norway, New Zealand and Brazil.
6. **Q.** Below is the dataset for the worldwide total primary energy supply, by source, for 2017⁴. Use the data to draw a pie chart to show the global energy mix.



ENERGY RESOURCE	UNITS (KTOE)	% OF ENERGY MIX
Coal	3,789,934	27%
Natural gas	3,106,799	22%
Nuclear	687,481	5%
Hydro	351,029	3%
Wind and solar, etc.	256,830	2%
Biofuels	1,329,064	10%
Oil	4,449,499	32%



³All answers correct as of June 2020

⁴Source: IEA World Energy Balances 2019 <https://www.iea.org/subscribe-to-data-services/world-energy-balances-and-statistics>

CAREERS IN ENERGY

15 mins

Could your future career be at HPC?

Hinkley Point C is the new power station we're building in Somerset. It'll generate 7% of the UK's electricity – that's enough to power six million homes! And it'll be low-carbon electricity, as generating electricity from nuclear power doesn't produce any carbon emissions. So it'll help the UK Government achieve its target of net-zero carbon emissions by 2050 too.

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:

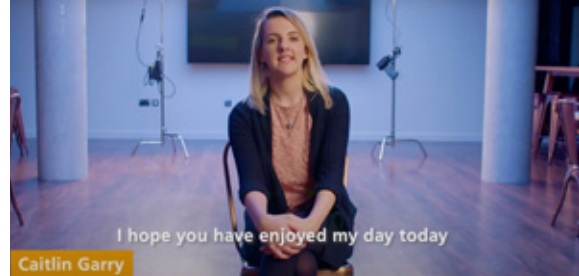
During the build:



Once the power station is operational:



Choose one or more of the following careers activities to run with students.



1. Meet Caitlin...

To find out what it's like to work at HPC, watch this **day in the life film** of Caitlin, a quantity surveyor apprentice on the project. Then answer this question:

Q. Give three benefits of being an apprentice at EDF.
A. Students could have given their answers from the following: working on one of the biggest construction projects in Europe; getting hands-on experience; working on-site and in the office; receiving a great salary and benefits package; furthering their education with a recognised qualification; getting a great start to their career; and avoiding debt.

2. Myths about apprenticeships

Watch **this film** about five myths about apprenticeships and list the five myths below, along with an explanation for each.

- 1. You earn less than minimum wage as an apprentice. But in fact:**
 - ▶ Your pay increases with level, age and time on the programme
 - ▶ It boosts your future earnings
 - ▶ You'll receive paid holidays
- 2. It's easier than university or college. But in fact:**
 - ▶ You'll need to be committed and professional
 - ▶ You're paid to study... with no tuition fees
 - ▶ You could end up with a degree
- 3. The job prospects aren't great. But in fact:**
 - ▶ 64% of apprentices stay on with the same employer
 - ▶ 92% of apprentices said their career prospects had improved
 - ▶ Employers can favour apprenticeships over uni qualifications

We've Got the Power! quick activity **KS4**

4. You need to have good GCSEs. But in fact:

- ▶ Entry requirements can vary
- ▶ Personal qualities often override qualifications
- ▶ Studying for GCSEs forms part of some apprenticeships

5. You just make the tea. But in fact:

- ▶ Your work is varied and meaningful
- ▶ You'll be a key member of the team
- ▶ 89% of apprentices are satisfied with their apprenticeship

3. Jobs of the future

Research three jobs in the low-carbon energy industry. (*Clue: take a look at sites like the [National Careers Service](#), [Start profile](#), [EDF's careers pages](#) and associations like [RenewableUK](#)).* For each, explain what the job involves, what skills you require and the pathway into them.

Did you know... By helping to build or operate a new nuclear power station, you could be part of our low-carbon future? Find out more about the variety of jobs available at HPC on **Start Profile**.

Useful links

Causes of climate change: <https://www.metoffice.gov.uk/weather/climate-change/causes-of-climate-change>

BBC Bitesize GCSE: <https://www.bbc.co.uk/bitesize/levels/z98jmp3>

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

Starting your career in nuclear power: https://careers.edfenergy.com/content/Early-Careers-at-EDF-Energy/?locale=en_GB

Learn more about HPC with these activities: <https://guest.startprofile.com/employer/19335/activities>

Curriculum links

AQA GCSE Combined Science: Synergy

Working scientifically; Atomic structure – Human impacts on the climate; Electricity: energy resources

AQA GCSE Combined Science: Trilogy

Working scientifically; Chemistry – atomic structure – Human activities which contribute to an increase in greenhouse gases in the atmosphere; Physics – National and global energy resources

AQA GCSE Physics

Working scientifically; Energy – National and global energy resources

Test your powers of deduction in this assessment

centre-style activity: https://www.edfenergy.com/sites/default/files/elimination_resource_pack_combined.pdf

When you're 16, you can sign up for Young HPC to find out about job opportunities at HPC: https://www.youtube.com/watch?v=REbCT7Sw4Ys&list=PLXeIrBe86r_JrPpHZDwmkg8lgAGa_fF4s&index=58

Discover what happens inside a nuclear reaction in this film: https://www.youtube.com/watch?v=3iQBMMyGmg-8&list=PLXeIrBe86r_K1Czba0ZOnMbkGChwu7pYb&index=7&t=0s

Find out about early careers at EDF: https://careers.edfenergy.com/content/Early-Careers-at-EDF-Energy/?locale=en_GB

AQA GCSE Chemistry

Working scientifically; Chemistry – atomic structure – Human activities which contribute to an increase in greenhouse gases in the atmosphere

Edexcel GCSE (9-1) Combined Science

Physics: Topic 3 – Conservation of energy

Edexcel GCSE (9-1) Physics

Working scientifically; Topic 3 – Conservation of energy

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

We've Got the Power!
quick activity **KS4**

THE MAIN ACTIVITY

Part 1: Renewable or non-renewable?

Do you know which energy resource is which?

Look at the pictures of the energy resources below. Then use the table to categorise each as renewable or non-renewable.

RENEWABLE ENERGY RESOURCE	NON-RENEWABLE ENERGY RESOURCE

Did you know... The Dinorwig hydro power station in Wales can go from zero to 1,320MW in 12 seconds!¹



¹ <http://www.electricmountain.co.uk/Dinorwig-Power-Station>

We've Got the Power!
quick activity **KS4**

Part 2: How well do you know your energy resources?

Complete the table below. Consider what additional information you can find out about each energy resource to include in the final column.

ENERGY RESOURCE	RENEWABLE/ NON-RENEWABLE?	IMPACT ON ENVIRONMENT	POWER OUTPUT	RELIABILITY	COST	OTHER CONSIDERATIONS
Nuclear						
Wind						
Solar						
Gas						

We've Got the Power!
quick activity **KS4**

Part 3: Dictionary definitions

Define the following energy terms in your Worksheet:

Reliable: _____

Variable: _____

Renewable: _____

Non-renewable: _____

Low-carbon: _____

Did you know... Just one kilo of uranium (the same weight as about two bags of sugar) makes enough electricity to power your home for almost 11 years? The same amount of coal could only power your home for about 4.5 hours!²

Part 4: 3x3 challenge

How quick can you complete the 3x3 challenge to test your knowledge of our energy needs?

1. Q. Broadly, we need energy for heating, transport and ?

A. _____

2. Q. In the UK, the three main sources of energy for electricity in 2018 were gas, renewables and ?

A. _____

3. Q. The three main greenhouse gases are carbon dioxide, water vapour and ?

A. _____

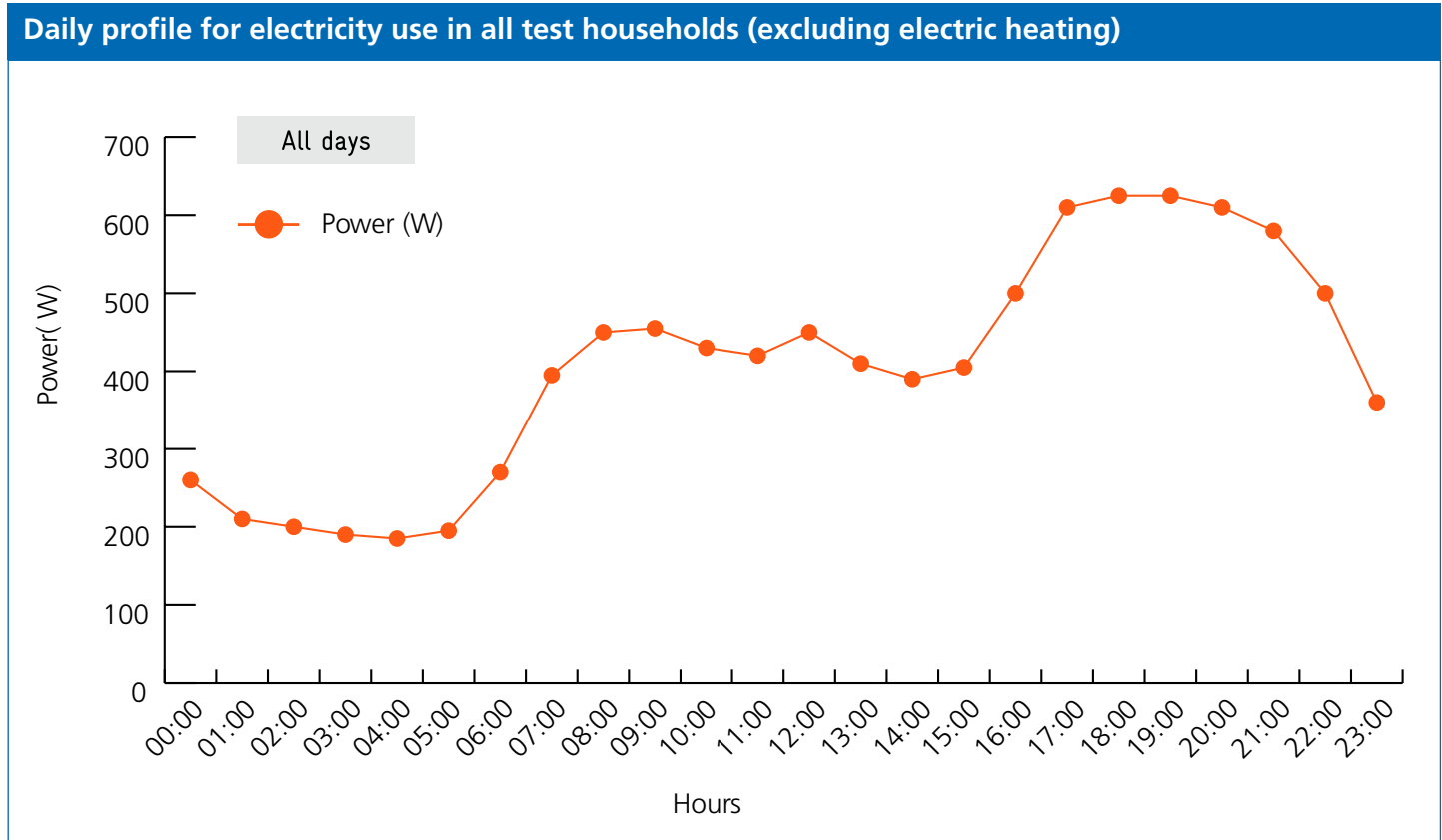
Do you know... It's now widely accepted that the main cause of climate change is human activity. While natural events – like volcanoes erupting – can release carbon dioxide into the atmosphere and cause climate change. Evidence shows that the increased amount of greenhouse gases in the atmosphere is due to man-made activities, like burning fossil fuels. Read more on the **Met Office website**.

² The Pod's How we make electricity from nuclear power poster: <https://jointhepod.org/teachers/posters/how-electricity-is-made-from-nuclear-power-poster>

We've Got the Power!
quick activity **KS4**

Part 5: Daily habits

Take a look at the diagram, then answer the questions below.



Source: <https://energysavingtrust.org.uk/sites/default/files/reports/PoweringthenationreportCO332.pdf>

1. Q. What's the time range for the three main peaks of electricity use over the day?

A. _____

2. Q. Give two reasons for these peaks:

A. _____

3. Q. Why do you think electricity is still being used at night?

A. _____

We've Got the Power!
quick activity **KS4**

Part 6: Globetrotters

How much do you know about our global use of energy?

Look at the [Global Energy Statistical Yearbook³](#) to find the answers to the following questions.

1. Q. Which countries are the three biggest consumers of *energy* in the world?

A. _____

2. Q. Which countries are the three biggest consumers of *electricity* in the world?

A. _____

3. Q. Which continent generated most of the growth in global *electricity* consumption this year?

A. _____

4. Q. What factors drove an increase in electricity in different countries?

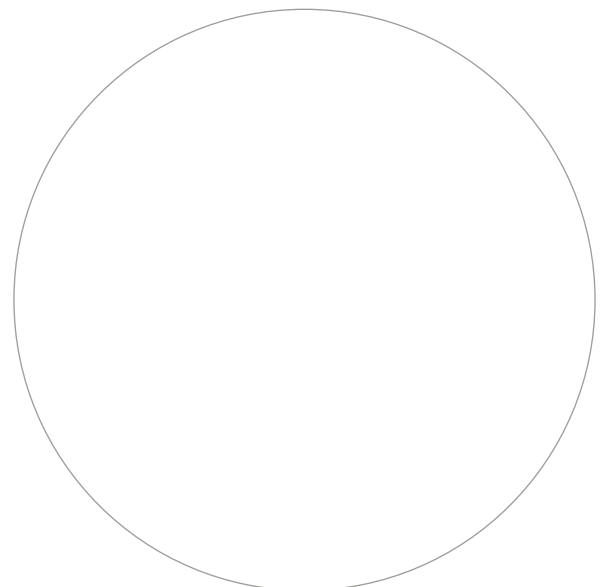
A. _____

5. Q. Which three countries generate the most electricity from renewables?

A. _____

6. Q. On the right is the dataset for the worldwide total primary energy supply, by source, for 2017⁴. Use the data to draw a pie chart to show the global energy mix.

ENERGY RESOURCE	UNITS: KTOE
Coal	3,789,934
Natural gas	3,106,799
Nuclear	687,481
Hydro	351,029
Wind and Solar, etc.	256,830
Biofuels	1,329,064
Oil	4,449,499



³Correct as of June 2020; ⁴IEA World Energy Balances 2019 <https://www.iea.org/subscribe-to-data-services/world-energy-balances-and-statistics>

We've Got the Power!
quick activity **KS4**

CAREERS IN ENERGY

Could your future career be at HPC?

Hinkley Point C is the new power station we're building in Somerset. It'll generate 7% of the UK's electricity – that's enough to power six million homes! And it'll be low-carbon electricity, as generating electricity from nuclear power doesn't produce any carbon emissions. So it'll help the UK Government achieve its target of net-zero carbon emissions by 2050 too.

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:

Project Planner
 Electrical Technician Project Manager
 Steel Fixer Drivers Control room operator
 Site Engineer Painter Engineers
 Demolition Operative Security Staff
 Pipe Fitter Managers General Construction
 Cleaners Finance Chemists Operative
 Ground Worker Environmental Safety
 Small Plant Operator Energy Analyst
 Scaffolder Physicists Catering Staff Estimator
 Joiner Welder Concrete Operative
 Industrial Safety Soil Contamination
 Clerical Worker Maintenance technician
 Plant operator Carpenter Plant Manger
 Architect Heating and Ventilation Engineer
 Quantity Surveyor Engineering Operative
 Logistics support

Once the power station is operational:

Document technician
 Communications Procurement & Supply Chain Training
 Apprentice Graduates
 Fuel Management Radiation Protection Technicians
 Nuclear Safety Engineers
 Org Learning Security Operational Crafts
 Junior Chemistry Engineer Finance Quality Assurance
 HR Operational Engineers
 Engineering/Technical Roles
 Information Management (including Com's & IT)
 Project Management
 Radiation Protection Engineers Nuclear Safety

Choose one or more of the following careers activities to run with students.



1. Meet Caitlin...

Find out what it's like to work at HPC with this [day in the life film](#) of Caitlin, a quantity surveyor apprentice on the project. Then answer this question:

Q. Give three benefits of being an apprentice at EDF.

A. _____

2. Myths about apprenticeships

Watch [this film](#) on five myths about apprenticeships and list the five myths below (give an explanation for each).

1. _____

2. _____

3. _____

4. _____

5. _____

We've Got the Power!
quick activity **KS4**

3. Jobs of the future

Research three jobs in the low-carbon energy industry. (Clue: take a look at sites like the **National Careers Service**, **Start profile**, **EDF's careers pages** and associations like **RenewableUK**). For each, explain what the job involves, what skills you require and the pathway into them.

Did you know... By helping to build or operate a new nuclear power station, you could be part of our low-carbon future? Find out more about the variety of jobs available at HPC on **Start Profile**.

Useful links

Causes of climate change: <https://www.metoffice.gov.uk/weather/climate-change/causes-of-climate-change>

BBC Bitesize GCSE: <https://www.bbc.co.uk/bitesize/levels/z98jmp3>

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

Starting your career in nuclear power: https://careers.edfenergy.com/content/Early-Careers-at-EDF-Energy/?locale=en_GB

Learn more about HPC with these activities: <https://guest.startprofile.com/employer/19335/activities>

Test your powers of deduction in this assessment centre-style activity: https://www.edfenergy.com/sites/default/files/elimination_resource_pack_combined.pdf

When you're 16, you can sign up for Young HPC to find out about job opportunities at HPC: https://www.youtube.com/watch?v=REbCT7Sw4Ys&list=PLXelrBe86r_JrPpHZDwmkg8lgAGa_fF4s&index=58

Discover what happens inside a nuclear reaction in this film: https://www.youtube.com/watch?v=3iQBMyGmg-8&list=PLXelrBe86r_K1Czba0ZOnMbkGChwu7pYb&index=7&t=0s

Find out about early careers at EDF: https://careers.edfenergy.com/content/Early-Careers-at-EDF-Energy/?locale=en_GB

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