

Who's got the Power?

You'll be blown away!



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Who's got the Power? (WGTP) guide notes

Curriculum for Excellence links:

Science > Planet Earth > Energy sources and sustainability

Third Level: By investigating renewable energy sources and taking part in practical activities to harness them, I can discuss their benefits and potential problems.

Literacy and English > Listening and Talking > Tools for listening and talking

Third Level: When I engage with others, I can make a relevant contribution, encourage others to contribute and acknowledge that they have the right to hold a different opinion.

I can respond in ways appropriate to my role and use contributions to reflect on, clarify or adapt thinking.

Literacy and English > Reading > Understanding, analysing and evaluating

Third Level: To help me develop an informed view, I am exploring the techniques used to influence my opinion. I can recognise persuasion and assess the reliability of information and credibility and value of my sources.

Technology > Technological developments in society

Third Level: From my studies of sustainable development, I can reflect on the implications and ethical issues arising from technological developments for individuals and societies

Who's got the Power?

is a dialogue activity that builds on students' prior knowledge of renewable energy. Three renewables are discussed: hydro, wind and tidal. It is possible to run this activity with little knowledge of renewables, though some background reading is strongly advised. Use the fact sheets and video links provided to get started and learn how the renewable works. An Internet connection that can access You Tube is required to view the videos.

Materials required

- Viewpoint cards (cut out)
- Fact and opinions cards (cut out)
- Newspaper article (one per group)
- Two different coloured highlighters (each group)
- Notice/display boards (optional)
- Island information
- Guide notes
- Internet connection (optional)

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Getting Started

- Start with a statement that forces the students to take a stance: 'We could live without electricity.' Place a Strongly Agree and Strongly Disagree sign at opposite ends of a wall and ask pupils to stand on the line in a continuum according to how they feel about the statement e.g. If they slightly agree then they would not be right at the end of the line but slightly towards the centre. Students will be given one minute for this part.
- Discuss with students their stance using techniques such as devil's advocate. Students may say something like 'How would we keep warm or light the house?' Challenge them by asking 'People managed to do that before electricity was discovered. How did they do it then?' This part should take around five minutes but can be extended if chat is flowing well.
TOP TIP: If you are unsure about having large groups all standing in a line, you can split into groups. Groups can reach a consensus with one representative standing and others feeding comments from the floor.
- The whole group should be split into three groups. Each group will discuss one of the three renewable energies: hydro, wind or tidal. WGTP works best with groups of no more than five but should have at least two in them.

The Island

- Introduce the island, discussing the role the class are going to play in the activity and how they are going to make a decision. Assign each group one of the three renewables to discuss: hydro, wind or tidal.

The Newspaper

- Ask the group to define fact and opinion. If there is access to a dictionary you could read out the definitions to clarify.
- Give out the newspaper articles. Groups should extract fact and opinion from the news article on solar power. Although solar power is not an option for the island it gets the pupils prepared for the next section which is organising the facts and opinions of their renewable. Facts should be highlighted in one colour and opinions in another.

Fact or Opinion Cards

- Give out six cards to each group relating to their renewable energy. Groups will sort them into fact or opinion. Although prior knowledge of the renewable may be limited, groups can make a judgement call on whether they think something is fact or opinion. There may be facts they have not heard before but it 'sounds' like a fact. The main aim is to elicit discussion and critically analyse the information. If available, the Internet can be used to help groups identify facts.
- One person should read out a card each within the group and collectively decide if it is a fact or opinion.

Approx. 15 minutes for this section depending on the rate of discussion.



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Viewpoint Cards

- Give out six viewpoint cards to each group related to their renewable energy (marked hydro wind and tidal)
- Each Group should work together to decide if they think the person is for or against the renewable. Students should be prepared to share why they have made these decisions. Cards should be put in a continuum according to viewpoints that are strongly for and strongly against.
- Group can use the blank sixth card to think of an islander that might have a particular viewpoint on the renewable and why. This allows the students to think of other implications that haven't already been discussed on the cards.

Students have 15 minutes or less for this section depending on the rate of discussion.

Discussion

Each group will discuss with the other groups the cards they have sorted relating to their renewable. Students should be encouraged to read out the fact and opinions cards giving reasons why they put them where they are. If time, discuss with the class the positives and negatives of a given fact.

Viewpoints should be discussed next. Students should be asked what they think of the views and how important they think the issue is to them. e.g. are they concerned about the impact on wildlife. Would it make them more or less likely to want that renewable on the island?

This section should last around 20 minutes.

Vote

After hearing the information on all three renewables, students should be given one minute to decide which renewable would be the best for the island. Students should vote individually and not as a group. A ballot box could be used.

Discuss (time dependant) with the students why they have chosen a particular renewable, again using techniques such as devil's advocate. This should lead the students to the conclusion that one renewable would not be enough and there would have to be mix of renewables as they all have their pros and cons.



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HYDRO Power Fact Sheet

Hydroelectric plants generate electricity from water using technology that has been in existence for a long time. Usually, a dam is built across a river to create a reservoir. The water from the reservoir is then pumped swiftly through turbines to produce the electricity. Although hydro power generation has moved on significantly, it has been used in the past for things such as milling. These days it is mostly used for the generation of electricity using dams and reservoirs. 85% of the UK's hydroelectric power comes from Scotland.

Advantages

- Hydro power is very reliable. The water to power the turbines can be stored in a nearby reservoir, constantly topped up by rainfall. As this technology has been around for such a long time, its reliability and efficiency have been decisively proven.
- A hydro plant can provide a constant supply of electricity; so long as there is water in the reservoir, the plant can generate electricity.
- Hydro plants can start generating electricity very quickly. At Cruachan Power Station in Argyll, for example, the turbines can go from not producing electricity to generating at full capacity in 30 seconds.

Disadvantages

- Building a dam and flooding a large area can endanger local wildlife and biodiversity.
- The water flowing downstream from the hydro plant can cause erosion of the river bed and have a negative impact on flora and fauna.
- It irreversibly alters the landscape and could be an aesthetic problem for local residents.

Video link

http://www.youtube.com/watch?v=XssiuK_OjfQ



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WIND Power Fact Sheet

Generating electricity through wind power is achieved through the use of turbines. The turbines can range in size and the blade sizes can be above 45 metres in length. A wind turbine works exactly like the opposite of a fan. Instead of using electricity to generate wind, the turbines use wind to generate electricity. The turbine blades are attached to a section called the nacelle. Inside the nacelle is the gearbox and generator. As the blades turn the generator is able to convert the kinetic or 'movement' energy into electrical energy.

Advantages

- Scotland, especially on the west coast, has lots of wind that can be exploited.
- 'Payback' is quick in terms of energy used to manufacture and install.
- Wind turbines have little impact on biodiversity.
- It is claimed that Scotland is the windiest country in Europe.

Disadvantages

- The wind does not always blow, meaning that there are times when the turbines are not generating any electricity.
- Large windfarms have a big impact visually on a landscape, which can be seen as a negative for some.
- Roads may have to be built or widened in order to transport the turbines to their destination, which might affect local farming and towns.

Video link

http://www.youtube.com/watch?v=0Kx3qj_oRCc



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TIDAL Power Fact Sheet

Generating electricity from the tide is achieved through the use of the underwater turbines which rotate as the tide passes through them. The UK has an excellent tidal stream resource, although there is currently only one tidal power project in development. If exploited to the fullest, tidal energy could provide 10% of the UK's electricity. The Forum for Renewable Energy Development in Scotland estimates that 1300MW of tidal and wave energy capacity could be installed in Scotland by 2020.

Advantages

- The tide is completely predictable. There are two tides every 24 hours, meaning that the energy levels can be predicted.
- Tidal turbines are not expensive to build and maintain. The turbines can be mostly obscured underwater, meaning little visual impact.
- The UK has some of the highest tidal ranges in the world which makes it a good location for tidal power.

Disadvantages

- Bird life on the estuary where the turbines would sit would be affected as they rely on the tide to uncover mud flats in order to feed.
- It is only possible to generate power for 10 hours per day as the tide comes in or out.
- The tidal technologies could interfere with shipping routes and access to ports. This could be damaging to the industry on the island that rely on the ports for importing and exporting.

Video link

<http://www.youtube.com/watch?v=qRUI1mJQHmc>

Strongly Agree



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Strongly Disagree



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SOLAR POWER ON THE RISE



Once thought to be pointless in Scotland, more and more are turning to solar power

The Scottish Government is hoping Scotland will be producing 100% of its energy by the year 2020. This renewable energy will come mostly from wind, hydro and tidal power. Solar power is rarely mentioned as an option that is suitable for Scotland, with most of us arriving at the conclusion that without a good climate, solar panels are pointless.

However, this way of thinking is changing as many people are reaping the benefits of solar panels on their homes and businesses.

Government schemes mean that homeowners can make around £1000 per year by installing solar panels.

The Scottish Gas headquarters in Edinburgh installed 650 solar panels on its roof in 2011 in a bid to reduce energy costs on the building.

It may seem that you would need a blazing hot sunny day to benefit from solar power but this is not the case. Managing Director of Scottish Gas, Kevin Roxburgh commented: "It's not about sunlight it's about

daylight. The key thing is if there's daylight we will generate energy from the sun."

There may still need to be some convincing of homeowners to install solar panels with around 60% believing it is too expensive. Homeowner John McNeil looked into installing solar panels in his own home, "They are simply too expensive. I am told that they will pay for themselves after about 10 years. That's an awful long time wait."

By Kate Tensley



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Isle of Auchrie

The Isle of Auchrie is asking for your help to decide which renewable energy to install on the island. The power station that supplies the island with power is being closed down. The island sees this as an opportunity to use a renewable energy to power the island. You have to decide which renewable energy is the best for the Isle of Auchrie: hydro, wind or tidal.

Island Background information

The Isle of Auchrie has been occupied for around 8000 years, going through many changes in its inhabitants. From early Iron Age settlers to Viking invaders to the farming and the fishing communities we see today. The island is situated on the west coast of Scotland, about 5 miles from the mainland and has a daily ferry service which allows access to and from the mainland. Whisky is the biggest industry on the island with tourism also providing a source of income. Most of the land is privately owned by individuals who rent out farmland to island's inhabitants.

Main towns: Port Rhuran, Bonmyre

Languages: Gaelic, English

Population: 3753

Biggest industries: Whisky, tourism, fishing

Size: 590km² (approx)

Weather: The weather on Auchrie, like most west coast islands in Scotland is extremely changeable. Strong winds are common and reach gale force regularly. High tides are common, but flooding risk is minimal.

Landforms: The underlying land on the island is mix of volcanic rock and marine sedimentary formed hundreds of millions of years ago. Most of this land is covered in blanket bog, grasslands, woodlands and vegetated sea cliffs. The vegetation provides food for grazing animals which in turn provides an important contribution to the ecosystem of the island. The island's main river is the River Allaidh which is fast flowing and is home to salmon and trout among other species of fish.

HYDRO Fact or Opinion cut out cards



Who's got the power?

HYDRO

Fact or Opinion?

85% of the UK's hydro power comes from Scotland.

Who's got the power?

HYDRO

Fact or Opinion?

Around 20% of the world's electricity comes from hydro power.

Who's got the power?

HYDRO

Fact or Opinion?

Building a hydro dam can flood some of the land around it.

Who's got the power?

HYDRO

Fact or Opinion?

I believe hydro dams damage wildlife and ruin fish stock.

Who's got the power?

HYDRO

Fact or Opinion?

There are better ways to reduce carbon emissions than using hydro power.

Who's got the power?

HYDRO

Fact or Opinion?

Hydro is better than wind or tidal as it has been tried and tested.

FACT

OPINION



WIND Fact or Opinion cut out cards



Who's got the power?

WIND

Fact or Opinion?

On 6th September 2010, windfarms provided around 10% of the UK's energy.

Who's got the power?

WIND

Fact or Opinion?

Roads are sometimes widened to transport wind turbines.

Who's got the power?

WIND

Fact or Opinion?

A 2.3 Megawatt (MW) turbine can power a PC for 2250 years.

Who's got the power?

WIND

Fact or Opinion?

Wind turbines are not noisy.

Who's got the power?

WIND

Fact or Opinion?

The wind turbines are damaging to the countryside.

Who's got the power?

WIND

Fact or Opinion?

We can't rely on wind turbines are because the wind does not always blow.

FACT

OPINION



TIDAL Fact or Opinion cut out cards



Who's got the power?

TIDAL

Fact or Opinion?

Tidal power is a new technology.

Who's got the power?

TIDAL

Fact or Opinion?

Scotland could power 500,000 homes with tidal, wave and hydro power.

Who's got the power?

TIDAL

Fact or Opinion?

There are two tides per day in most places.

Who's got the power?

TIDAL

Fact or Opinion?

We would be gambling with tidal, as it is an unproven technology.

Who's got the power?

TIDAL

Fact or Opinion?

I don't think tidal turbines are an environmental threat to wildlife.

Who's got the power?

TIDAL

Fact or Opinion?

Tidal turbines won't make electricity bills any cheaper.

FACT

OPINION



HYDRO Viewpoint Cards



Who's got the power?

HYDRO

For or Against?

I have been fishing in the river for 15 years. If the hydro dam is built here, the amount of fish in the river is going to drop, which will damage my way of life.

Barney Greenway,
FISHERMAN



Who's got the power?

HYDRO

For or Against?

My house sits on the land next to the river, where the dam would be built. I have been offered money to move but I have not made my mind up yet.

Dave Murray,
HOME OWNER



Who's got the power?

HYDRO

For or Against?

The river has provided me with plenty of business from fishermen who use my pub for lunch. If the fishermen go elsewhere because of the dam, my business will suffer.

Bill Steer,
PUB LANDLORD



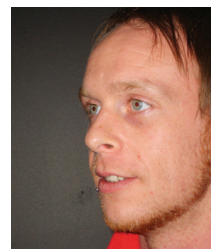
Who's got the power?

HYDRO

For or Against?

Hydro power is a proven technology and has been used in Scotland for decades. With fossil fuels running out we need to use renewables such as hydro to secure our future energy.

Neil Peart, MSP



Who's got the power?

HYDRO

For or Against?

We are concerned about the effect the hydro dam would have on the wildlife in the area. We believe that more research is needed to find out more about what the hydro dam could do to the environment.

Rico Santini,
ENVIRONMENTAL OFFICER



Who's got the power?

HYDRO

For or Against?

continue on back if needed

STRONGLY FOR

STRONGLY AGAINST



WIND Viewpoint Cards



Who's got the power?

WIND

For or Against?

We don't really have a choice here; we need electricity. I have allowed some of my land to be used for the windfarm.

**Alex Lifeson,
FARMER**



Who's got the power?

WIND

For or Against?

The building of a windfarm on Auchrie will secure my job. I feel that the creation of jobs is important because there are not too many around these days.

**Rachel Nash,
TURBINE ENGINEER**



Who's got the power?

WIND

For or Against?

The area where the windfarm will be built is my favourite place to walk. One of the reasons it is my favourite place to walk is the view. The turbines are going to spoil this view.

Les West, WALKER



Who's got the power?

WIND

For or Against?

I have visited Auchrie since I was a child. I am told that wind turbines are huge! I have heard that there would be more paths made available on the hillside for walking if the windfarm is built.

Glenn Doyle, TOURIST



Who's got the power?

WIND

For or Against?

The village has looked almost the same for two hundred years. The turbines, which will be visible from the village, will look out of place.

**Vanessa Warwick,
VILLAGE RESIDENT**



Who's got the power?

WIND

For or Against?

continue on back if needed

STRONGLY FOR

STRONGLY AGAINST



TIDAL Viewpoint Cards



Who's got the power?

TIDAL

For or Against?

The estuary on the island is one of my favourite places to go bird watching. I am really worried that the tidal turbines could spoil this magnificent bird area.

Kirsteen Lithgow,
BIRD WATCHER



Who's got the power?

TIDAL

For or Against?

The RSPB favours a broad mix of renewables, including solar, wind, and marine power, wherever they are used in ways that minimise unnecessary damage to wildlife and the natural environment.

Royal Society for the Protection of Birds (RSPB)



Who's got the power?

TIDAL

For or Against?

Last summer I spent a lot of money on a brand new yacht. Yachting is my main passion. Will the tidal turbines restrict where I can sail?

Lou Koller,
YACHTER



Who's got the power?

TIDAL

For or Against?

The tourist industry supports renewable energy on the island. It is important however, that everyone on the island has a voice and there is little negative impact on the island.

Kathleen Emery,
OFFICER FOR TOURISM



Who's got the power?

TIDAL

For or Against?

If the tidal turbines are put in the estuary, how are boats and ships supposed to sail into the harbour? A lot of my business comes from these boats and ships.

Thomas Araya,
HOTEL OWNER



Who's got the power?

TIDAL

For or Against?

continue on back if needed

STRONGLY FOR

STRONGLY AGAINST



HYDRO Fact or Opinion Answers

85% of the UK's hydro power comes from Scotland - **FACT**

Around 20% of the world's electricity comes from hydro power - **FACT**

Building a hydro dam can flood some of the land around it - **FACT**

NOTE: When a river is dammed it raises the water level. Water can spread to the peripheral land around the river.

I believe hydro dams damage wildlife and ruin fish stock - **OPINION**

NOTE: there is a case for this in some dams in the US where depleted fish stock and sediment in the rivers were issues. In the case of the dam on the island there would need to be evidence to back up the claim.

There are better ways to reduce carbon emissions than using hydro power - **OPINION** Hydro is better than wind or tidal as it has been tried and tested - **OPINION**

WIND Fact or Opinion Answers

On 6th September 2010, windfarms provided around 10% of the UK's energy - **FACT**

NOTE: information regarding this can be found on Renewable UK website: www.renewableuk.co.uk

Roads are sometimes widened to transport wind turbines - **FACT**

NOTE: this is often the case as the blades can be in excess of 45 meters meaning very large vehicles have to be used for transport.

A 2.3 Megawatt (MW) turbine can power a PC for 2250 years - **FACT**

Wind turbines are not noisy - **OPINION**

NOTE: Noise is subjective which is why this is an opinion.

The wind turbines are damaging to the countryside - **OPINION**

We can't rely on wind turbines are because the wind does not always blow - **OPINION**

NOTE: this is a discussion point. There is part of the statement that is fact: '...wind does not always blow.' What makes it an opinion is the subjectiveness of what is reliable.

TIDAL Fact or Opinion Answers

Tidal power is a new technology - **FACT**

NOTE: the world's first tidal array is to be installed off West Coast of Scotland.

Scotland could power 500,000 homes with tidal, wave and hydro power - **FACT**

There are two tides per day in most places - **FACT**

NOTE: the benefit of knowing this means we can predict when electricity will be generated.

We would be gambling with tidal, as it is an unproven technology - **OPINION**

I don't think tidal turbines are an environmental threat to wildlife - **OPINION**

Tidal turbines won't make electricity bills any cheaper - **OPINION**

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