Workshop Title: Scotland’s environment

Overview: Examples of different types of renewable energy and where they need to be sited. Includes why Scotland has more Hydro than England. Efficiency is important when it comes to getting as much electricity from a renewable source as possible. Pupils will test different water turbines and identify sources of losses.

Length: 50 minutes

Slide 1: Introduction

Slide 2: Landscape

* Scotland’s landscape has been formed through many different processes over billions of years.
* The processes include volcanic activity, the movement and collision of landmasses, and ice and water moving across the surface.
* There are several distinct areas in Scotland:

Slide 3: Southern Uplands

* The Southern Uplands is a gentle, rolling landscape. The undulations were created by ice, wind and water.

Slide 4: Midland valley

* The Midland valley takes in central Scotland between the Southern Uplands and the Highlands. The name is mis-leading as it isn’t just one valley and there are many different features. The most distinct features (for example, the rocks on which Edinburgh and Stirling castles stand) were created by volcanic activity.

Slide 5: the Highlands

* The Highlands is very different to the southern areas in that there is a combination of high mountains, valleys and lochs. The type of rock the mountains are made from differs from east to west, but the features were generally a result of the movement of ice.
* There are several different kinds of renewable energy types and each technology needs certain conditions to work.

Slide 6: Solar Power

* More and more we are using energy from the sun to generate electricity.
* We use solar panels to do this.
* In Scotland solar panels can be found on the roofs of homes and businesses. We don’t have the large flat spaces available to host a solar farm.
* The Sun rises in the east and sets in the west, so we face our panels south towards the path of the Sun.
* The height of the Sun in the sky changes across the year and we tilt the solar panels to gather as much sunlight as possible.

Slide 7: Hydro Power

* Hydroelectric power stations allow us to generate electricity using flowing water.
* A standard hydro power station requires two reservoirs (or lochs) at different heights.
* A dam is installed in the higher loch with the turbines used to generate electricity sitting at the bottom.
* The flow of water is controlled by the dam and ends up in the bottom loch.
* There are over 75 hydroelectric power stations in Scotland, 7 in Wales and only 20-30 small-scale sites in England.
* The output of the combined sites in England is only 0.7 per cent of the total potential output in Scotland.
* The reason that the amount of electricity generated in Scotland from hydro is so much greater than England is due to our geography.
* We naturally have many lochs (mainly in the Highlands) that have the height differences we need and the space around them to build the infrastructure and access required.

Slide 8: Wind Power

* We are seeing more and more wind farms across Scotland.
* Blades sit on top of a tower connected to a generator.
* In order for the blades to turn, the wind speed needs to be high enough.
* Wind speed increases as you go higher in the atmosphere, so wind turbines and wind farms are often placed on a hill.
* The blades themselves are often on towers over 100m high.
* Scotland has an average wind speed of 6-7 metres per second. This is high enough for wind turbines to work.

Slide 9: Wind farms

* We have large open spaces on hills in order to site numerous turbines.
* However, these wind farms often affect the look of an area and can be controversial.
* More and more wind farms are now being sited off-shore around the coast of Scotland where the wind speed is still high.

Slide 10: Task

* You will be split into 5 teams of 4.
* Here are some example turbines.
* When built, measure the electricity generated and report that value to me.
* Each turbine and the amount it generates will then be displayed.
* You need to design blades and attach them directly to the black disc.
* Here are some example blades.

Slide 11: Results

* Ask pupils to explain their approach and differences in results