Workshop Title: Innovation in Scotland

Overview: Scotland leads the world in researching and developing renewable energy sources. Achievements to be highlighted along with examples. Excepting solar power, all types of renewable energy generation move a magnet within a coil of wire. Pupils will build their own simple electrical generator.

Length: 50 minutes

Slide 1: Introduction

* Scotland has a long history of innovators who come up with solutions that impact on the way we live.
* We lead the world in researching and developing renewable energy sources.
* In this session you will learn about some of these areas.
* Excepting solar power, all types of renewable energy generation move a magnet near coils of wire to generate electricity.
* You will learn exactly how this works when you use your own generator in this session.

Slide 2: Wind

* The first electricity generating wind turbine was invented and installed by Scottish Engineer James Blyth in 1887.
* At that time wind turbines were seen as too expensive to build.
* He built his turbine next to his house in Marykirk.
* Blyth’s design included using canvas sails.
* It produced enough electricity for ten 25 volt bulbs.
* He was an early pioneer in the use of wind to generate electricity but he had an interest in generally using renewable energy sources.
* There are now over 80 wind farms in Scotland making wind power responsible for over 55% of the electricity output from renewable sources.

Slide 3: Hydro:

* The first major Hydro Power schemes were introduced in the 1940s.
* At this time only around 40% of households had electricity connections.
* By using Hydro Power, this was to provide electricity to remote locations by using local, renewable sources.
* By the 1960s, when all major Hydro Power developments were complete, over 90% of households were connected to the National Grid.
* This greatly impacted on life in remote locations.
* This was made possible because the development of the power stations and the technology was backed by the Government.
* Many are still in use today, but their turbine technology has been upgraded.

Slide 4: Generating Electricity

* The method of generating electricity at the heart of several types of renewable energy technology is the same.
* Wind, wave, tidal and hydro are all trying to move a magnet near a coil of wire.
* They just achieve the movement in different ways.
* Your challenge is to take on the role of an electrical engineer to investigate the amount of electricity you get when you move a magnet near a coil of wire.

Challenge:

* Looking at the magnets and coiled wire, draw or write down the different ways you can move the magnets near the coil to generate electricity.
* Get the class to report back on the different ways you can move the magnets and agree on 4 or 5 to test. Everyone should test the same ones as we want to be able to compare their results at the end.
* Now try one way of moving the magnets and record the maximum output registered on your multi-meter. Set it to 20m A at 3 o’clock on the dial.
* Try moving the magnet a different speed, does this make a difference?
* Ask the class to report back on what difference the speed makes. They will find that a faster speed gives a higher reading.
* Ask the class to agree on a speed to take their readings. If they don’t agree on a speed then they can’t compare their findings.
* Each group should try each way of moving the magnet and write down their results.
* Collect the data in a table at the end of the class and compare the results. An example table is below.
* You should see that the coils with the most turns produce the highest reading.

Slide 5: Results

* Ask pupils to describe the movement and number of magnets that gave them the largest output.
* Record the largest output of each group as you go around the class.
* Different groups will have coils of wire with different numbers of turns. The more turns, the higher the output. As you collect the data from the groups, also ask them about their coil.
* Pupils should find that the output is greatest when they have a large number of coils and magnets.