



Renewable Energy factsheet

What is renewable energy?

Renewable energy comes from energy resources like the sun, water and wind and will never run out. Renewable energy is clean and doesn't produce harmful greenhouse gases.

The main sources are...

- Sun – solar energy
- Wind – wind energy
- Water – hydropower, wave and tidal energy
- Biomass – energy from wood, waste and energy crops
- Geothermal – energy from heat below the surface of the earth

Advantages	Disadvantages
<ul style="list-style-type: none">• Will never run out• Does not produce dangerous chemicals and harmful greenhouse gasses• Does not cause climate change• Reduces our dependence on fossil fuels• Renewable energy resources can be found in every country	<ul style="list-style-type: none">• The technology is still being developed• Not yet available to everyone• Usually more expensive than fossil fuels• Initial costs high

Did you know?

6%

The percentage of Irish energy that comes from renewable resources

18%

The percentage of Irish electricity that comes from renewable resources

Energy in the home...

$\frac{2}{3}$

Energy use is responsible for two-thirds of Ireland's greenhouse gas emissions

$\frac{1}{4}$

Irish homes use around a quarter of all energy used in the country – that's even more than industry

40%

The average home consumes almost 40% more electricity than it did in 1990

80%

We can use renewable energy in our homes for heating and hot water, which account for over 80% of the energy a household uses



Ireland's Renewable Energy Targets

Although we have a large amount of available renewable energy resources, at the moment we are only using a small amount. But this is changing. You may have already begun to see wind farms around the country and solar panels on rooftops.

Ireland, along with many other countries, has agreed to international laws (such as the Kyoto Protocol and the EU 2009 Renewable Energy Directive) which promise to lower greenhouse gas emissions and energy use.

Ireland must reach these targets by 2020:

- to lower greenhouse gas emissions by 20%
- to lower energy use in homes by 20%
- that 20% of our total energy – heat, transport and electricity – will come from renewable energy



Renewable Energy factsheet: Wind energy

Wind energy is energy in moving currents of air

Since Ancient Times, people have used the energy from the wind to travel (sailing) and power machines (windmills to grind grain). Today, we have much larger machines called wind turbines, which use the power of the wind to make electricity. Wind turbines are usually found in groups called wind farms. Wind farms can be built on the land (onshore) and also at sea (offshore).

Advantages	Disadvantages
<ul style="list-style-type: none">• Renewable, will never run out• Causes no pollution• Available all over the world• Will work in remote places• Wind farms take up less space compared to a standard power station• Electricity made from wind costs the same as electricity made from burning fossil fuels	<ul style="list-style-type: none">• Wind farms can be noisy• Some people think that wind farms spoil the beauty of natural landscapes• Needs constant wind to work• Won't work when there is too little or too much wind• Wind farms need a lot of land

Wind energy facts

How long have people in Ireland been using wind energy?

The earliest windmill in Ireland dates from 1281 (Kilscanlon, Co. Wexford) and was used to grind grain

Where was the first wind farm in Ireland?

The first wind farm in Ireland was built in 1992 in Bellacorick, Co. Mayo

Where is the largest wind farm in Ireland?

Meentycat wind farm in Co. Donegal

How many wind farms are there in Ireland?

179

How big is a wind turbine?

They come in many different sizes, but are typically between 60-120m in height.

How strong does the wind have to blow for the wind turbines to work?

Approx. Beaufort Force 3
(3-5 metres per second)

Where is the best place in Ireland for wind farms?

The best places for wind farms are in wild and windy places like the mountains, the coast and in the open sea

Did you know?

13%

The percentage of Irish electricity that comes from wind energy

650

The number of homes one large wind turbine could provide electricity for

50%

The percentage of Ireland's electricity that came from wind energy on a particularly windy day in April 2010... this is a world record!

How do they work?

- The rotor blades on top of tall towers are angled so they turn when the wind blows.
- The blades turn a shaft inside, which is connected to a generator.
- Inside the generator, coils of wires are wrapped around really powerful magnets. This generates electricity which flows into power cables.
- The blades of the wind turbine can turn to face the direction of the wind, so they can catch the strongest winds.



Interesting

A company in the USA called WhalePower has designed blades for wind turbines that copy the shape of the flipper of a humpback whale. Why? Well, they realised that these huge whales are able to turn really tight circles when catching food. And by copying the shape of their flippers, WhalePower wind turbine blades are able to work 40% better than traditional blades, and are also quieter!



Renewable Energy factsheet: Ocean energy

Ocean energy is energy from waves and tides

Being an island has its advantages. Ireland is fortunate to be surrounded by the Irish Sea and the Atlantic Ocean. We can harness the energy in these ocean waters by using the movement of the tides and waves to generate electricity.

Advantages		Disadvantages	
<ul style="list-style-type: none"> • Renewable, will never run out • Clean, causes no pollution, chemicals or greenhouse gases 		<ul style="list-style-type: none"> • Technology is still being developed and tested 	
Tidal energy		Tidal energy	
<ul style="list-style-type: none"> • Tides are very reliable and do not depend on weather • There is a lot of tidal energy around Ireland that could be harnessed 		<ul style="list-style-type: none"> • Can have a big effect on wildlife • Can disrupt shipping • Energy only made for about 10 hours per day 	
Wave energy		Wave energy	
<ul style="list-style-type: none"> • Ireland has lots of coastline and powerful waves from the Atlantic Ocean • Machines are low-lying and do not spoil the beauty of natural landscapes • The space needed (foot print) for a wave energy farm is much less than required for wind turbines 		<ul style="list-style-type: none"> • Can be unpredictable and depends on weather • Can be noisy • Storms, rust, seaweed and barnacles can damage the machines 	

Ocean energy facts

How much of Ireland's electricity comes from wave and tidal energy?

None at the moment. But the technologies being developed have huge potential. It has been estimated that Ireland has enough wave energy off the West coast to provide 75% of our electricity needs!

Which areas in Ireland are the best for producing wave energy?

Areas along the Atlantic Ocean, where the waves are biggest

Where is the world's first tidal power station?

In Northern France, in the Rance estuary. It is the second largest tidal power station in the world

Examples of ocean energy

Wave energy

Wave energy is energy from the up and down motion of waves, which are caused by the wind blowing across the sea. Wave machines are used to capture the energy from waves and turn it into electricity.

Wave energy depends on daily weather conditions – sometimes waves can be large and powerful, and have lots of energy, but in calm weather there could be no waves at all!

Tidal energy

Tidal energy is energy from the horizontal motion of tidal currents in the sea, caused by the pull of the moon. All around Ireland's coast, the tide flows in and out twice per day, making this source of energy reliable.

Tidal energy is very powerful, and can be harnessed by building tidal barrages across estuaries. These work like dams to capture the energy of moving water and turn it into electricity.



Interesting!

Ocean energy technology is new, and still being tested and developed. Ireland is one of the world leaders in researching this energy source. Supported by SEAI, Ireland has developed a world class test site for wave energy machines off the coast of Belmullet, Co. Mayo called the Atlantic Marine Energy Test Site (AMETS). Here the performance of these machines in generating electricity and their strength against storms can be tested out in the open ocean, in real-life conditions.



Renewable Energy factsheet: Hydro energy

Hydro energy is energy from flowing water

The energy in flowing water, called hydropower, has been an important source of power in Ireland for centuries. Rivers and waterfalls have been used to drive waterwheels in mills for grinding flour and corn since early times. Today, we use hydropower to generate electricity, by pushing water turbines. The electricity made from hydropower is called hydroelectricity.

Advantages	Disadvantages
<ul style="list-style-type: none">• Renewable, will never run out• Abundant• Clean, causes no pollution, chemicals or greenhouse gases• Quiet• Energy is cheap to make once the power station has been built• Energy can be stored in reservoirs behind dams, and therefore it's available any time you need it• Reservoirs allow for fishing and sailing	<ul style="list-style-type: none">• Locations for hydro power are limited to suitable places, such as a fast flowing river• Dams flood huge areas upstream, which can affect people and wildlife• Below the dam, water is sometimes piped away from rivers, which can also affect people and wildlife• High initial investment

Did you know?



The percentage of Irish electricity that comes from hydro energy



The year Ireland's largest hydroelectric power station, Ardnacrusha was opened. It is on the river Shannon in Co. Clare.

How does it work?

- A dam is built across a fast-flowing river
- The valley upstream of the dam is sometimes flooded to create a reservoir
- Pipes inside the dam take water to the turbines
- This water is under a lot of pressure, and turns the water turbines
- The turbines turn a generator, which make electricity as they spin
- The water is then usually piped back into the river



Interesting!

Ardnacrusha, a major engineering achievement!

Opened in 1929, Ardnacrusha is the largest hydroelectric power station in Ireland. It took four years and 5,000 people to build. The Electricity Supply Board (ESB) was set up to run this power station, and still does to this day. Ardnacrusha alone can make enough electricity to power a town the size of Ennis in Co. Clare!



Renewable Energy factsheet: Solar energy

Solar energy is energy from the sun

The sun is just one of billions of stars, yet it is the powerhouse of every living thing and of the earth itself! The sun's rays contain energy. We see this energy as light, and feel this energy as heat. Solar energy can be harnessed in many ways to heat your home, provide hot water and generate electricity.

Advantages	Disadvantages
<ul style="list-style-type: none">• Free, will never run out• No water or air pollution• Available all over the world	<ul style="list-style-type: none">• Needs sunlight to work• Not really cost effective at present• Energy storage and back-up are needed

Solar energy facts

How much of Ireland's energy is comes from solar energy?

Less than 1% at the moment, but for the past 10 years solar PV has been the fastest growing renewable technology.

Do solar panels work at night?

No

Can solar panels work on cloudy days?

Yes, but they only create $\frac{1}{3}$ of the power

Where is the World's biggest solar power station?

In the Mojave desert in California

Did you know?

60%

Ireland gets enough sun to use solar panels to provide 60% of the hot water in our homes

2.5%

It is expected that by 2025, around 2.5% of the energy on this planet will be made from solar energy

Types of solar energy in Ireland

Passive solar design

Passive solar design means designing buildings so that they make the best use of the energy from the sun in the form of heat, daylight or wind.

Did you know? Just by designing a house in this way, the heating needs of a single house can be reduced by up to 30% at no extra cost.

Active solar heating

Some solar panels are used to collect heat from the sun. The sun's rays heat cold water flowing through the panels – their black surfaces absorb heat and warm the water. This heat is then pumped to your hot water cylinder.

Did you know? In Ireland, this type of solar panel can provide 60% of a household's hot water needs over a year, and it works even when the sky is overcast or cloudy.

Photovoltaic solar panels

Another type of solar panel, called photovoltaic (PV), is made from special materials like crystalline silicone. These PV solar panels change sunlight energy directly into electricity. You may have seen a small one in items such as solar-powered toys or calculators.

Did you know? In Dublin, parking metres are powered by PV panels.



Interesting!

Gaelscoil An Eiscir Riada, Tullamore, Co.Offaly

This school in Co. Offaly was built with a passive solar design. The building has been positioned to take maximum advantage of early morning sun to pre-heat the building. Windows and sky lights allow natural day light to light the school for 80% of the school day, and rainwater is collected and used for flushing toilets.



Renewable Energy factsheet: Bioenergy

Bioenergy is energy from plant and animal matter (biomass)

Biomass is the oldest fuel used by mankind. People have burnt wood and animal dung for thousands of years to keep warm. Today we can use other sources of biomass to make heat, fuel and electricity. Some examples are recycled wood shavings, straw and animal manure, sewage, methane from decomposing waste at landfill sites, and crops that are specially grown for making biofuel.

Advantages	Disadvantages
<ul style="list-style-type: none">• Renewable energy resource (crops & trees can be replanted)• Can be stored for use when needed• Can use up waste• Available all over the world• Can stop the greenhouse gas, methane, from going into the air	<ul style="list-style-type: none">• The materials that bioenergy is made from (wood, straw etc) is bulky to transport• Burning waste does cause some air pollution• Bioenergy crops are only able to be grown at certain times of the year• Bioenergy crops take land and water away from food crops

Bioenergy facts

How long has wood been used as a fuel for cooking and heating?

Over 500,000 years

Where was the first bioenergy power plant in Ireland?

Grainger Sawmills, Co. Cork, which began in 2004

Does biomass produce the greenhouse gas CO₂?

Yes, but the same amount of CO₂ is absorbed when crops are replanted. In this way, it is said to be carbon neutral

What are biofuels?

Fuels made with oils and sugars from plants. These include biodiesel, bioethanol and biogas

What is biodiesel made from?

Plant oils like cooking oil, palm oil and oilseed rape

What is bioethanol made from?

Petrol mixed with crops such as wheat and sugar beet

What is biogas made from?

Methane from waste such as landfills and sewage

Did you know?

2%

The percentage of Irish electricity that comes from bioenergy

one million

Because of biofuels, there are 1 million fewer barrels of crude oil (a fossil fuel) used per day worldwide

Examples of bioenergy

- Pellets, made from waste wood (shavings and sawdust) and fast growing crops (willow and poplar trees) can be burnt for heat and electricity.
- Straw can be burnt to make electricity.
- Oilseed rape, wheat and sugar beet crops are grown to be used as biofuels such as biodiesel and bioethanol.
- Waste from people (landfills) and plants & animals (compost and manure) gives off methane gas, which can be used to make biogas (a fuel for heat and electricity).



Interesting!

Abbey Vocational School, a post-primary school on the outskirts of Donegal Town, is heated with a wood chip boiler! The wood chips come from waste trees and branches from local forests, which is much more environmentally-friendly than imported wood pellets.