Renewable Energy in the Lake District National Park

New research from the Lake District National Park Authority shows remarkable growth in small-scale renewable energy installations across the Lake District.

The study, carried out in early 2014, estimates how many renewable energy installations there are in the area, what types of technology, how much power is being generated each year, and how much carbon is saved as a result.

An explanation of terms used is provided at the end of this briefing.

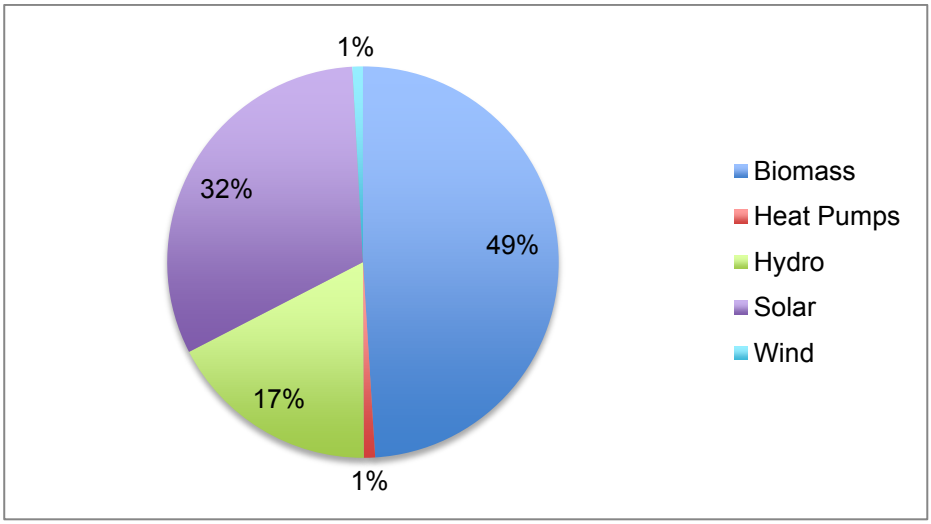
The number, type and output of renewable energy installations

There are an estimated 1162 renewable energy installations altogether in the National Park, including:

- 39 biomass installations, mainly wood fuel used for heating
- 16 heat pumps
- 26 hydro schemes
- 16 wind energy schemes
- An estimated1035 solar photovoltaic (solar PV) schemes

See the 'explanation of terms' at the end of this briefing for a description of each technology.

Although there are many more solar schemes in terms of absolute numbers, they tend to be quite small. Looked at in terms of the amount of heat or electrical power the schemes are capable of generating (called 'capacity' – see explanation below), biomass accounts for nearly half the total, with solar coming second, at 32%.



technology by capacity (% of total)

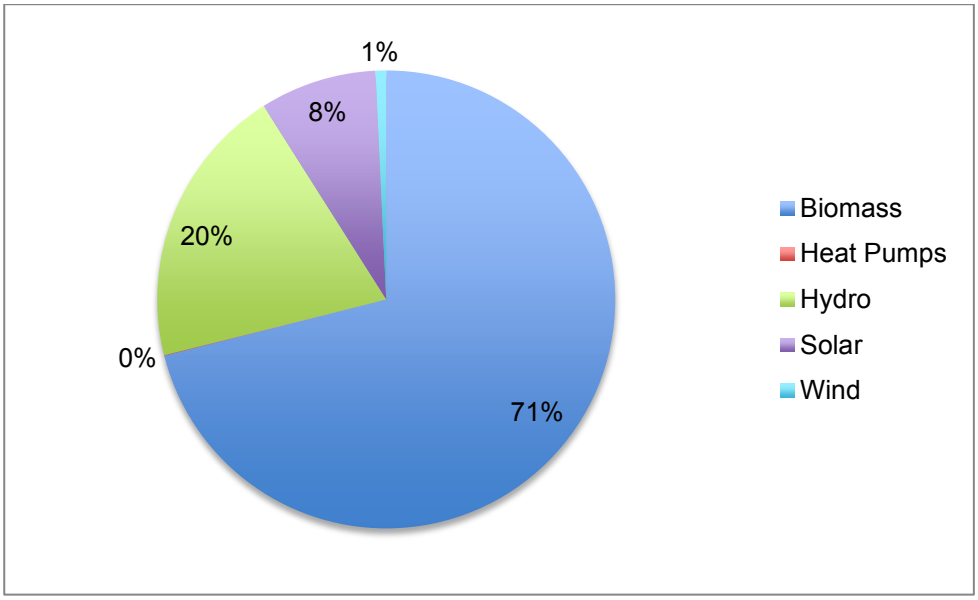
Church Beck hydro scheme, Coniston

Altogether, this capacity adds up to approximately 13MW (megawatts), which is equivalent to 5-7 large wind turbines. Around 36000MWh (megawatt hours) of energy is produced per year, which is enough to heat and power around 2000 average homes, or 8% of households in the Lake District.[i]

Carbon savings from renewable energy

The renewable energy installations in the Lake District National Park lead to an annual carbon saving of around 19000 tonnes of carbon dioxide (CO_2), compared to standard ('grid-average') generation. This is just under 1% of the total carbon footprint of the area.

Over two-thirds of these savings come from biomass heating installations, with significant savings also coming from hydro and solar power.



carbon savings by technology (% of total)

How we will use the results

The findings from this work have been included in our Carbon Budget progress update. They will also be used to inform the work of the Lake District National Park Partnership. More information is available at www.lakedistrict.gov.uk/carbonbudget. Other individuals and organisations are welcome to use the dataset, available on request.

About the study

The study was carried out by Alex Finch, as part of a volunteer research placement at the Lake District National Park Authority.

Data comes from the following sources:

- Information received through planning applications
- The database of installations registering for the Feed-in Tariff, administered by energy regulator Ofgem
- Information from local renewable energy installers

The study provides an estimate only, as the data available is incomplete. The full dataset, including notes on the quality of the data, is available on request.

We would like to thank Alex Finch for his work on this project, together with all those from the Lake District National Park Authority and partner organisations who contributed to the study.

wind turbines in the landscape at Kirkstone Pass
photo: Maxine Prescott

Explanation of terms

Megawatts (MW) and kilowatts (kW)
A megawatt is a measure of electrical power. One megawatt is a thousand kilowatts (kW).

Capacity
The capacity of a renewable electricity installation is measured in megawatts (MW) or kilowatts (kW). The capacity of an installation is the theoretical amount of electricity that it can produce in an hour. For example, a 1MW capacity wind turbine could produce 1MW per hour (1MWh) if running at full capacity. However, no form of electricity or heat generation is 100% efficient. Each type of generation, and each project, will produce a percentage of its capacity, dependent on the 'capacity factor', described below.

Capacity Factor
The capacity factor, also called 'load factor', expressed as a percentage, is the output of a renewable electricity or heat installation relative to its theoretical maximum capacity. For example, a 1MW capacity wind turbine with a capacity factor of 30% would produce 0.3MW per hour (0.3MWh). This takes account of the fact that wind turbines will only generate electricity when the wind is blowing, and will produce less at lower wind speeds. Solar schemes only generate during daylight hours.

Capacity factors vary according to technology type and location. Typical capacity factors, as used in this report, are:

- Biomass: 46.36%
- Hydro: 36.46%
- Solar: 8.38%
- Wind: 27.42%

To calculate the total output of renewable energy installations in the LDNPA, we estimated the total capacity of the installations, and then used average capacity factors to determine output.

Renewable energy technologies
The technologies mentioned in this briefing are:

- **Biomass**: heat or electricity produced by burning animal or vegetable matter. The most common type of biomass installation in the Lake District is wood-fuelled boilers for heating and hot water.
- **Heat pumps:** A heat pump extracts heat from a natural source (the ground, air or water) and concentrates it to obtain a higher temperature, which can then be used for heating or hot water. It uses similar technology to refrigeration. The pump is powered by electricity, but the amount of heat energy delivered is several times more than the electrical energy consumed.
- **Hydro:** hydro power is produced by capturing the energy of water flowing through a turbine connected to an electricity generator.
- **Solar:** solar photovoltaic (solar PV) systems convert the sun's energy into electricity. Solar PV panels can be mounted on a roof or on the ground. Solar thermal systems collect heat from the sun and use it to heat water.
- **Wind:** wind turbines convert wind energy into electrical power. They vary in size from very small – a few kilowatts – to 3MW or larger for offshore turbines.

More information on these technologies can be found on the Renewable Energy Association website, www.rea.org.uk

Carbon footprint
The 'carbon footprint' of the Lake District National Park is defined as the total emissions of carbon dioxide and other greenhouse gases that the area is responsible for. The carbon footprint of the LDNP was estimated in 2010 to be 2.3 million tonnes.

Carbon budget
The Lake District is one of the first local areas to set itself a carbon budget, as part of our Low-carbon Lake District initiative. The principle behind a carbon budget is simple: like a financial budget, we aim to find out how much carbon the Lake District is responsible for, and then reduce the carbon 'spend' year on year.

We aim to reduce the emission of carbon and other greenhouse gases, measured on a consumption basis, by 1% per year, against a baseline carbon footprint of 2.3 million tonnes in 2010. The target tracks the national carbon budget, as set out in the 2008 Climate Change Act.

Each year, progress against this target is estimated. The information on renewable energy feeds into this estimate. For more information, see www.lakedistrict.gov.uk/carbonbudget .

[i] There are 23893 households in the National Park. According to Ofgem data, the average UK household uses 16,500kWh gas and 3300kWh electricity, or 19,800kWh per year (19.8MWh). https://www.ofgem.gov.uk/ofgem-publications/64026/domestic-energy-consump-fig-fs.pdf

Heat pump capacity factors are particularly variable, and are therefore excluded from the 36,000 Megawatt hours figure.