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Domestic wind turbines could 'power 800,000 UK homes'

Small-scale turbines could supply 3.1% of the UK's energy demand from homes, according to the Energy Saving Trust

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Small domestic wind turbines could provide enough clean electricity to power more than 800,000 UK homes, according to the Energy Saving Trust (EST). Previous studies have suggested that small turbines in residential areas fail to generate enough power to justify their installation.

While the new work still suggests houses in dense urban areas are poor sites, it identifies 450,000 suitable domestic locations across the nation. There are currently just 2,000 such turbines. The research, which provides the most accurate picture of wind speeds in the UK yet, is available to the public via (est.org.uk) where householders can enter their postcode.

In total, small-scale wind in domestic properties could supply around 3.1% of the UK's energy demand from homes.

The UK is committed to cutting its carbon emissions by 80% by 2050, compared to 1990 levels. In the shorter term, the country has to source 15% of its energy from renewable sources by 2020. Energy use in homes is responsible for around a quarter of the UK's carbon dioxide emissions and the government is keen to reduce this figure by encouraging homeowners to improve their energy efficiency with, for example, loft and wall insulation.

"If the government is going to achieve the 80% carbon targets, particularly for the domestic sector, retrofit insulation isn't going to cut it. You're going to have to invest in lower-carbon energy generation," said Simon Green, head of business development at the EST.

In the first study of its kind, the EST spent a year monitoring small wind turbines from 500W to 6kW in size, in 57 different urban and rural locations around the UK.

"Generally, pole-mounted in areas of good, clean air with unobstructed air flow gave better than expected performance," said Green. Those in the most exposed rural parts of Scotland gave the best results, generating in excess of 18,000 KWh (or £2,300 of electricity) and save 7,500kg of carbon dioxide a year.

Turbines mounted on buildings did not fare as well, with a typical urban installations generating less than 200kWh (around £26 of electricity) a year and even those in rural Scottish locations generating just 1,000kWh (or £127 of electricity) a year. "It wasn't because the turbines themselves were bad, it was because of the wind resource was too poor – they're very sensitive to local turbulence and obstruction," said Green.

The study comes a few days before the government's white paper on energy and climate change. This will map out future incentives for, among other things, small-scale

renewable energy schemes in the UK. The energy minister, Lord Philip Hunt, said the government planned to reward "small scale renewables with clean energy cashbacks from April next year as part of the UK transition to low carbon. This is why it is important for us to be as aware as possible of the best places in the UK to site onshore wind turbines."

Friends of the Earth's executive director, Andy Atkins, welcomed the EST study. "Domestic small-scale wind turbines can play a significant role in tackling climate change. The UK is already one of the leading manufacturers of small scale wind turbines with the potential to deliver many more green jobs in this area. ."

Edward Hyams, EST chairman, said the study was part of his organisation's attempt to bring reliable and user-friendly low-carbon technologies to the consumer market.

Until now, consumers had little independent data on the performance of small windmills, said Green. "To date, consumers have only had manufacturers' data and we thought it was really important that we undertake proper in situ monitoring of these technologies in a wide a variety of locations as possible."

Comparing different turbines has therefore been difficult and there were few tools to work out how reliable the wind is in a particular location. Small-scale turbines need to operate in an average wind speed of around 5 metres per second for them to make economic sense. The only way until now to estimate an area's wind resource was to use a government map called NOABL. However, this map is only accurate over unobstructed areas and tends to over-estimate the wind resource in cities.

In their experiments, the EST was also able to calculate the proportion of time that turbines in different locations actually generated electricity over the course of a year, a number known as the load factor. This topped out at around 35% for the pole-mounted turbines with an average around 19%.

The best-performing building-mounted turbines had a load factor around 7.5%. "In all the ones we monitored, we could not get a recording of 5m per second for any of them," said Green. "Turbines do work if they get the right wind speed – the reason they didn't is because they used this old NOABL model that over-estimated the wind resource."

The EST study was carried out in partnership with the Department for Energy and Climate Change, several power companies and the University of Southampton. It will be the first of several field trials of domestic-scale generation technology – further studies on solar thermal heating, air and ground-source heat pumps, and light-emitting diodes are already under way.