When the Wind Blows

Dr. Steven McCabe, Associate Professor, Institute of Design, Economic Acceleration & Sustainability (IDEAS) and Senior Fellow, Centre for Brexit Studies, Birmingham City University

A lot's been written about weather recently. Understandably, the succession of storms, Dudley and Eunice last week and Franklin on Sunday night and into Monday, has created inevitable stories based on our being subjected the dangers associated extremely high wind speeds which damage property and are a threat to life and limb.

That three people lost their lives and 1.4million homes were without power as well as over 150 flood warnings have been issues, underlines how dangerous such storms can be (Durbin and Gallagher, 2022). Wind, a naturally occurring phenomenon caused by temperature differences as well as rotation of the earth (Coriolis effect), creates energy that's so dangerous.

Wind can, when harnessed, be a tremendous resource and is an essential part of the renewable energy mix. The amount of power generated by wind last Friday by Storm Eunice at 5:30am provided 48.5% of Britain's electricity needs and over the whole day created 39% of power (Cuff, 2022). Indeed, as O'Neill (2022) reports, in Northern Ireland, this figure has been as high as 90% in recent days.

As Dollimore (2022) suggests, the generation of a huge amount of additional power by wind should be good news to all of us following the 54% hike in the energy 'price cap' by Ofgem (Office of Gas and Electricity Markets). According to the Telegraph's James Warrington Giulia Bottaro, "Day-ahead UK power dropped 11pc to £140 per megawatt-hour as Storm Eunice whipped up gusts of up to 90 miles per hour" (2022).

In this country, we're blessed by the fact that, mostly, the wind blows regularly. This makes it a very effective way to generate power from a source that's constantly available and, nominally, free. Though there's a long tradition of using wind to achieve tasks such as grinding grain to produce flour from wheat and to pump water, its use in creating electricity in this country relatively recent.

As explained by the British Library Science blog (2022), Scottish engineer and physicist James Blyth (1839-1906) created the "first ever wind-powered electrical generator" in July 1887. Inspired by sceptical comments made by fellow Glaswegian, physicist William Thomson, later Lord Kelvin, Blythe installed a ten-metre-high cloth-sailed windmill in his garden in Marykirk which was attached to a dynamo.

What Blythe demonstrated was that wind could generate a steady supply of electricity which, having charged accumulators that had been developed by Frenchman Camille Alphonse Faure, provided power for lighting in his cottage. Amusingly, as all new innovations tend to be regarded, Blythe's offer to use surplus electricity to provide lighting to the town's main street was rejected as being "the work of the devil."

Since then, wind power, particularly in Denmark and the United States, developed significantly. However, in the UK it wasn't until 1951 that wind power was used to create electricity for a community when a wind turbine was installed in the Orkney Islands by John Brown and Company.

The 1970s energy crisis, caused by a phenomenal increase in the price of oil gave wind power a fillip as an alternative method of generating electricity. Economic justification for wind power has always been reliant on ensuring the costs of producing the equipment needed to capture and generate

electricity are sufficiently attractive. The rapidly increased cost of gas experienced in recent months makes the argument for wind power ever more appealing.

Good Energy website (2022) explain that wind power works by the blades of the turbine being turned by the prevailing gust and rotating a shaft in the nacelle, "the box-like structure at the top of a wind turbine", which converts kinetic energy into electrical energy. Importantly, electricity is passed through a transformer to ensure voltage is reduced allowing it to be "transported on the National Grid or used by a local site" (ibid).

Wind turbines can generate electricity with a gentle breeze to 3-5 meters per second. Logically, the greater the wind, the more power is produced. A doubling of the wind speed will produce eight times more power which makes it very effective. Crucially, as winds become part of a storm like those in recent days, there's a safety mechanism which shuts the turbine down to avoid possible damage occurring (ibid).

However, what's given even greater impetus to wind power is the that once the wind turbines have been manufactured and installed, power produced is, unlike the burning of fossil fuels, entirely free of greenhouse gas emissions Wind power is arguably the greenest forms of power it's possible to create.

A favourable environment means that it's no surprise that wind power, most especially through locating turbines 'offshore', has become key to the current government's explicit intention to radically reduce carbon in coming years to achieve 'net zero' by 2050 (Government, 2020). The Office for National Statistics in June last year emphasised the importance of wind power in tackling climate change (ONS, 2021).

Renewable UK (2022), which provides up-to-date data on power generated by wind, states that there are, respectively, 8,793 onshore and 2,297 offshore projects giving a total operational capacity of 24,629.990 megawatts. This allows 68,266,057 MWh/p.a. (megawatt per annum) of energy to be produced which is the equivalent of power to 18,213,996 home and, importantly, represents an annual reduction in CO2 of 30,037,065 tonnes.

Wind power, in supplying almost a quarter of Britain's energy needs, gas still being more significant at over 35% (UK Electricity Production, 2022), is already vital to supplying electricity. As Rao and Whiteside (2021) point out, "In the last 20 years, the contribution of wind power to the UK's energy needs has gone from around 320MW (in 2001) to more than 24GW (in 2021) – a 73-fold increase". Indeed, as ONS reports, electricity generated by wind power in the UK was worth nearly £6 billion in 2019 (ibid).

In making the announcement concerning the intention to make the UK the "Saudi Arabia of wind power" in October 2020, Prime Minister Boris Johnson stated that investment would set this country on a path towards a "a green industrial revolution […] which will provide tens of thousands of highly-skilled jobs" (ibid).

Additionally, as Johnson announced, there would be sufficient offshore wind capacity to enable every home in the country to be powered by this energy by 2030 (based on current levels of usage) which required increasing the government's previous 30GW target to 40GW. Johnson also stated a target for floating offshore wind of 1GW of energy by 2030 which, as well as requiring innovative technology, would need the turbines to be located in deeper waters that are more expensive (as North Sea oil extraction has proved).

Accordingly, wind turbines are set to become even more ubiquitous than at present as part of the quest for a cleaner, greener and, potentially, much cheaper form of power. The challenge, as many point out, is in developing capability essential to this objective and that there are adequate incentives to producers in making the necessary investment. This will be facilitated through what's 'Contracts for Difference' (CfD) scheme (Government, 2022).

As is explained on the government's website, CfDs are intended to encourage investment in renewable energy through giving assistance to developers and ensuring "long lifetimes with direct protection from volatile wholesale prices, and they protect consumers from paying increased support costs when electricity prices are high" (ibid).

Nonetheless, there are many who question whether what's proposed is possible. Rao and Whiteside cite the opinion of "experts" who believe that the amount of wind power required for domestic consumption envisaged in the government white paper produced in December 2020 would need to be "upscaled significantly above the 40GW in order to allow the UK to reach carbon neutrality by 2050" (ibid).

Clearly there are many challenges on the road to net zero.

Intriguingly, as the Telegraph reported over the weekend, despite the urgency of reducing carbon emissions and the importance of increasing energy generated by wind, because of rules applying to the way in which this form of power is generated, some wind farms in Scotland have been paid "not to generate half their potential electricity" (Malnick, 2022).

Though very different from the 'cash for ash' scandal in Northern Ireland, a green-energy initiative known as the Renewal Heat Incentive (RHI) in which those with wood-pellet boilers were paid £1.60 for every £1 of fuel they burned, and which led to widespread abuse (McBride, 2019), Malnick describes the way in which what's known as "constraint payments" to producers restricted output.

Based on data collected by the Renewable Energy Foundation (REF), these payments, totalling £24.5 million in 2020, were paid to three large wind farms in Scotland when the amount of electricity produced would overwhelm the grid. Given the current context, the inability to ensure electricity produced can be sent to supply demand elsewhere in the UK would seem somewhat bizarre, especially as the cost of the constraint payments is passed onto consumers.

Many will concur with the view of REF Principal Analyst, Dr Lee Moroney, who believes that when wind farms, in this case in Scotland, have been so poorly sited it's financially beneficial to simply switch off production thus not being able to capture almost half of potential output, "the public has every right to ask how on Earth these projects came to get planning permission".

As in all of the underlying assumptions concerned with renewable energy, there are complexities and particularities of costing which do not always seem clear or logical. Indeed, as has frequently been the case, achieving the cheapest form of energy provision is fraught with difficulty and requires deft analysis and sensitivity.

What's obvious is that, as the recent storms have shown, not dealing with greenhouse gas emissions with urgency is only likely to exacerbate the very conditions that lead to their occurrence. Anything undermining this effort or gives 'ammunition' to climate change detractors will make the quest to implement remedies more difficult.

As a Guardian editorial (2022) asserts, based on ONS data published last week, opportunities offered by implementation of technology and initiatives intended to ensure a green economy are

floundering through “a combination of misplaced ideology, blinkered short-termism and lack of strategic imagination and ambition in Whitehall”.

If that’s the case, we can expect extreme winds (and weather) with even greater regularity in the future with all the attendant consequences and potential implications of danger to life and damage to property. As we should acknowledge, indecision in dealing with climate change means there’ll be an even heavier cost in the long-term.

References

British Library (2022), ‘James Blyth and the world’s first wind-powered generator’, Science blog, 17th August, https://blogs.bl.uk/science/2017/08/james-blyth-and-the-worlds-first-wind-powered-generator.html, accessed 22ndFebruary

Cuff, M. (2022), ‘Storm Eunice: Turbines generate almost 50 per cent of Britain’s electricity needs during gale force winds’, iNews, 19th February, https://inews.co.uk/news/storm-eunice-turbines-generate-almost-50-per-cent-of-uk-electricity-needs-during-gale-force-winds-1470963, accessed 22nd February

Dollimore, L. (2022), ‘Power prices plunge after Storm Eunice’s 122mph winds cause some of the highest-EVER output from Britain’s wind turbines’, MailOnline, 18th February, https://www.dailymail.co.uk/news/article-10528581/Power-prices-plunge-Storm-Eunice-causes-highest-output-wind-turbines.html, accessed 22nd February

Durbin, A. and Gallagher, S. (2022), ‘Storm Franklin hits UK with flooding and high winds’, BBC News, 21st February, https://www.bbc.co.uk/news/uk-60452334, accessed 22nd February

Good Energy (2022), ‘How do wind turbines work?’, Good Energy website, https://www.goodenergy.co.uk/how-do-wind-turbines-work/, accessed 22nd February

Government (2020), ‘New plans to make UK world leader in green energy’, Gov.UK, 6th October,https://www.gov.uk/government/news/new-plans-to-make-uk-world-leader-in-green-energy, accessed 22nd February

Government (2022), ‘Policy paper, Contracts for Difference’, Gov.Uk, updated 4th February, https://www.gov.uk/government/publications/contracts-for-difference/contract-for-difference, accessed 22nd February

Guardian (2022), ‘The Guardian view on Britain’s green economy: seriously underpowered’, Guardian Editorial, 20thFebruary, https://www.theguardian.com/commentisfree/2022/feb/20/the-guardian-view-on-britains-green-economy-seriously-underpowered?CMP=Share_AndroidApp_Other, accessed 22nd February

O’Neill, B. (2022), ‘At several stages over the past few days over 90% of NI energy needs came from renewables…’, Slugger O’Toole Website, 21st February, https://sluggerotoole.com/2022/02/21/at-several-stages-over-the-past-few-days-over-90-of-ni-energy-needs-came-from-renewables/, accessed 22nd February

McBride, S. (2019), Burned: The Inside Story of the ‘Cash-for-Ash’ Scandal and Northern Ireland’s Secretive New Elite, Merrion Press, Newbridge, Kildare, Republic of Ireland

ONS (2021), ‘Wind energy in the UK: June 2021’, Office for National Statistics, 14th June, https://www.ons.gov.uk/releases/windenergyintheukjune2021, accessed 22nd February

Rao, G. and Whiteside, P. (2021), Wind turbine farms in Britain have grown in the last 10 years – is the UK the Saudi Arabia of wind power?, Sky News, 13th October, https://news.sky.com/story/the-ballooning-of-british-wind-turbine-farms-is-the-uk-the-saudi-arabia-of-wind-power-12282674, accessed 22nd February

Renewable UK (2022), Wind Energy Statistics, Renewable UK Website, https://www.renewableuk.com/page/UKWEDhome, accessed 22nd February

Warrington, J. and Bottaro, G. (2022), 'Power prices crash as Storm Eunice drives wind turbines', Telegraph, 18thFebruary, https://www.telegraph.co.uk/business/2022/02/18/ftse-100-markets-live-news-oil-price-ukraine-retail/, accessed 22nd February

UK Electricity Production (2022), Live Energy Data, UK Electricity Production Website, https://electricityproduction.uk/, accessed 22nd February

Dr. Steven McCabe is co-editor of *Exploring the Green Economy, Issues, Challenge and Benefits* (ISBN-13 979-8532032347) and companion text, *Green Manufacturing, What this involves and how to achieve success* (ISBN-13 979-8751284619), both recently published by Bite-Sized Books last year. His latest book, *Stop House Prices Rising! The Essential First Fix For the Broken Housing Market* has just been published by Bite-Sized Books (ISBN:9781739726102).