

About the FAQ

The FAQ displayed on this site was originally compiled by the Scientific Alliance.

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1 [Wind Energy - Background](#)

Wind has been used to power machines for some 2,000 years and the first recognisable windmill producing electricity was built by American Charles Brush in 1888. Windmills have therefore had an extraordinary long lifespan but mostly restricted to milling wheat or pumping water. They were sometimes used to produce electricity as well, but this was on a very small scale, mainly charging DC batteries on electric fences or radio transmitters. These applications were reasonably successful as intermittency was not an issue. However, the last twenty or so years have seen the worldwide proliferation of ever larger windmills, now referred to as turbines and now used on a large scale to produce AC electricity for national grids. As all their well-documented problems of intermittency remain (only producing electricity when the wind blows), building and operating these machines has been dependent on a high level of public subsidy. Such use of consumers' and taxpayers' money is justified by politicians to reduce our carbon emissions in keeping with the hypothesis that the human race is responsible for changes in the climate by increasing the level of carbon dioxide in the atmosphere.

2 [Wind Energy - The Scottish Dimension](#)

Building wind farms in a windy country like Scotland sounds like a good idea. After all, the wind is free, we have lots of it and it will reduce our dependency on expensive imported gas as North Sea fields run down. This sort of simplistic thinking is perhaps why the renewable energy industry's opinion polls still show a majority in favour of wind power. But it seems to be largely the opinion of people who are unaware of the whole picture; wind power stations or farms often attract strong local opposition usually based on visual impacts and noise but increasingly on other impacts such as those affecting water supplies.

3. [Wind Energy - Intermittent](#)

Wind energy is intermittent. Electricity is only generated when the wind is blowing, so it can never provide a secure supply. There may be a surplus during the night when demand is low or none at all when demand is high. Government information shows that onshore wind turbines produce energy around 27% of the time. That is equivalent to producing electricity 99 days each year. A further problem with intermittency is that our consumption of electricity varies through each hour of a day (increasing use during the daytime and reducing at night) as well as seasonally (we use more electricity in winter than summer). Electricity cannot easily be stored, it has to be used instantly. So, the amount of electricity generated has to match our use of electricity. Inevitably the energy produced by wind turbines (when the wind is blowing) does not match our variable use of electricity.

4. Wind Energy - Wind Speeds

Turbines only operate given the 'right' wind. As well as not operating when the wind isn't blowing, they turn off when it gets too windy. Turbines typically start producing electricity at wind speeds of around 10mph, but need to be shut down above 55mph. They are most efficient at wind speed of around 20mph. Above this their efficiency declines as the wind increases. Hence onshore wind turbines give an average annual efficiency of around 27%. The wind is more constant and reliable offshore. So offshore wind turbines produce energy for 40% of the time, or 146 days each year. New offshore wind farms, with larger turbines, are producing electricity around 50% of a year. Since they can use higher turbines and the wind is more constant out at sea offshore wind farms produce much more electricity than onshore wind farms.

5. Wind Energy - Land Mass

Wind farms need to cover large areas to give a significant output. Wind may be free but it is a very weak source of energy compared to fossil, nuclear or even hydro-power. Large areas of land need to be covered with turbines, with a visual impact on the landscapes for miles around. A typical gas fired power station (which is available to operate all years round) can produce around 13,000 megawatts of electricity for each square kilometre of land they use. To produce the same amount of electricity annually wind farms would need to take up 3,400 square kilometres of land. That is a land area equivalent to more than half of Dumfries and Galloway, or about twenty times the size of Glasgow, or nearly two and half times the area of Shetland.

6. Wind Energy - Is It Expensive?

Wind energy is expensive. Despite the contribution of renewable sources of electricity to the National Grid, consumers have seen nothing but price rises for over 10 years although the cost of wind energy (particularly for offshore windfarms) has fallen in recent years. Prices claimed for wind electricity do not include hidden costs such as the already existing publicly funded Feed in Tariffs (FiTs) for smaller installations and subsidies for larger sites (these are still costs to consumers for years to come). Wind energy also needs to have backup, usually fossil fuel generators (running inefficiently on standby). It requires the building of many miles of additional and unsightly transmission lines and the decommissioning or the replacing of turbines at the end of their lifespan. Prices for conventional electricity have also been increased by the Climate Change Levy and CO2 charging.

7. Wind Energy - Lifespan of Turbines

Wind turbines have a much shorter life than conventional generating plant. Gas and coal stations operate for 40 years or more and can be refurbished or upgraded component by component. Nuclear stations have an operational life of 50 years or more. In contrast, wind turbines only last for around 20-25 years before having to be scrapped. In addition, recent research shows that their efficiency and output deteriorates significantly after only ten years.

8. [Wind Energy - Backup Supplies](#)

Wind energy needs constant backup and displaces only a modest amount of conventional electricity. Because of wind's intermittency, conventional generating capacity must remain available, on standby. Because the output of wind farms can rise and fall very quickly, the primary backup is from open-cycle gas turbines. These are relatively inefficient, even more so if kept running on standby. Live generating figures can be viewed at – www.gridwatch.templar.co.uk/

9. [Wind Energy - Smart Grid](#)

There was a proposal that Scottish wind energy could contribute to a European 'smart grid'. However, even if built a European 'smart grid' would not guarantee security of supply. The renewable energy lobby claims that 'the wind is always blowing somewhere', therefore a European-wide grid would smooth out local variations. This is a myth. All windy areas of Europe are subject to similar weather patterns and calm spells often prevail across the entire continent. For example, within Scotland, if the wind is blowing in Shetland it tends to be blowing in Galloway, over four hundred miles away, as well. The only way to guarantee security of supply, with any intermittent generating method such as wind, would be an energy storage capability of at least several consecutive days or even weeks. For the higher use of electricity in winter we have always relied on the capability of natural gas production (in the North Sea and Norway) to adjust to meet the seasonal variation in demand. Despite many years of research and development, the very large scale storage of energy that would be needed, if we relied on wind farms, still eludes the world's best brains.

Battery Energy Storage Systems (BESS) based on lithium batteries, are now increasingly being built both alongside new windfarm developments and separately as stand alone installations. These also attract publicly funded subsidies to be 'on stand by' to even out grid supply fluctuations, as well as being paid top rates for when electricity is in short supply. The payment to be 'on standby' is called a capacity payment, which is also paid to other 'standby' fossil fuel generators, whether or not their generation capacity is used.

The problem with BESS is that not only are they only ever likely to be able to provide a few hours of electricity at best, but that like lithium batteries in phones and laptops, they have a limited lifespan of 8 to 10 years. Rapid charging and discharging of BESS also causes them to heat up – which requires additional electricity for air conditioning units to keep the batteries cool. Like other lithium batteries, there have been numerous serious incidents across the world where these BESS have spontaneously caught fire or exploded, with fires that are difficult to get under control.

10. [Wind Energy - Consumer Costs](#)

Another problem is that consumers pay if too much electricity is generated. The transmission lines, which move electricity around the country, have a finite or limited capacity. The growth of wind farms in Scotland in recent years has far exceeded the combined Scottish use of electricity and the capacity of the transmission lines to export electricity out of Scotland. As a consequence, there is an excess of energy in Scotland when the wind is blowing. The

contracts under which wind energy is supplied include a provision to pay wind farms to shut down if their output is not needed. ie. when the wind is blowing but demand is low and the capacity of transmission lines is exceeded. This is known as a constraint payment.

The cost of constraint payments to wind farm operators is also borne by the consumer via higher electricity prices. This turning off of wind farms, known as ‘curtailment’ may also require the replacement electricity to be generated elsewhere in the country. Because this has to be purchased at short notice this costs a premium. Thus, in some situations, consumers can be paying constraint payments for a wind farm to be turned off with replacement electricity generation nearer point of use at higher than normal price as well as for a subsidy to the wind farm (under the financial support to renewable electricity generators).

11. [Wind Energy - Transmission Lines](#)

Wind energy requires long transmission lines. Wind farms are mostly built in remote areas or offshore, far away from centres of population where the electricity is needed. Most of the onshore wind farms in the UK are in Scotland. However, most of the use of electricity in the UK is in the large cities in southern England. This requires longer, more expensive and more intrusive transmission lines than power from conventional sources (which are located much nearer to the large cities in England). Because many wind farms have to be built to match the output of a single conventional station, long lines of pylons have become an eyesore in themselves. Such long transmission lines also lead to greater power loss through the length of the transmission lines themselves. This can be a substantial loss - estimated as about 4% over 100 miles for a high kilovoltage transmission line. Generators, for example in the Highlands of Scotland, get paid for the amount of electricity they produce from the windfarm, not for the amount that actually arrives hundreds of miles away at the point of use.

12. [Wind Energy - Offshore Costs](#)

Offshore wind energy has been doubly expensive in the past, but in recent years the cost has fallen dramatically so that now offshore wind farms offer the lowest cost renewable energy. Offshore wind turbines attract less opposition and appear more efficient as average wind speeds are higher and more reliable. However, marine turbines are much more expensive to build and maintain.

13. [Wind Energy - Batteries will solve the problem of intermittency](#)

Some wind and solar developments are installing batteries on site and claiming that they will solve the intermittency problem. However, a typical installation will store a maximum of 20 minutes or so of a windfarm’s output. Conventional generation is still needed to cover hours or days of low wind. There is no sight of a technical solution for seasonal electricity storage. (See 9 above)

For more information see:

14. **Wind Energy - Wind is now the cheapest form of generation**

No it isn't. This myth arises from electricity 'strike prices' bid by offshore developers which are comparable to current prices per MWh from gas generation. Bidding a low price helps to secure the option to build.

But these are notional prices for wind farms not yet built and do not commit the developer to build or to deliver anything.

The reason that electricity prices soared in 2022 with sudden gas shortages in Europe is because electricity prices are tagged to gas prices, not because costs of renewable generation changed.

15. **Wind Energy - CO2 Emissions Reduction**

The wind energy industry claims that a unit of wind-produced electricity displaces one generated from coal or gas, so reducing CO² emissions. The wind farm developers show this information in their proposals. However, this does not take into account that the mix of low carbon electricity generation has increased in recent years. So new wind farms are not replacing coal or gas fired electricity generation anymore. For example, in Scotland there are no remaining coal fired power stations and only one essential gas fired generator and one remaining but aged nuclear power station producing carbon free electricity but multiple large wind power stations are still being consented which will not replace these essential remaining two conventional power stations.

16. **Wind Energy - Carbon Debt**

Turbines may never pay off their 'carbon debt'. According to Scottish Renewables, the carbon dioxide emissions from construction and installation of turbines is paid back within the first year of operation. This is patent nonsense as it fails to take into account the construction cost and environmental impact of the turbine components or the manufacture and installation of the associated cables and transmission lines. It also assumes that damage to peatland is successfully addressed by restoration efforts.

17. **Wind Energy - Local Jobs**

The industry claim wind farms create local jobs, but in reality wind energy creates few local jobs. There is an established industry producing wind turbines overseas by firms such as Vestas and Siemens. These are all outside Scotland and there are no jobs in Scotland manufacturing wind turbines. Most employment arising from wind farm developments in Scotland come during the planning and construction stage. Wind farm site supervisors can

look after several wind farms in an area. Consequently, the number of permanent local jobs arising from wind farms is tiny. It is economically insignificant, even in remote rural area where the local economy is small.

18. Local Environmental Effects

Residents and communities living close to or near wind farms can experience several main local environmental effects. The most obvious effect is the visual impact of the sight of a group of wind turbines. As well as possibly being visually intrusive these can also change the character of the local landscape. Whilst wind turbines used to be up to 100m or 140m high, recent proposals have come forward with 200m or even 250m high turbines. The sight of large industrial structures, which rotate as the wind drives them, in a natural environment can look out of character and out of context in the landscape. The issues are accentuated because homes and communities are long established and settled, whilst wind farms are a new, sometimes disturbing, arrival. Perhaps the most common long term nuisance arising from wind turbines is noise. Wind turbines do create various sounds, such as swishing and thumping (amplitude modulation) and tonal fluctuations. Turbine noise varies and may cause stress for anyone suffering the noise effect. Wind turbines also create an effect, known as shadow flicker, where the rotation of the turbine blades causes the sunlight shadow to flash on and off rapidly. This can also happen at night if the turbines have aviation safeguarding lights. It can be a health risk to some people. It is possible to avoid day time flicker if it is properly assessed and managed but some developers and local authorities have a poor record in dealing with complaints.

Increasingly, it is being recognised that industrialisation and major earthworks to construct on-shore windfarms have the potential to either disrupt or pollute private water supplies. Many remote and rural households and farms rely on such supplies and they may be many miles away from alternative public water supplies. Public water supply catchment areas have also previously been affected by industrial scale turbine development in Scotland, but changes in policy now protect public water catchment areas from such development.

Other general problems can arise with construction traffic, new transmission lines and potentially adverse effects on birds, bats and wildlife in general.

19. Wind Energy - Community Payments

Arising from resistance to wind farms, enhanced incentives are now being offered by wind farm developers to local communities to accept wind farms in their areas. In England the Government recommended £5,000 per megawatt of installed generating capacity per year. This figure has been adopted in Scotland. However, the payment of community benefit by wind farms is not mandatory and cannot be enforced.

Community benefit is not a material matter in a planning application, although it is often referred to and may still influence local Councillors. Community Benefit is distributed in various ways. What is increasingly obvious is that little or no money reaches those properties which directly suffer from the adverse effects of 'hosting' an industrial neighbour in their rural environment.

To put this £5,000/megawatt in perspective, a single two-megawatt wind turbine will generate over £425,000 per annum from a combination of the electricity it produces and various subsidies including “constraint” payments from over-capacity shutdowns. There are now calls to extend community payments to more people with some even suggesting that “everyone should benefit from this bonanza.” This is of course impossible as the majority must continue to pay in so that the lucky few may benefit. For communities receiving community benefit, there remains some uncertainties because there is no formal monitoring or reporting of payments. Since they are discretionary payments by wind farm operators, payments can be withdrawn or reduced at any time and payment of such benefit cannot be enforced by local authorities.

20. Wind Energy - Conclusions

Wind energy can make a potentially valuable contribution to addressing climate change, as it can provide energy without burning fossil fuels.

However, as with most technology there are adverse issues which need to be balanced honestly against the positive benefits. Onshore windfarms can have adverse local environmental impacts, including significant release of carbon by being sited on precious peatlands which counter their aims to produce carbon savings from generated electricity. In addition, predictable, adverse effects and risks for local communities, the environment and ecology require to be put into the balance of whether projects should be consented. The track record of onshore wind farm developments shows that they are mostly being located in Scotland. Yet, these wind farms are a considerable distance from the UK’s main locations of energy demand, resulting in a requirement for expensive long distance transmission lines.

Unfortunately, so much wind energy has already been approved in Scotland that the electricity produced far exceeds the consumption of electricity in Scotland and the capacity of the electricity transmission system to export this excess to England and afar. This results in wasteful curtailment, or turning off, of wind farms. Some estimates show that nearly one in five of all the Scottish wind farms output is wasted in this way. Not only is this a waste of consumer money it means that adverse environmental effects are caused for no benefit. In any event, there will always be underlying problems with wind farms. The unavoidable intermittency of wind energy, only producing electricity when the wind blows, means that it can never be the sole source of electricity generation. The short life expectancy of windfarms requires that after 25 to 30 years, infrastructure will require to be replaced, with more environmental adverse effect and use of precious resources. Other sources of electricity, including from fossil fuel generators, are required on permanent standby to provide back up for when the wind is not blowing.