Energy&Climate
INTELLIGENCE UNIT

Blown away

What is the UK losing by banning the cheapest form of electricity generation?

October 2017

EXECUTIVE SUMMARY

Onshore wind power is now the cheapest form of electricity generation that can be built in the UK. However, once the current project pipeline is dry, there are few plans to build any more onshore wind farms owing to lack of government support. For a government whose declared intention is to have the lowest energy costs in Europe, this is somewhat contradictory – especially as the UK has the best wind resource of any European country. It would also appear to be at odds with the Clean Growth Strategy, in which Business and Energy Secretary Greg Clark wrote about a low-carbon growth pathway delivering "lower energy bills for households and businesses", and in which the government acknowledged that new policies are needed to ensure the UK meets national legally-binding targets for 2025 and 2030 (the fourth and fifth carbon budgets).

Building new onshore wind farms was curtailed during the last years of the Coalition government under David Cameron, and effectively banned after the 2015 General Election by a Conservative Party manifesto promise of "no subsidies". However, since 2015, the cost of onshore wind has plummeted. New projects in Europe are being agreed at costs below the UK's current wholesale electricity price. This is a result of improved technology and larger turbines, and also the effects of the industry maturing, opening the door to cheaper finance and more efficient supply chains. The price reductions mean that onshore wind farms do not now need a subsidy. But most developments would still need centrally-agreed fixed price contracts; and while these are available to biomass, nuclear, offshore wind and a few niche technologies, new onshore wind farms remain excluded. Legacy UK government policy is therefore precluding the UK from building the cheapest generation technology available.

We looked at the cost of generating electricity over one year from one gigawatt (1 GW) of new onshore wind capacity. (Based on past progress, 0.5-1 GW is a reasonable estimate of an annual build rate.) We then looked at the cost of generating the same amount of electricity from other new low-carbon generators – offshore wind, biomass, and nuclear.[1] Compared against both nuclear and biomass, onshore wind is cheaper by more than £100 million per year; compared with offshore wind, £30 million cheaper. Because these sums roll over from year to year, as building programmes continue the cumulative price difference between onshore wind and from biomass/nuclear amounts to £1bn over 4-5 years. New onshore wind is also cheaper than new gas generation, although the calculation is less straightforward given gas price variability.

These numbers are based on currently-available turbine technology, and thus are almost certainly an under-estimate. Onshore wind turbines are becoming more efficient, largely due to increases in size. This is why many new wind farms being built across Europe are set to be subsidy-free. Planning regulations mean that the UK already has among the least efficient fleet of onshore turbines on the continent, and we are currently projected to fall to bottom place.

Another notable change since the 2015 election is an increase in public acceptance of onshore wind among Conservative voters. Originally courted with the Cameron-era ban, they are now broadly in favour of onshore wind providing there is no public subsidy and that local communities have the final say. Surveys show that far fewer people would object to living near a wind farm than a small nuclear reactor or a fracking site. This is not to say that onshore wind commands universal support – far from it, and a revival could surely only happen if caveated with the need

1 Because these technologies all have different "capacity factors" – the amount of the time for which they generate – the capacities needed to generate the same amount of electricity are not the same. I GW of onshore wind farms would generate about 2.7 terawatt-hours (TWh) of electricity every year. The amount of offshore wind capacity needed to generate this is smaller than 1GW – for biomass and nuclear it is smaller still.

for local community support and an absence of serious impact on culturally valuable landscapes and wildlife. Nevertheless, the change in Conservative opinion is real, and could be due to several factors; increased acceptance of a more common technology, a greater understanding of the need to move away from high-carbon power sources, or rising public awareness of the low costs associated with onshore wind.

Onshore wind cannot be a direct substitute for biomass or nuclear generation because of its intermittent output, and its capacity factor (the proportion of time for which it operates) is also lower than for offshore wind. Therefore, while a decision to replace some biomass or nuclear investment with onshore wind might look attractive on simple price grounds, it misses the big system picture. An alternative approach is to see onshore wind as a parallel offer to the current raft of nuclear, biomass and offshore wind. Given that supporting it incurs no extra overall cost relative to not supporting it, that it fits with the acknowledged need to cut carbon emissions faster and that it will boost UK jobs in a variety of locales, re-opening the door to onshore wind can best be seen as a "no-regrets" option to work in parallel with current low-carbon power plans.

In response to criticisms of energy policy and in search of its goal of the lowest prices in Europe, the Government has commissioned from Professor Dieter Helm an independent review of energy costs, which is due to report before the end of October. Ahead of the review, industry body EnergyUK warned that excluding the lowest cost generation – onshore wind and large-scale solar – will lead to higher bills in the future. This report puts some numbers on that claim – and indicates that as ministers and Professor Helm look for ways of reducing energy bills, options for restoring onshore wind power in the UK, where communities agree, ought logically to be on the table.

INTRODUCTION

As the windiest country in Europe[2] and one of the early backers of wind power (both on- and offshore) the UK can boast one of the least carbon-intensive electricity systems in Europe.[3] The move to renewables (and away from coal, which has fallen from around 40% of UK generation in 2014 to less than 10% in 2016)[4] has helped the UK to its G7-leading performance in per-capita decarbonisation in the 25 years since the Rio Earth Summit, while concurrently leading in terms of per-capita GDP growth.[5]

In addition to being the world leader in offshore wind, the UK boasts 11 GW of onshore wind capacity.[6] Within Europe, this puts us second only to Germany.[7] By investing early, the UK now finds itself as one of the global centres for wind energy, both in manufacturing and installation (in NE England and Scotland) and in associated financial and legal services.[8]

2 http://www.renewablesolutionconsultancy.co.uk/index.php/renewable-energy-training/wind-turbine-training/14-training-information/77-windiest-country-in-europe

3 https://www.eea.europa.eu/data-and-maps/indicators/overview-of-the-electricity-production-1/assessment

4 https://www.carbonbrief.org/analysis-uk-wind-generated-more-electricity-coal-2016

5 http://eciu.net/assets/Reports/ECIU_Conscious_Decoupling.pdf

6 http://www.renewableuk.com/page/UKWEDhome

7 https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Statistics-2016.pdf

8 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48359/5229-onshore-wind-direct--wider-economic-impacts.pdf

A recent auction to support new offshore wind capacity in the North Sea closed well below market expectations, with two wind farms set to be paid £57.50 per megawatt hour (MWh) for power produced once online in 2022/23.[9] These Contracts for Difference (CfDs) involve a fixed payment for every unit of power generated – topping up market revenue if the wholesale price is below £57.50/MWh, with developers paying back any revenue earned for selling electricity above this agreed price.

Almost every form of generation built in the UK now requires some form of price support or guarantee. For low-carbon technologies such as nuclear, solar and offshore wind, the mechanism is the CfD; for high-carbon natural gas, the capacity market. But "price support" is not the same thing as a subsidy. The fixed price paid through CfDs to these two North Sea offshore wind farms per MWh generated over the contracts' 15-year lifespan is almost identical to the projected wholesale cost of electricity over the same period. Therefore, these wind farms can be described as virtually subsidy-free.[10] However, because wind farms (like nuclear reactors) have high construction costs and low running costs, and because having more of them depresses the wholesale electricity price (potentially to zero), a fixed price contract is currently needed to finance them. (One analysis[11] suggests that the cost of these offshore wind CfDs will be more than the government estimated. Its rationale is that this is because the additional wind capacity will lower the wholesale power price more than estimated; even if this is correct, it will not raise bills.)

Onshore wind power is significantly cheaper than offshore generation, for the familiar reasons of easier construction and proximity to existing grid connections. It is now the cheapest new source of electricity generating capacity available per unit of output, with large-scale solar also beating gas on cost alone (Figure 1).[12]

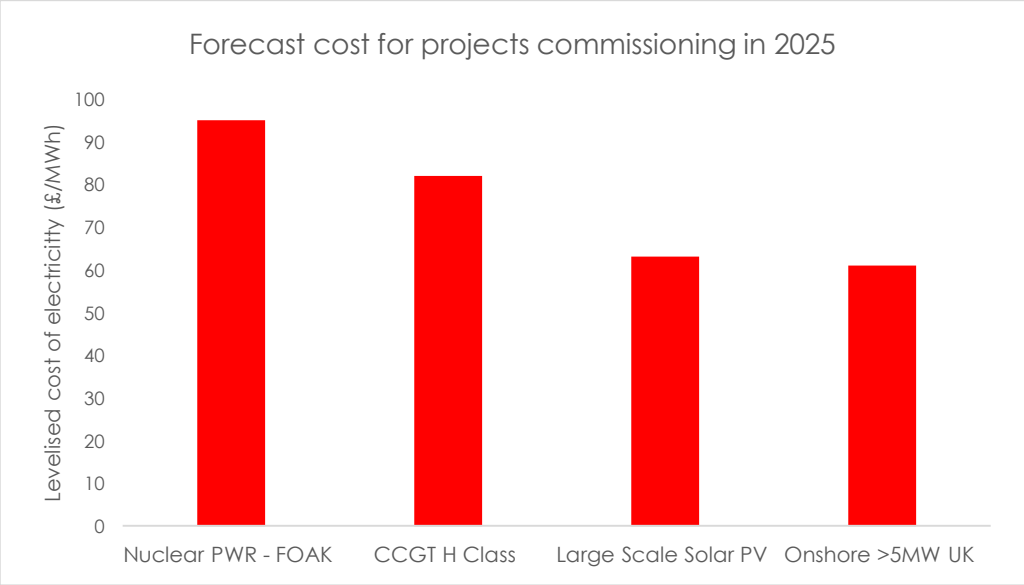

Figure 1: Cost estimates for projects commissioning in 2025. Source: BEIS. Note: since these forecasts were made in late 2016, the cost of onshore wind in other countries has fallen well below levels shown here.

Although some onshore wind projects may come to fruition in the UK without a fixed-price contract, they will be few and far between. Political pressure and planning restrictions have

9 https://www.gov.uk/government/publications/contracts-for-difference-cfd-second-allocation-round-results

10 https://capx.co/innovation-not-subsidy-is-transforming-the-energy-market/

11 https://www.auroraer.com/insight/commentary-government-underestimated-subsidy-cost-latest-offshore-wind-sites/

12 https://about.bnef.com/blog/wind-solar-boost-cost-competitiveness-versus-fossil-fuels/

strangled the project pipeline, with very little new capacity expected beyond the end of the decade.[13] On the face of things, this runs contrary to the 2017 Conservative manifesto target for the UK to have the lowest energy costs in Europe.[14]

The government has commissioned a review into energy costs from Oxford University's Professor Dieter Helm, expected to be completed by the end of October.[15] In advance of the review, industry body EnergyUK penned a letter to Professor Helm stressing that current roadblocks to the lowest cost sources of electricity generation – onshore wind and large-scale solar – will hinder the goal of achieving low energy prices.[16] This sentiment has been echoed by others in both industry and academia, making clear that opting for higher-cost generation for political ends will ultimately lead to greater expense for consumers.[17]

The Clean Growth Strategy indicated that the government sees improving energy efficiency as a key way to slash bills while also reducing carbon emissions.[18] It is logical to assume that Professor Helm, having reviewed the same evidence, will come up with the same conclusion on energy efficiency. However, the Clean Growth Strategy has nothing to say on onshore wind beyond limited support in Scottish islands. This creates an opportunity for Professor Helm, unconstrained by political factors, to produce new evidence-based advice for government.

WHAT IS THE UK MISSING OUT ON?

The final onshore wind farms to gain support continue to be built – more than 1.2 GW of capacity has been connected to the grid in 2017 to date. This is mainly on contracts signed before the previous support scheme grace period expired in March 2017. However, current policy does not provide developers with a route to market into the next decade and beyond.

This makes a marked contrast with major European competitors. Projects announced in the years to 2020 are due to support around 18 GW of onshore capacity, none of which will be in the UK (Figure 2). In 2017 so far, more than 4 GW of European onshore wind capacity has reached "final investment decision" (the stage at which developers are fully committed to building the project) – again, none of this has been in the UK, despite being the windiest country in Europe.[19]

13 http://www.green-alliance.org.uk/2016_UK_infrastructure_pipeline_analysis.php

14 https://www.conservatives.com/manifesto/

15 https://www.gov.uk/government/news/independent-review-to-ensure-energy-is-affordable-for-households-and-businesses

16 http://www.energy-uk.org.uk/publication.html?task=file.download&id=6291

17 https://www.theguardian.com/environment/2017/apr/25/uk-windfarm-subsidies-ban-cheap-energy-electricity

18 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651916/BEIS_The_Clean_Growth_online_12.10.17.pdf

19 https://windeurope.org/about-wind/reports/wind-energy-in-europe-outlook-to-2020/

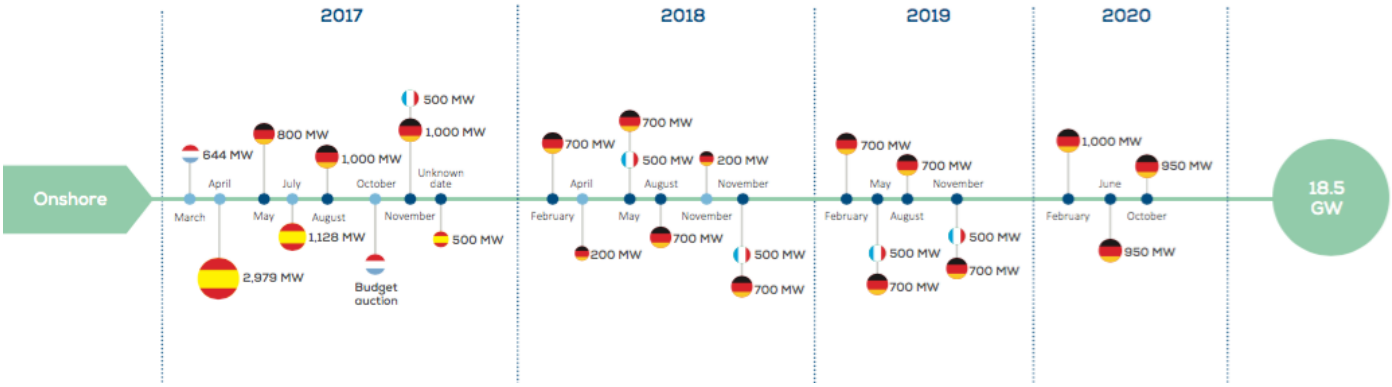

Figure 2: European onshore wind auction schedules. Source: WindEurope.

Germany, France and Spain have all announced auction schedules that will ensure healthy competition between rival projects and provide developers with confidence to make long-term commitments. Industry body WindEurope predicts that French onshore wind capacity will top 15 GW by 2018, becoming the third largest European market by the end of the decade and the second largest a decade later.[20] Among major competitors, the UK has the thinnest announced pipeline of onshore wind.

Onshore auctions in the first half of 2017 yielded results that beat price expectations – just as the recent offshore auction did in the UK. Spain – which operates under a fixed price model akin to the UK's CfD – has seen auctions clear as low as Eur43/MWh (£38/MWh),[21] while the German system of topping up wholesale revenues has also resulted in auctions clearing at a low enough price for new capacity to be classed as effectively subsidy-free.[22, 23, 24] In both Spanish and German auctions, there was a backlog of pent-up demand, as there is currently in the UK, and bidders were able to take advantage of the latest technology on the market. These recent trends show the extent to which a mature onshore wind market is able to drive down costs to levels well below even the most optimistic forecasts from just a few years ago.

Country	Potential onshore wind installations to 2020 (GW)
Ger	12.9
Fr	6
Spain	3.7
UK	2.6

Table 1: Expected new onshore installations to 2020 (GW). Source: WindEurope.

Most support for onshore wind in the UK was not awarded under a competitive process, with the Renewables Obligation scheme granting subsidised contracts without an auction.[25] Thus it is reasonable to suppose that new onshore auctions would follow the familiar pattern of rapidly reducing prices. And analysis conducted even before the latest offshore wind auction shows that UK onshore wind would come in below £50/MWh, rendering it cheaper than new gas-fired

20 https://windeurope.org/newsroom/news/france-can-be-number-2-in-wind-in-europe-by-2030/

21 https://windeurope.org/newsroom/press-releases/spain-returns-to-wind-energy-with-record-low-prices/

22 https://www.businessgreen.com/bg/news/3015755/german-onshore-wind-costs-plummet-25-per-cent-in-latest-auction

23 https://www.bloomberg.com/news/articles/2017-08-15/german-onshore-wind-power-costs-plummet-in-second-auction

24 http://energyandcarbon.com/spanish-german-auctions-price-onshore-wind-e60-mwh/

25 https://policyexchange.org.uk/wp-content/uploads/2016/09/powering-up-2.pdf

capacity, forecast at £66/MWh by BEIS.[26,27] Analysis by Baringa shows that if awarded CfD contracts on the same 15-year basis as offshore wind, 1 GW of new onshore capacity would result in a net payback of £18 million to the Low Carbon Contracts Company (the body responsible for issuing fixed-price contracts).[28] (As noted earlier, the use of larger turbines and a competitive mechanism are likely to make £50/MWh an over-estimate – nevertheless, we use it in this report.)

This 1 GW of onshore wind would generate around 2.7 terawatt-hours (TWh) of electricity per year.[29] Table 2 and Figure 3 show the relative costs of generating the same amount of low-carbon electricity, in 2017 terms, using new installations of other technologies. The unit prices are taken from the most recent CfDs for large-scale nuclear, biomass conversion and offshore wind, while the (so far entirely theoretical) cost for a first wave of small modular nuclear reactors (SMR) is taken from Rolls-Royce.[30] Figures for variable renewables include a £10/MWh integration cost, to account for the additional cost imposed on the system by wind compared with "firm" output.[31] Although not directly comparable, also shown is the forecast levelised cost of generating the same amount of high-carbon electricity from a theoretical new gas-fired power station.[32]

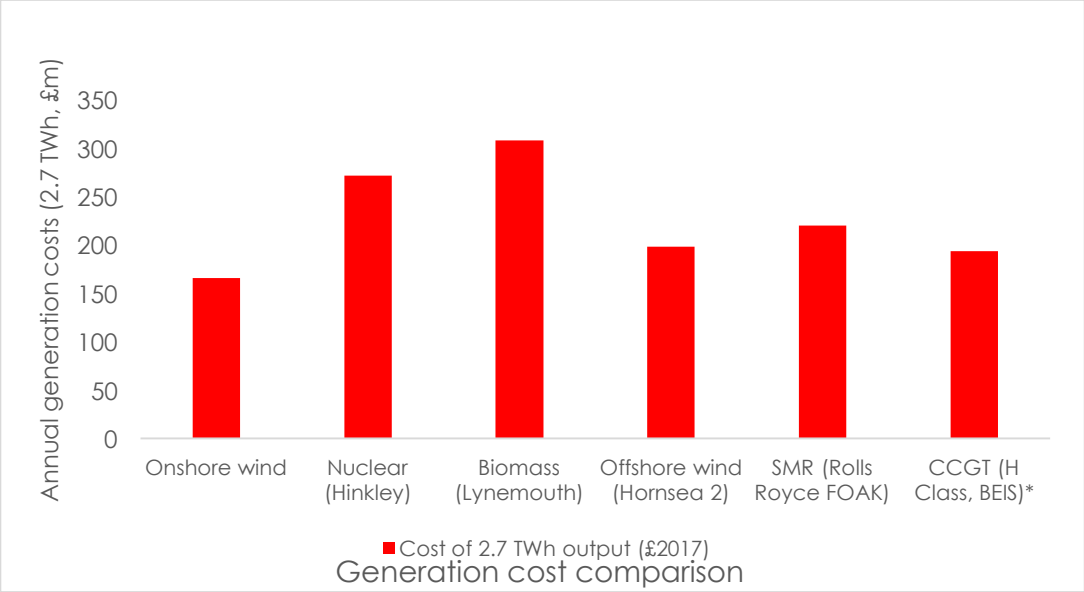

*Figure 3: Generation costs of 2.7 TWh of power by various new low carbon generators. Based on agreed £2012 prices adjusted for inflation. *High-carbon CCGTs included for illustrative purposes only, calculation based on BEIS LCOE forecasts, which are not directly comparable to CfD costs*

26 https://www.baringa.com/getmedia/99d7aa0f-5333-47ef-b7a8-1ca3b3c10644/Baringa_Scottish-Renewables_UK-Pot-1-CfD-scenario_April-2017_Report_FINA/

27 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/566567/BEIS_Electricity_Generation_Cost_Report.pdf

28 https://www.baringa.com/getmedia/99d7aa0f-5333-47ef-b7a8-1ca3b3c10644/Baringa_Scottish-Renewables_UK-Pot-1-CfD-scenario_April-2017_Report_FINA/

29 Based on Baringa-suggested load factor of 0.31

30 Flexibility costs (£10/MWh) added to onshore and onshore wind CfD deals to account for lack of 'firm' capacity. This figure is an estimation of the costs of backup capacity, DSR, interconnection and storage needed to balance variable output, in addition to grid costs resulting from a greater proportion of decentralised renewables on the system.

31 http://www.ukerc.ac.uk/programmes/technology-and-policy-assessment/the-costs-and-impacts-of-intermittency-ii.html

32 Care must be taken comparing agreed strike prices with levelised costs (LCOE), with the latter usually lower. LCOE only accounts for the cost of generation and does not include (for example) land costs, risk allocation costs, financing costs. More information on the difference LCOE and strike prices can be found in: BEIS, Electricity Generation Costs (Nov 2016)

Generating this power from new onshore wind farms would be over £100 million per year cheaper than doing so from new nuclear reactors or biomass plants, and more than £30 million cheaper than under the latest offshore wind contracts.[33]

The economic gain from onshore wind continues into the next year, and the next – in fact, for the lifetime of the CfD. To illustrate the point, power from 1 GW of onshore wind would come in over £100 million cheaper in year one as compared with biomass plant or nuclear reactors. If building continues at the same rate, then at the end of year two, the cumulative difference would rise to £300 million; after year three, £600 million, after year four £1bn, and after year five, to £1.5bn.[40]

One gigawatt per year might be considered unlikely now, as many optimum sites have already been taken. Also, pursuing a higher build rate might reduce competition and so somewhat elevate CfD prices. If instead it is assumed that 1 GW is brought online in the first year of a new build programme and 500 MW for each of the four following years, the cumulative cost difference after five years still amounts to just over £1bn.

	Cost of 2.7 TWh output (£2017)
Onshore wind[34]	£165.5 million
Nuclear (Hinkley)[35]	£271.3 million
Biomass (Lynemouth)[36]	£307.8 million
Offshore wind (Hornsea 2)[37]	£197.9 million
SMR (FOAK)[38]	£220.0 million
CCGT (BEIS)*[39]	£193.5 million

*Table 1: Costs of 2.7 TWh power from CfD-supported low carbon generators. 2012 prices adjusted for inflation. *High carbon CCGT for illustration only*

In addition to missing out on financial savings, curtailing onshore wind ensures that the UK's electricity supply is not as diversified as it could be. Building onshore in addition to offshore wind would allow the different properties of the two technologies to complement each other. In fact, given the Baringa analysis showing that for now, CfDs for onshore wind would more than pay for themselves as well as accelerating progress towards challenging climate change targets, it should not logically be thought of as an "either-or".

MISSING OUT ON PROGRESS

The UK has one of the least efficient onshore wind turbine fleets in Europe. Among comparable nations, only Spain's is in worse shape. The UK comes in behind not only the likes of Germany and

33 http://www.bbc.co.uk/news/business-41220948

34 Annual generation cost based on 2.72 TWh at £46.10/MWh (Baringa Partners analysis) plus £10/MWh flexibility costs.

35 Annual generation cost based on 2.72 TWh at £92.50/MWh (£2012)

36 Annual generation cost based on 2.72 TWh at £105/MWh (£2012)

37 Annual generation cost based on 2.72 TWh at £57.50/MWh (£2012) plus £10/MWh flexibility costs.

38 Annual generation cost based on 2.72 TWh at £75 /MWh (£2012)

39 Based on BEIS forecast LCOE of £66/MWh for plant commissioning in 2020. CCGT costings included for illustrative purposes only

40 Assuming an unchanged whole system cost of additional wind capacity; either than CfD and integration costs remain unchanged, or that rising costs of integrating more wind into the system are offset by falling prices in future CfD auctions.

France, but also Greece, Lithuania and Estonia (Figure 4). This is largely due to planning laws restricting turbine height to 125m.[41]

Increasing size is one of the main drivers of higher turbine efficiency and falling wind power costs. The power output of a wind turbine increases with the square of rotor radius and the cube of wind speed; therefore, installing larger turbines in windier areas can have a dramatic effect on generation.[42] Larger turbines can operate in lower wind speeds, opening up more sites for development, and can harness more energy from the air, generating a greater amount of electricity with each revolution. However, due to planning restrictions, the average power of onshore turbines installed in 2017 in the UK is just 2.25 MW, while the average fleet-wide capacity is less than 2 MW.[43] For comparison, the Swedish average is 3.3 MW, close to 70% larger.

This disparity is likely to grow as countries placing orders now and in the near future gain access to new, larger equipment while the UK fleet remains stagnant. Total European investment in onshore wind in 2019 and 2020 is expected to be double that in 2017 and 2018.[44] Recent tenders in Spain (the only country with a lower average turbine size than the UK) are set to see more than 4 GW of wind capacity come online, capacity likely to consist of the latest 4-5 MW turbines that can generate at far lower costs than smaller units.[45] This will push the UK to the bottom of the list, rendering its onshore wind fleet the least efficient – and thereby the least economically competitive – among rival EU nations.

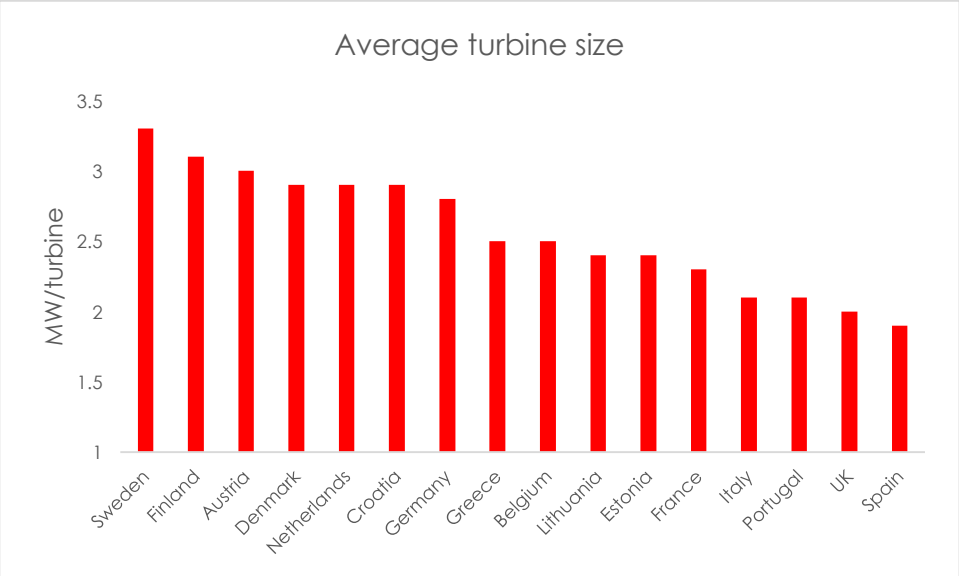

Figure 4: Average turbine ratings in EU nations. Source: WindEurope.[46]

Across Europe, it is estimated that upwards of 250 GW of wind capacity could be installed by 2030, more than double the installed capacity at the end of 2016, with onshore wind farms set to make up the vast majority.[47] While the UK's strong position offshore is likely to ensure that resources

41 researchbriefings.files.parliament.uk/documents/SN04370/SN04370.pdf

42 http://www.hoareleaacoustics.com/images/uploads/docs/Environmental_Protection_UK_Conference-110309-A_Bullmore_Presentation.pdf

43 http://www.renewableuk.com/page/UKWEDhome

44 https://windeurope.org/about-wind/reports/wind-energy-in-europe-outlook-to-2020/

45 https://windeurope.org/about-wind/reports/wind-energy-in-europe-outlook-to-2020/

46 https://windeurope.org/about-wind/reports/wind-energy-in-europe-outlook-to-2020/

47 https://windeurope.org/wp-content/uploads/files/about-wind/reports/Wind-energy-in-Europe-Scenarios-for-2030.pdf

are not put entirely to waste, continued blockage of onshore wind is likely to see bills rising relative to those in nations that do not prevent the cheapest source of power coming to market.

HOW UNPOPULAR IS ONSHORE WIND?

David Cameron's 2015 Conservative manifesto pledged to halt the spread of onshore wind farms in the UK, a position that was reaffirmed ahead of the snap 2017 election despite reports of cheaper onshore wind contracts agreed in other European nations.

"Onshore windfarms often fail to win public support… we will end any new public subsidy for them and change the law so that local people have the final say on windfarm applications"

- 2015 Conservative manifesto.[48]

"We do not believe that more large-scale onshore wind power is right for England"

- 2017 Conservative manifesto.[49]

Surveys consistently show onshore wind to be one of the most popular forms of energy in the UK. The government's own most recent results show that nearly three in four Britons (73%) support onshore wind (Figure 6), with only 16% of respondents unhappy to have a large scale renewable energy development in their area.[50]

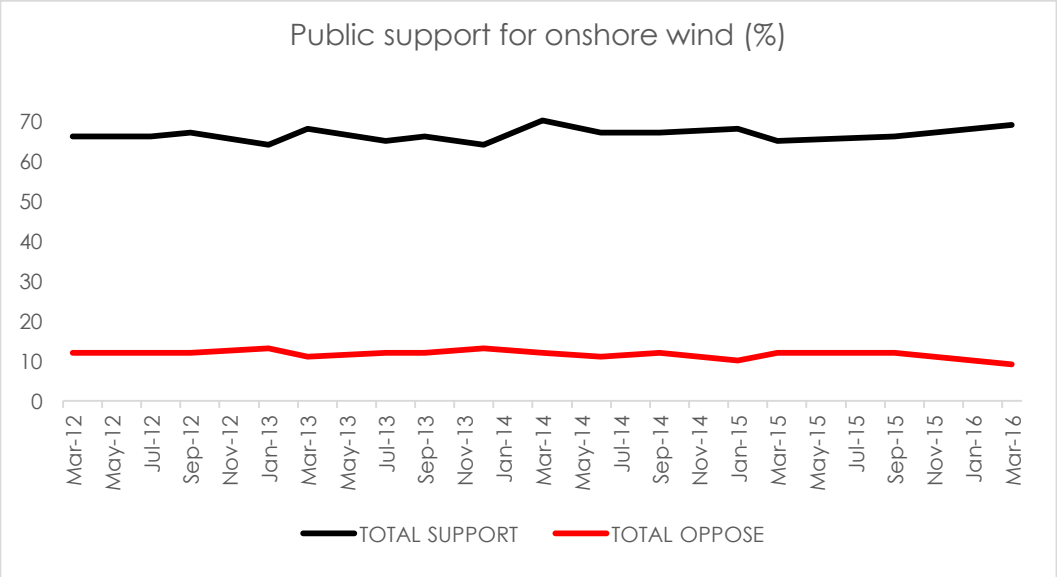

Figure 6: UK public support for onshore wind. Source: BEIS public attitudes tracker.[51]

48 https://www.conservatives.com/manifesto2015

49 https://www.conservatives.com/manifesto *Note that the Scottish Conservative manifesto also ruled out large-scale onshore wind in Scotland using the same terminology.

50 https://www.gov.uk/government/statistics/energy-and-climate-change-public-attitudes-tracker-wave-22

51 https://www.gov.uk/government/statistics/energy-and-climate-change-public-attitudes-tracker-wave-22

Separate polling shows that only 24% of the UK public would be unhappy to live within five miles of a wind farm.[52] For comparison, 62% would oppose living near a small modular nuclear reactor, and 61% would be unhappy to live within five miles of a fracking site.[53]

These results (and previous academic research)[54] highlight the disparity between the reality of public opinion and the Cameron government's perception of it. Levels of objection are higher among Conservative voters than the public overall; yet more than half approved of onshore wind when the pledge to ban new capacity was first mooted in 2010[55]. Support has risen since, with a 2017 survey of Conservative voters finding that 59% now back onshore wind providing local communities have the final say and there is no subsidy.[56]

Increased public support for onshore wind farms could be due to numerous reasons; greater acceptance of an increasingly common technology; increased awareness of the need to curb emissions (two thirds of survey respondents are concerned about the UK not investing quickly enough in low-carbon energy)[57]; or even in response to recent reports of cost reductions. In addition, modern turbines have been engineered to reduce operational noise, a common complaint for earlier designs.[58] Smart controls can minimise noise without significant generation loss, in addition to reducing impact on airborne animals and birds. Increased understanding of wind farm acoustics and aerodynamics also allows site selection and design to be modified to reduce aural disturbance to local communities.

Comments at the 2017 Conservative Party conference suggest that the government position may be softening. Speaking at a fringe event, Energy Minister Richard Harrington said: "*Provided that it goes through a reasonable local planning system, I see no reason why (onshore wind) should not be on the same level playing field as everything else*."[59] This position was reiterated by Climate Change Minister Claire Perry.[60] However, there was no mention of onshore wind in the Clean Growth Strategy, except on Scottish islands.

CAN WIND KEEP THE LIGHTS ON?

Market developments over the past 18 months show that objections to wind power on cost grounds no longer hold weight, while opinion surveys show general support for onshore wind farms. One issue, however, continues to provoke discussion: the variable nature with which wind farms generate power. Which raises the questions: 1) can the lights be kept reliably on as more and more variable-output renewable generation is added to the grid – and 2) if so, at what cost?

52 https://1010uk.org/articles/fracking-nuclear-and-wind-which-would-you-rather-have-in-your-backyard

53 https://1010uk.org/press-releases/fracking-and-small-scale-nuclear-struggle-as-onshore-wind-finds-favour-with-the-public

54 https://www.sheffield.ac.uk/polopoly_fs/1.88117!/file/Understanding-wind-farm-opposition---Dr-Chris-Jones-PDF-674K-.pdf

55 https://policyexchange.org.uk/wp-content/uploads/2016/09/powering-up-2.pdf

56 http://green.brightblue.org.uk/blog/2017/5/4/a-manifesto-for-green-conservatism

57 https://www.gov.uk/government/statistics/energy-and-climate-change-public-attitudes-tracker-wave-22

58 http://www.telegraph.co.uk/news/earth/earthnews/7377641/Noise-complaints-about-one-in-six-wind-farms.html

59 http://utilityweek.co.uk/news/ministers-back-level-playing-field-for-onshore-wind/1313482?

60 http://www.telegraph.co.uk/business/2017/10/04/onshore-wind-poised-comeback-tories-warm-lower-costs/

The answer to the first is, so far, "yes". Variable renewables (wind and solar) contribute about 15% of UK electricity already – in Denmark it is up to 40% – with no impact on system reliability. Replacing dispatchable assets with variable renewables alone would in the long run compromise security of supply, but that is not the reality of the situation: the system is also gaining additional flexibility, which allows it to cope with increasingly variable inputs. (It should be noted that electricity systems have always had variable demand, so matching supply to demand dynamically is not a new problem).

There are four mechanisms that can be employed to balance variable generation:

- Storage, in pumped hydropower facilities and increasingly in batteries
- Demand shifting (DSR), which encourages customers to switch non-time-critical use away from periods of peak demand and therefore high price
- Interconnectors, cables that physically link grids in different countries, which facilitate trade based on variations in demand and generation
- Gas-fired plants designed to work only during periods of peak demand.

Research indicates that a mixture of these technologies is the most cost effective.[61] Analysis by the UK Energy Research Centre shows that overall, variable-output renewables command an average 'integration cost' of around £10/MWh, which is added onto generation costs to give a whole system cost.[62]

Successful rollout of flexibilising technologies offers major benefits to billpayers. The National Infrastructure Committee calculates annual savings of up to £8bn per year from the national energy bill.[63]

Nevertheless, most projections of the UK's future electricity system incorporate a number of different technologies, with baseload and dispatchable generation alongside variable-output renewables. For this reason alone it would not be sensible to think of replacing the nuclear, biomass and offshore wind building programmes with onshore wind. For the moment at least, a diverse portfolio would appear to offer the best route forward.

CONCLUSION

Despite the UK investing early in the wind sector and undoubtedly supporting it on the journey towards maturity, the country now finds itself in danger of possessing the least efficient onshore wind fleet in Europe. Considering the dramatic cost reductions seen in recent years, sticking with a Cameron-era policy that blocks new onshore wind farms in the UK risks damaging competitiveness on the world stage as energy costs fall faster in other countries.

Onshore wind is the cheapest form of new generation that can be built in the UK, with costs that have now fallen enough to need no subsidy. While landscape and wildlife arguments against

61 https://www.e3g.org/docs/Whole-system_cost_of_variable_renewables_in_future_GB_electricity_system.pdf

62 http://www.ukerc.ac.uk/programmes/technology-and-policy-assessment/the-costs-and-impacts-of-intermittency-ii.html

63 https://www.gov.uk/government/publications/smart-power-a-national-infrastructure-commission-report

onshore wind are clearly important in some areas of the country, it is not clear that there is any longer a rationale for the blanket ban given substantial and increasing public support. Even among Conservative voters, who were originally courted by plans to ban new onshore wind farms, a majority is now behind onshore wind providing that local communities have the final say.

Not only does the onshore wind power ban add to energy bills, it also compromises the government's intention to secure the cheapest energy in Europe, because other countries are building onshore wind with the most efficient modern turbines and so reaping the price dividend. And as other countries boost onshore wind capacity, the UK faces a choice: ignore the public and raise electricity bills, or work with local communities to reignite the British onshore wind industry and replicate the successes seen offshore, while making concrete steps towards the twin ambitions of having the lowest energy prices in Europe and accelerating decarbonisation.

One way to approach the issue would be to have two parallel mechanisms for low-carbon power. The current regime would continue, delivering nuclear, biomass, ever-cheaper offshore wind and, potentially, other technologies such as tidal and gas with carbon capture and storage. For the foreseeable future, these are likely to include an element of subsidy. The second mechanism would award fixed-price contracts to onshore wind – but only for projects judged to need no net subsidy or to raise significant landscape or wildlife issues, and where there is community support. Large-scale solar energy projects could also bid into such a mechanism. The exact parameters remain to be worked out, but this would appear to be a pragmatic approach that balances all relevant concerns.

The Clean Growth Strategy explicitly acknowledges the imperative for new policies to reduce carbon emissions: "*In order to meet the fourth and fifth carbon budgets (covering the periods 2023-2027 and 2028-2032) we will need to drive a significant acceleration in the pace of decarbonisation*"[64]. The Strategy is also explicit that those new policies must be acceptable on cost-effectiveness grounds. Given that that onshore wind power commands no price premium against gas, would contribute to accelerating decarbonisation, would benefit UK plc and commands widespread public support, it is not clear that any of the reasons for a blanket ban stack up any longer.

64 https://www.gov.uk/government/publications/clean-growth-strategy