Powering Up

The future of onshore wind in the UK

Richard Howard
Katherine Drayson

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Published by
Policy Exchange, Clutha House, 10 Storey's Gate, London SW1P 3AY
www.policyexchange.org.uk

ISBN: 978-1-907689-00-6
Printed by Heron, Dawson and Sawyer
Designed by Soapbox, www.soapbox.co.uk

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Acknowledgements

The authors would like to thank RWE Innogy and Vattenfall for their support for this research. In addition, the authors would like to thank Aurora Energy Research, Bloomberg New Energy Finance and RenewableUK for providing access to data. Thanks also go to Daniel Stone (CSE), Rachel Coxcoon (CSE), and Sarah Lee (RSPB) for their comments on a draft of this report. Finally, the authors would also like to thank all those who gave their time and expertise to inform this research:

Alex Murley (RWE Innogy)
Andrew Buglass (Buglass Advisory)
Andrew Wood (CPRE)
Anna Stanford (RES)
Brian Tilley (E.On)
Dr. Claire Haggett (Edinburgh University)
Clare MacGregor (Vattenfall)
Clementine Cowton (Bellenden)
Daniel Stone (Centre for Sustainable Energy)
Eric Machiels (Infinis Energy)
Gemma Grimes (RenewableUK)
Gordon Edge (RenewableUK)
Guy Mortimer (Vattenfall)
John Ainslie (RWE Innogy)
Karl Harder (Abundance Generation)
Katy Woodington (RWE Innogy)
Lauren Branston (Good Energy)
Lindsay McQuade (Scottish Power)
Maf Smith (RenewableUK)
Mandy Gloyer (Scottish Power)
Mary Thorogood (Vattenfall)
Matt Partridge (REG)
Nick Perepelov (RenewableUK)
Phil Brogan (RES)
Rahel Jones (Vattenfall)
Dr. Richard Cowell (Cardiff University)
Richard Mardon (Airvolution)
Richard Nourse (Greencoat)
Sarah Lee (RSPB)
Shane Kelly (Vattenfall)
Sheila Wren (John Muir Trust)
Simon Heyes (Infinis)
Simon Wannop (REG)
Zoe Keeton (RWE Innogy)
Zoe Leader (Citizens Advice)

The views expressed in this report, and any errors therein, are the authors' own.

Executive Summary

Context

The UK has been building onshore wind farms since the 1990s. Onshore wind is now the UK's largest source of renewable energy, with more than 8GW of operational capacity meeting 5.6% of the UK's electricity needs. More than 60% of existing, consented, and planned onshore wind farms in the UK are located in Scotland (by capacity). The onshore wind industry now supports some 13,600 jobs across the UK, in project development, manufacturing, construction, operations, and maintenance.

The Government has recognised the important contribution that onshore wind makes towards meeting the UK's decarbonisation and renewable energy commitments. However, the new Government has changed the direction of onshore wind policy, committing to "halt the spread of subsidised onshore wind farms" and making significant changes to onshore wind subsidies and planning policies.

This report examines the future of onshore wind as one of the major low carbon energy generation opportunities in the UK. We examine the case for continuing the deployment of onshore wind, and review the latest onshore wind policy announcements. We outline a series of recommendations to continue the deployment of onshore wind, but in a form where subsidies are progressively removed and communities have more of a say.

The case for onshore wind

Public opinion is generally in favour of onshore wind

Onshore wind is a technology that divides opinion: some people are strongly opposed to it, whilst others don't mind or are supportive of it. A 2003 MORI Scotland survey, commissioned by the Scottish Executive, explored the opinions of 1,810 people living near larger onshore wind farms in Scotland. When asked "What effect, if any, would you say the presence of the windfarm has had on your local area?", 7% of people said they had a negative impact, 20% said they had a positive impact, but the majority (74%) did not express an opinion either way. The most common concern raised about onshore wind is landscape and visual impact, but research shows that the problems expected by communities generally do not turn out to be as bad as anticipated.

The general population is also largely in favour of onshore wind: a Government survey revealed that approximately two-thirds of the UK population support onshore wind, and a 2013 poll found that 70% of the public would be happy to have an onshore wind farm in their local area. Support for onshore wind is also far greater than for nuclear energy or fracking.[1]

1 Fracking is the process of releasing shale gas from rock by using a high pressure water solution to create, or keep open, fractures in the rock.

Some groups of people are more likely to oppose onshore wind developments than others. YouGov polling data reveals that the groups of people most likely to oppose onshore wind farms are those aged 55 and above, males, those in rural locations, and Conservative or UKIP voters. This does not mean that all people within these categories oppose onshore wind, but that opposition is more prevalent in these groups. For example whilst more than a third (38%) of Conservative voters in the 2010 election oppose onshore wind, more than half (53%) support it. Support for onshore wind is higher in Scotland than England and Wales, and the Devolved Governments are seen as more supportive of renewable energy development than Westminster.

Onshore wind is cheaper than other sources of low carbon power

Analysis by the Department of Energy and Climate Change (DECC) suggests that onshore wind is already the cheapest major form of low carbon power generation available in the UK: cheaper than alternatives such as solar, biomass, nuclear or Carbon Capture and Storage. Costs have come down in recent years, in particular due to the introduction of an auction mechanism for allocating subsidy contracts (the Contract for Difference mechanism, or CfD). Onshore wind still requires support, but this is diminishing over time.

Our analysis suggests that there is significant scope for further cost reduction if onshore wind continues to be deployed in the UK. Onshore wind costs in the UK are well above other leading markets, due in part to the fact that the UK is not using the latest technology available. If all cost reduction opportunities were pursued then the cost of onshore wind could approach the cost of new gas generation by 2020 or shortly thereafter.

A moratorium on onshore wind is likely to lead to a higher cost to consumers of meeting decarbonisation objectives. For example, replacing 1GW of onshore wind with the equivalent amount of power from offshore wind would increase the cost to consumers by £75–90 million each year. As identified in a recent Policy Exchange report, the energy and climate change budget is already extremely stretched.[2] On this basis, we recommend that the Government continues to pursue mature renewables including onshore wind, rather than abandoning them in favour of more expensive options. As the cheapest form of low carbon power, onshore wind should logically continue to play a role in cutting carbon emissions, provided that developments are acceptable to communities.

Onshore wind has not compromised the stability of the energy system

Onshore wind produces variable amounts of power, which presents a challenge in terms of system balancing and system security. Onshore wind generators only pay for part of the cost they impose on the system. However, the UK has coped with incorporating 13GW of wind capacity to date (onshore and offshore combined) and other countries such as Denmark and Ireland obtain a much large share of power from wind farms than the UK.

The notion that onshore wind is "unable to provide firm capacity" is misleading: policymakers think about security of the system as a whole, and no technologies are able to provide firm capacity 100% of the time. Onshore wind is less predictable and offers less system benefit than say a gas power plant, but to date this has been manageable.

2 Richard Howard, *The Customer Is Always Right* (Policy Exchange, 2015), http://www.policyexchange.org.uk/publications/category/item/the-customer-is-always-right-putting-consumers-back-at-the-heart-of-uk-energy-policy

Evidence suggests that the system cost of managing the variability of wind power is relatively low, although this could increase as more wind capacity is added. The combination of increasing electricity storage capacity, interconnection to other power markets, and Demand Side Response, will make a contribution to managing larger amounts of wind capacity. That said, further research on the system costs and practical implications of increasing wind and other intermittent capacity is required. Policy changes could be made to better reflect the system cost of different forms of generation.

Onshore wind subsidies

To date, onshore wind projects have mainly been supported under the Renewables Obligation (RO) subsidy mechanism, which provides 'green certificates' to generators which can be sold to energy suppliers. Going forward, the RO is being replaced with a new mechanism, the Contract for Difference (CfD). Unlike the RO where support levels are set by Government, the CfD model uses an auction framework to allocate support. Policy Exchange has previously argued that auctions could reduce the cost of decarbonisation to consumers, and this is confirmed by our analysis of the most recent CfD auction results.[3] The CfD model also offers other benefits such as giving Government far greater control on overall expenditure.

The RO model is scheduled to close to all new projects in March 2017. However, the Government has recently announced its intention to bring forward the closure of the scheme to new onshore wind projects to March 2016. Projects already supported under the RO will continue to receive support, but no new projects would be allowed to accredit to receive support after March 2016. In making this change, Government has put in place a grace period, which in theory means that many consented onshore wind farms will still be able to proceed. However, there is uncertainty surrounding the precise impact of this change, since the legislative process itself is creating risk and leading financiers to withdraw funding for new projects.

Recommendation: The Government should fast-track the Energy Bill to minimise uncertainty concerning the early closure of the Renewables Obligation for onshore wind developers.

The Government has also alluded to the possibility of excluding onshore wind from future CfD auctions, which in our view would be a mistake. It is likely that reductions in the cost of onshore wind, coupled with increasing competition from solar PV projects, will further drive down the cost of achieving decarbonisation under the CfD model. Our analysis shows that onshore wind could approach the cost of new build gas generation by 2020 or shortly thereafter, at which point a CfD contract should no longer been seen as a 'subsidy'.

If onshore wind remains in the CfD, it is likely that it would favour lower cost onshore wind projects in Scotland and Wales over projects in England. In fact, modelling suggests that future CfD auctions would deliver almost no new onshore wind capacity in England (where there is more public and political opposition).

Conversely, removing onshore wind from the CfD would distort what was intended to be a technology-neutral auction, and may contravene the State Aid approval that was given for the CfD.

Alongside the development of new onshore wind farms there is also the question of what happens to existing wind farms at the end of their economic

3 Simon Moore, *Going, Going, Gone: The Role of Auctions and Competition in Renewable Electricity Support* (Policy Exchange, 2013), http://www.policyexchange.org.uk/publications/category/item/going-going-gone-the-role-of-auctions-and-competition-in-renewable-electricity-support?category_id=24

lifetime. There is now a growing pipeline of sites that are reaching 10+ years of operation, and could potentially be 'repowered' – upgrading the turbines but potentially reusing other infrastructure. Evidence suggests that repowering can further reduce the cost of onshore wind, and also faces lower community resistance than building on new sites.

Recommendation: The Government should continue to allow new and repowered onshore wind projects to proceed under the CfD model, as a cost effective route to decarbonisation. Together with the early closure of the RO this will largely bring a halt to onshore wind development in England, but allow cost-effective projects to continue in Scotland and Wales. Ultimately, this will lead to a saving for UK consumers versus alternative ways to meet decarbonisation objectives.

Whilst we recommend that onshore wind should continue under the CfD model, Government needs to ensure that it is getting best value for money for consumers. It is clear from our analysis that onshore wind can achieve significant cost reductions, achieving a cost similar to that of a new build gas power station by 2020 or shortly thereafter. Onshore wind projects will continue to require a CfD contract, but as the strike price declines and approaches the cost of a gas power station it should no longer be seen as a 'subsidy'.

Recommendation: The Government should revise down 'administrative strike prices' in the CfD auction to cap the amount payable to new and repowered onshore wind projects. The cap should taper downwards to achieve a reduction in subsidies to onshore wind, whilst also recognising that fossil fuel generators (such as gas) also receive subsidy payments.

Planning for onshore wind

Implications of recent policy announcements

The Government has proposed two changes to the planning system to give the public "the final say" on onshore wind developments. However, due to devolution, this will have no impact on Scotland (where the bulk of projects in the planning system are located). Instead, the impacts will be mainly in England, with minimal long-term impacts in Wales (Wales will likely have almost complete control over onshore wind planning applications as a result of the proposed Wales Bill).

The first change that the Government is introducing is transferring decision-making powers for onshore wind developments of 50MW or greater capacity from the Planning Inspectorate to Local Planning Authorities (LPAs). This will affect large projects in England, albeit that there are currently no onshore wind developments of this size currently awaiting a planning decision in England.

Recommendation: The Government is committed to ensuring that all onshore wind developments in England are decided by Local Planning Authorities (Welsh Minsters are likely to determine all onshore wind developments in Wales in future). As a result, the information on onshore wind within the National Policy Statement for Renewable Energy Infrastructure (which sets out Government policy for delivering major renewable energy infrastructure) should be transferred to the Planning Practice Guidance for Renewable and Low Carbon Energy, which only applies to England.

The second change applies to onshore wind developments of any size in England. From 18 June 2015, planning permission can only be granted if the development site is in an area "identified as suitable for wind energy development in a Local or Neighbourhood Plan", *and* "planning impacts identified by affected local communities have been fully addressed and the proposal has their backing."

This effectively halts *all* new onshore wind applications in England, at least in the short term, since almost 40% of LPAs do not have a Local Plan. Even those that do have a Plan are unlikely to have identified sites suitable for onshore wind development (there is also no guidance available on how suitable sites should be identified). Moreover, demonstrating community backing is problematic in the absence of guidance on how this requirement is to be applied, leading to a Catch-22 situation for LPAs, which could expose them to legal action for either granting or refusing consent depending on how "community backing" is interpreted.

The foundation of current planning policy, the 2012 National Planning Policy Framework (NPPF), set out the core principle of a "presumption in favour of sustainable development". Yet the new requirement for explicit site allocation in a Local or Neighbourhood Plan is effectively a presumption against sustainable development, at least until sites are allocated. This stands in the way of onshore wind projects that are community-led, or commercial projects supported by communities, which is counter to DECC's 2014 Community Energy Strategy.

Recommendation: The condition for only granting planning permission to onshore wind developments on sites that are specifically allocated in Local or Neighbourhood Plans is counter to the National Planning Policy Framework's core principle of a "presumption in favour of sustainable development". It should therefore be either removed entirely, or at least removed for community-scale developments. All developments would still need to demonstrate community backing.

Recommendation: DCLG should set out clearly what it means by community backing in this context, in order to reduce the risk of legal challenge by both developers and communities.

Increasing community support for onshore wind

The Government's recent planning policy announcements effectively halt onshore wind development altogether (in England). It is important that local communities are not forced to host unwelcome onshore wind farms (or indeed other energy developments). However, as a previous Policy Exchange report on housing has argued, our "planning system does not do enough to recognise that the impact of development is focused on those closest to development". There is therefore a strong argument that future onshore wind development should involve greater community engagement and community benefit.

Community benefits

DECC surveys show that almost 80% of the public think that renewable energy developments should provide direct benefit to the communities in which they are located. Onshore wind developments offer a wide range of potential sources of community benefits, including community benefit funds, community ownership, business rates, benefits in kind, and discounted electricity. Community benefits can be substantial: the Scottish wind energy industry now contributes £8.8 million per year to local communities. However, many of these sources of community benefit are not achieving their full potential.

The amount of funding offered by developers as part of Community Benefit Funds (CBFs) is highly variable between projects and across the UK. The industry standard for new projects is a CBF of £5,000 per MW per annum, but many older projects are offering far less than this. The CfD auction model favours projects that offer lower community benefits (since they face lower costs).

Recommendation: DECC should introduce a requirement for all onshore wind projects in future CfD rounds for a minimum Community Benefit Fund of £5,000 *per MW per annum* (this should not apply retrospectively to projects that have already been awarded CfDs).

There can also be issues with governance and effectiveness of CBFs. Learning from best practice is important, but there is currently no requirement for developers to provide public details of the community benefits they offer in a central database.

Recommendation: There should be a mandatory requirement for developers to input data into the community benefit registers.

Under Ofgem's Retail Market Review, energy suppliers are limited to having four core tariffs, which reduces the ability of energy companies to offer tariff reductions to local residents around onshore wind farms. A recent report by the Competition and Markets Authority made a provisional recommendation to remove the restriction on tariffs, in order to stimulate competition and innovation in energy tariffs. This would make it far easier for energy companies to develop tariff reductions schemes for communities close to onshore wind farms.

Recommendation: Ofgem should implement the Competition and Markets Authority's recommendation to remove the Retail Market Review's tariff restrictions for domestic retail energy suppliers.

DECC has previously supported the growth of community ownership in the energy sector. The diversity of models available helps meet the varying needs of different communities. However, the Financial Conduct Authority has recently blocked several applications for the creation of renewable energy co-operatives. This could hinder community ownership of onshore wind developments, with implications for garnering community support.

Recommendation: DECC should ensure that a quick resolution is found to the issue of community ownership structures, to both reduce uncertainty and help meet community ownership goals.

1
Introduction

... the power of the wind, constantly exerted over the globe... here is an almost incalculable power at our disposal, yet how trifling the use we make of it.

Henry David Thoreau[4]

Current status of onshore wind

Across the globe, there was 370GW of installed wind capacity as at the end of 2014, comprising 361GW onshore wind and 9GW offshore wind.[5] The EU represents 35% of this at 129GW, of which 121GW is onshore and 8GW is offshore.[6] In 2014, the UK had just over 2% of the operational onshore wind capacity in the world, at 8GW. Together with 4GW of offshore wind capacity, this made the UK the sixth-largest country in the world by total installed wind capacity, after China (115GW), USA (66GW), Germany (39GW), Spain (23GW), and India (22GW).[7] In terms of annual build rate, in 2014 the UK was the second largest market for wind in Europe, after Germany.

Box 1.1: Energy and planning terminology

The size of a wind farm is defined in terms of the installed capacity (measured in watts W), which denotes the maximum rate of electricity generation. Throughout this report, capacity is either stated in Megawatts (1 million watts, MW) or Gigawatts (1 billion watts, GW). Electricity production is measured in watt-hours (or kilowatt hours (kWh), megawatt hours (MWh), gigawatt hours (GWh), etc.).

In this report, we will be focusing on mainly on mid- to large-scale scales of onshore wind farms, which we define according to the planning processes they require and the subsidies they are eligible for (Table 1.1).

Table 1.1: Characteristics of the different scales of onshore wind farms

Scale	Windfarm Capacity	Eligible subsidy regime/s	Planning applications determined by…
Small-scale	<5MW	Small-scale Feed-in-Tariff	Local planning authorities & Secretary of State for Communities and Local Government
Mid-scale	5–49MW	Contract for Difference Renewables Obligation	
Large-scale	≥50MW		Planning Inspectorate & Secretary of State for Energy and Climate Change

4 Henry David Thoreau, "Paradise (To Be) Regained," *The United States Magazine and Democratic Review*, 1843.

5 Global Wind Energy Council, *Global Wind Report: Annual Market Update*, 2014.

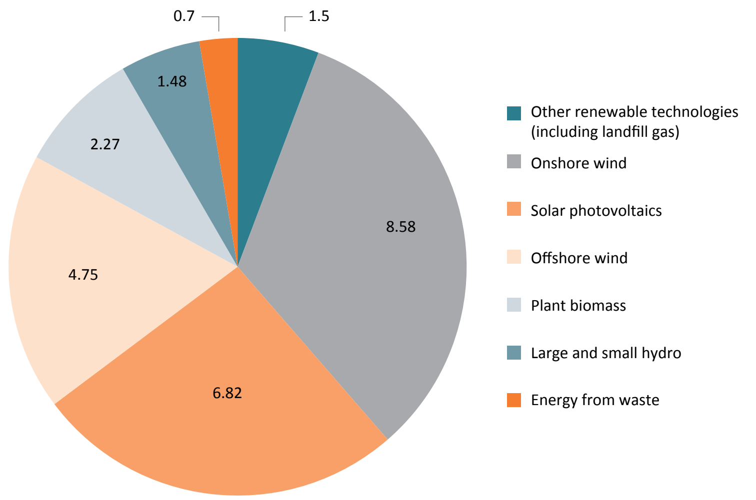
6 Global Wind Energy Council, *Global Wind Statistics 2014*, 2015.

7 Ibid.

We also distinguish between onshore wind *farms* (i.e. that are already operational or under construction) and onshore wind *developments* (i.e. that are consented / awaiting construction, or awaiting a planning decision).

More recent data from the Department of Energy and Climate Change (DECC) shows that the UK has now reached 8.6GW of installed capacity as at the end of March 2015. Onshore wind remains the UK's largest source (32.4%) of renewable energy in terms of installed capacity (Figure 1.1), accounting for almost 6% of the total electricity supplied in the UK.[8]

Figure 1.1: Total operational capacity (in GW) of renewable energy technologies in the UK[9]



DECC's renewable energy planning database provides a useful breakdown by country and stage of development (note that the planning database differs slightly from DECC's capacity and generation data in estimating total installed onshore wind capacity at 8.4GW rather than 8.6GW). This shows that onshore wind farms are not distributed evenly across the UK (Figure 1.2). In fact, they are overwhelmingly focused in Scotland, which has just over 5GW (61%) of the total installed onshore wind capacity in the UK – 2.4 times the capacity in England (2.1GW). Scotland has higher wind speeds and a sparser population than the rest of the UK, making it more conducive to onshore wind development.

In addition to operational capacity, there is a further 6.6GW of capacity across the UK that is either currently being built, or has planning consent and is awaiting construction. Again, the majority of these projects are located in Scotland, which has four times (4.3GW) the consented capacity in England (1GW). Onshore wind projects typically take around two years to build, following consent, although for various reasons relating to project economics, radar and grid issues it cannot be assumed that all consented projects will proceed (for example, 35 consented developments have been formally abandoned since 2000).[11]

Beyond this, there is a further 6.5GW of projects where a planning application has been submitted and the developer is currently awaiting a decision. As with operational

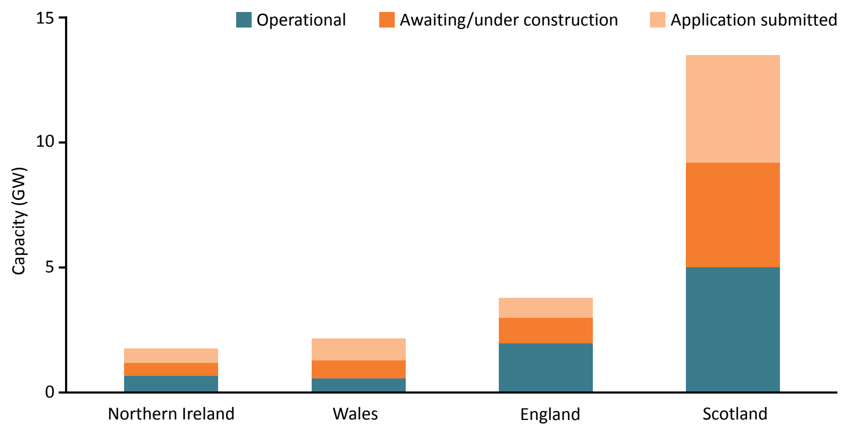
8 DECC, "Renewable Electricity Capacity and Generation 2015 Q1," 2015, https://www.gov.uk/government/statistics/energy-trends-section-6-renewables N.B. data for 2015 is provisional; RenewableUK, *Onshore Wind: Economic Impacts in 2014*, 2015, http://www.renewableuk.com/en/publications/index.cfm/BiGGAR

9 DECC, "Renewable Electricity Capacity and Generation 2015 Q1".

10 DECC, *UK Renewable Energy Roadmap: 2013 Update*, 2013, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/255182/UK_Renewable_Energy_Roadmap_-_5_November_-_FINAL_DOCUMENT_FOR_PUBLICATIO___.pdf; DECC, "Renewable Energy Planning Database: June 2015," 2015, https://www.gov.uk/government/statistics/renewable-energy-planning-database-monthly-extract

11 Ibid.

Figure 1.2: Operational and consented wind farm capacity in the different countries of the UK[10]



projects and those awaiting or under construction, Scotland has by far the largest capacity currently in the planning system, at 4.3GW (England has 0.8GW).

Analysis shows that the onshore wind industry now supports 13,600 jobs across the UK – in project development, manufacturing, construction, operations and maintenance.[12] This equates to £0.9 billion of Gross Value Added to the UK economy. Over the lifetime of an onshore wind project, 69% of total expenditure is within the UK: turbines are typically sourced from overseas, but construction spending is otherwise focused on UK firms. It is estimated that there are more than 3,000 long term jobs in operations and maintenance.

Decarbonisation and the role of onshore wind in the UK

There is strong scientific evidence to show that our climate is warming due to emissions of greenhouse gases, largely driven by human activity.[13] In response to this, the UK has set an ambitious target under the Climate Change Act to reduce carbon emissions by 80% by 2050 compared to 1990 levels. The UK has also set a number of five-yearly 'carbon budgets' as stepping stones towards the 2050 target (the fourth carbon budget has been set for the period 2023 to 2027). Both the 2010 and 2015 Conservative manifestos stressed the importance of tackling climate change – both by working internationally to secure a global deal, and by taking action to reduce the UK's emissions.

Reducing emissions from the power sector has been the principal focus of efforts to reduce UK emissions to date, and onshore wind has been seen as playing a key role. The 2010 Conservative manifesto stated an intention to "promote small- and large-scale low carbon energy production, including nuclear, wind, clean coal and biogas."[14] The Coalition Government set out the UK's strategy for renewable energy in the 2011 Renewables Roadmap.[15] This suggested that there could be 10–19GW of onshore wind capacity by 2020, with a central range of up to 13GW. The 2013 update to the Roadmap states that "as one of the most cost effective and proven renewable energy technologies, [onshore wind] has an important part to play in a responsible and balanced UK energy policy."[16]

12 RenewableUK, *Onshore Wind: Economic Impacts in 2014*, 2015.

13 Committee on Climate Change, "Tackling Climate Change," 2015, https://www.theccc.org.uk/tackling-climate-change/; IPCC, *Climate Change 2013: The Physical Science Basis* (Cambridge University Press, 2013), http://www.ipcc.ch/report/ar5/wg1/

14 The Conservative Party, *Invitation To Join the Government of Britain: The Conservative Manifesto 2010*, 2010.

15 DECC, *UK Renewable Energy Roadmap*, 2011.

16 DECC, *UK Renewable Energy Roadmap: 2013 Update*.

However, both documents recognise that the planning system and community opposition are key barriers to further deployment.

In 2011, the independent statutory advisory body, the Climate Change Committee (CCC), recommended that the Government "pursue a portfolio approach, with each of the different technologies [including onshore wind] playing a role." Critically, the CCC found that this should "include market arrangements to encourage competitive investment in mature technologies such as nuclear and onshore wind generation." The CCC has recently published a new report which suggests that current policies are insufficient to meet legislated carbon budgets and the cost effective pathway to achieving long term decarbonisation.[17] Therefore a policy to halt onshore wind could affect the UK's ability to meet decarbonisation targets, and means that additional effort would be required in other sectors and technologies.

A new onshore wind policy

Recent events mark a significant change in the Government's attitude towards onshore wind. Whilst the 2010 Conservative manifesto position was to promote onshore wind, the 2015 Conservative manifesto included a commitment to "halt the spread of subsidised onshore wind farms".[18] The 2015 manifesto gave the following reasons for this change in policy:

1. **Public Opinion:** the manifesto stated that onshore wind farms "often fail to win public support". This is considered in **Chapter 2** of this report.
2. **Security of Supply:** the manifesto stated that onshore wind farms "are unable by themselves to provide the firm capacity that a stable energy system requires". This is explored in **Chapter 4** of this report.

The manifesto also outlined how onshore wind farms would be halted. It proposed to change "the law so that local people have the final say" on onshore wind planning applications. The implications of the Government's proposals are discussed in **Chapter 5.**

The manifesto also proposed to "end any new public subsidy" for onshore wind. Onshore wind developments are currently supported under three different mechanisms, all of which are paid for through levies on consumer energy bills:

- the small-scale Feed in Tariff (ssFIT) supports projects under 5MW, plus community projects. Support is provided in the form of a feed in tariff payment to generators.
- the Renewables Obligation (RO) has since 2002 been the main mechanism to support large-scale renewables. Support is provided in the form of Renewables Obligation Certificates, which have a tradable value. The RO will close to all new generators in March 2017.
- the new Contract for Difference (CfD) regime was introduced to replace the RO. Subsidy support is allocated through a competitive auction on the basis of price. Onshore wind competes against other mature renewable technologies such as solar photovoltaics (solar PV). The first auction round concluded in February 2015.

17 Committee on Climate Change, *Meeting Carbon Budgets – Progress in Reducing the UK's Emissions*, 2015, http://www.theccc.org.uk/publication/reducing-emissions-and-preparing-for-climate-change-2015-progress-report-to-parliament/

18 The Conservative Party, *Strong Leadership, A Clear Economic Plan, A Brighter, More Secure Future: The Conservative Party Manifesto 2015*, 2015.

The Government recently confirmed its intention to close the RO to onshore wind one year early, in March 2016, but has not yet set out firm plans in relation to the CfD. The question of subsidy is linked to the economics of onshore wind farms, which we consider in **Chapter 3.**

2
Public Opinion of Onshore Wind

The 2015 Conservative manifesto claimed that onshore wind developments "often fail to win public support". This chapter examines polling and survey data to determine to what extent this is the case, particularly focusing on comparisons with other energy technologies.

Public opinion is generally in favour of onshore wind

It is often said that there is a lack of support for onshore wind, and resistance from local residents. However, this appears not to be backed up by the evidence. For example, a study of objections to the planning application for Bears Down wind farm in Cornwall revealed that 95% came from people living outside Cornwall, likely due to the large proportion (almost 50%) of dwellings in the area being second homes.[19]

A 2003 study of *local* attitudes towards larger wind farms in Scotland was conducted by MORI Scotland (commissioned by the Scottish Executive). 1,810 people living up to 20km away from ten large onshore wind developments (9–46 turbines in size) were interviewed by telephone. It revealed that those living within 20km of onshore wind farms were largely indifferent towards them. When asked "What effect, if any, would you say the presence of the windfarm has had on your local area?", 7% of people stated that they have a negative impact, 20% stated that they have a positive impact, and the majority (73%) did not express an opinion either way. Interestingly, people living closest to wind farms and those who most frequently see them were found to be the most favourably disposed towards them: 45% of those living within 5km considered that they have a positive impact, whilst only 17% of those living 10–20km away were supporters. In contrast, just 6% of people living up to 5km and 6% of people living 10–20km away considered that larger onshore wind developments have a negative impact.[20]

At a national level, polling commissioned by the Government reveals that approximately two-thirds of the UK population support onshore wind (Figure 2.1).[21] In addition, a 2013 poll found that 70% of the public would be happy to have an onshore wind farm in their local area.[22] By comparison to other energy technologies, onshore wind has less support than solar or offshore wind, but far more support than nuclear or fracking.[23] For example, a 2013 poll found that people were more than twice as likely to prefer an onshore wind farm in their local area (68%) than a fracking plant (32%).[24] This highlights the disparity between public opinion and Government policy of supporting fracking but attempting to halt onshore wind development.

19 Sally Sims and Peter Dent, "Property Stigma: Wind Farms Are Just the Latest Fashion," *Journal of Property Investment & Finance* 25, no. 6 (2007): 626–51; Sally Sims, Peter Dent, and G. Reza Oskrochi, "Modelling the Impact of Wind Farms on House Prices in the UK," *International Journal of Strategic Property Management* 12, no. 4 (2008): 251–69.

20 Simon Braunholtz, *Public Attitudes to Windfarms* (Scottish Executive, 2003), http://www.scotland.gov.uk/socialresearch

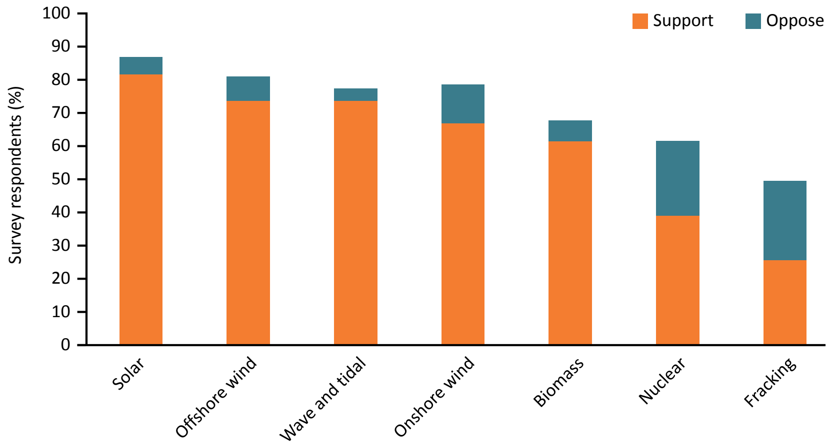
21 DECC, "Public Attitudes Tracker – Waves 1–13 Headline Findings," 2013.

22 Survation, *Energy Poll 27/10/2013 Prepared on Behalf of The Mail On Sunday*, 2013, http://survation.com/the-great-uk-energy-debate-survation-take-a-detailed-look-for-the-mail-on-sunday/

23 Fracking is the process of releasing shale gas from rock by using a high pressure water solution to create, or keep open, fractures in the rock.

24 Survation, *Energy Poll 27/10/2013 Prepared on Behalf of The Mail On Sunday*, 2013, http://survation.com/the-great-uk-energy-debate-survation-take-a-detailed-look-for-the-mail-on-sunday/.

Figure 2.1: Average levels of public support and opposition to different energy generation technologies and fracking over Waves 8–13 (2014–15) of DECC's Public Attitudes tracker survey[25]



Who supports or objects to onshore wind developments?

There are some groups of people that are *more likely* to oppose onshore wind developments (although by no means all, or even the majority of, members of these groups oppose onshore wind). Polling data from YouGov suggests that the groups of people most likely to strongly oppose wind developments are people aged 55 and above, males (particularly males over the age of 55), and those living in rural areas. There is also a political angle, with UKIP and Conservative voters most likely to be opposed to wind developments (such voters are disproportionately focused in the countryside, where onshore wind farms tend to be located).[26] Interestingly, whilst more than a third (38%) of Conservative voters in the 2010 election oppose onshore wind, more than half (53%) support it.[27] In addition, whilst those in rural locations are more likely to oppose onshore wind than those in urban locations, the 2003 MORI Scotland study found that it is those living furthest away from developments that are most likely to have a negative perception of them. The public in Scotland support onshore wind more strongly than the public in England and Wales (71% think it should be allowed or encouraged in Scotland, compared to 61% in England and Wales).[28] The demographic profile of objectors (particularly age and voting preference) may go some way to explaining the current Government's stance on onshore wind (Figure 2.2).

The accepted wisdom is that objection to onshore wind developments is the result of 'not in my back yard' (NIMBY) syndrome.[29] However, the academic literature identifies several different categories of objector:

- **Qualified Supporters** – a large proportion of the population that supports wind energy in qualified circumstances (they are concerned about the impact on the environment but particularly on landscape and fairness);
- **Place-Protectors** – do not apply a universal qualifier on support, but oppose development on the basis of the value of a particular place over and above

25 DECC, "Public Attitudes Tracker – Waves 1–13 Headline Findings".

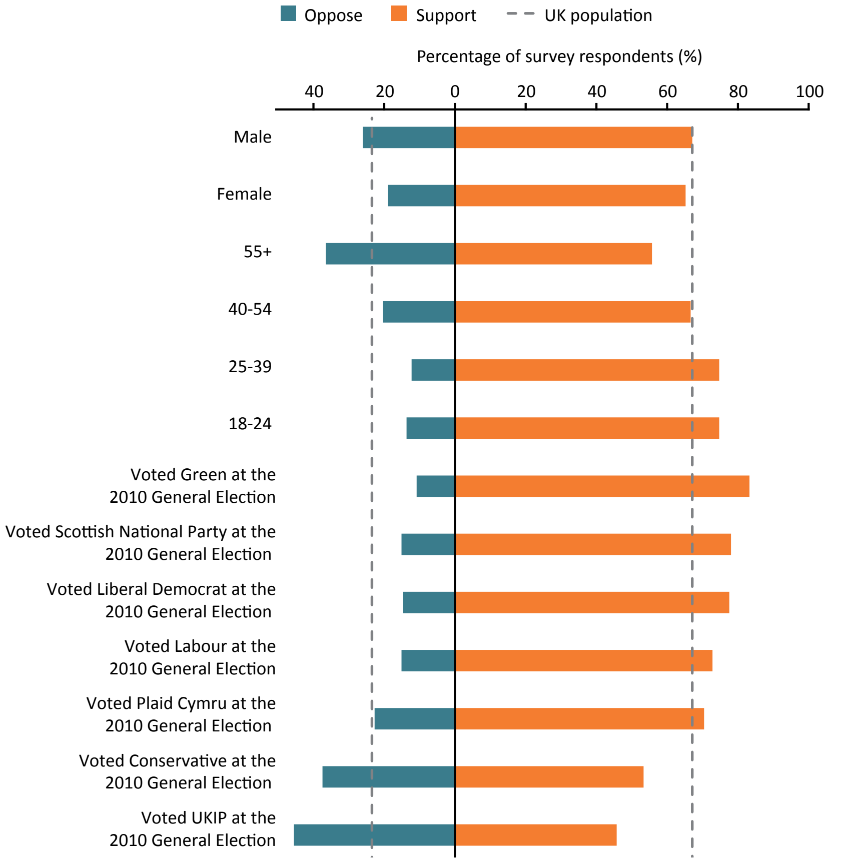
26 YouGov, no. of those strongly opposed to onshore wind = 8,435 (26-07-2015).

27 YouGov, no. of Conservative voters in the 2010 election = 64,038 (26-07-2015).

28 *YouGov / Sunday Times Survey Results*, 2015, http://d25d2506sfb94s.cloudfront.net/cumulus_uploads/document/gxvihxoixc/SundayTimesResults_150515_Website.pdf

29 Christopher R. Jones and J. Richard Eiser, "Understanding 'Local' Opposition to Wind Development in the UK: How Big Is a Backyard?," *Energy Policy* 38, no. 6 (2010): 3106–17.

Figure 2.2: Characteristics of opponents and supporters of onshore wind developments[30]



other places (it is difficult to determine the proportion of the population that falls in this category because of the similarity with Qualified Supporters);

- **NIMBYs** – a small proportion of the population that objects to local developments purely out of self-interest, without regard for the impacts on other people; and
- **Unqualified Opponents** – a small proportion of the population that indicates strong opposition to wind energy in opinion surveys, regardless of location or other considerations.[31]

Why do people object to onshore wind developments?

Academic research has generally found that landscape and visual impacts are a key driver of public opinion towards onshore wind developments.[32] For example, a study of larger wind farms in Scotland revealed that whilst most people had no particular concerns, the most common concern identified was that the look of the landscape would be spoiled (Figure 2.3).[33] This was particularly the case with people who were already living in the area before the wind farm was built.

The study also revealed that there are large differences between the anticipated and actual problems associated with onshore wind farms (Figure 2.4). The general trend is that problems did not turn out to be as bad as anticipated, including landscape impacts. Problems associated with the construction phase

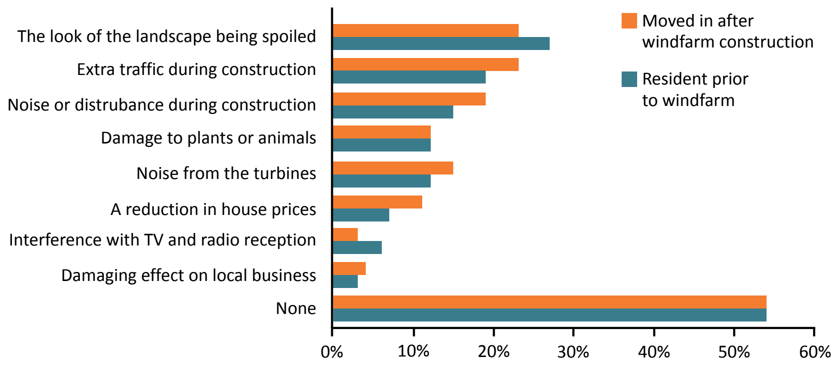
30 YouGov (26-07-2015)

31 Derek Bell, Tim Gray, and Claire Haggett, "The 'Social Gap' in Wind Farm Siting Decisions: Explanations and Policy Responses," *Environmental Politics* 14, no. 4 (2005): 460–77; Derek Bell et al., "Re-Visiting the 'Social Gap': Public Opinion and Relations of Power in the Local Politics of Wind Energy," *Environmental Politics* 22, no. 1 (2013): 115–35.

32 Maarten Wolsink, "Wind Power Implementation: The Nature of Public Attitudes: Equity and Fairness instead of 'Backyard Motives,'" *Renewable and Sustainable Energy Reviews* 11, no. 6 (2007): 1188–1207; Bell et al., "Re-Visiting the 'Social Gap': Public Opinion and Relations of Power in the Local Politics of Wind Energy".

33 Simon Braunholtz, *Public Attitudes to Windfarms* (Scottish Executive, 2003), http://www.scotland.gov.uk/socialresearch

Figure 2.3: The main problems that people associate with onshore wind farms[34]

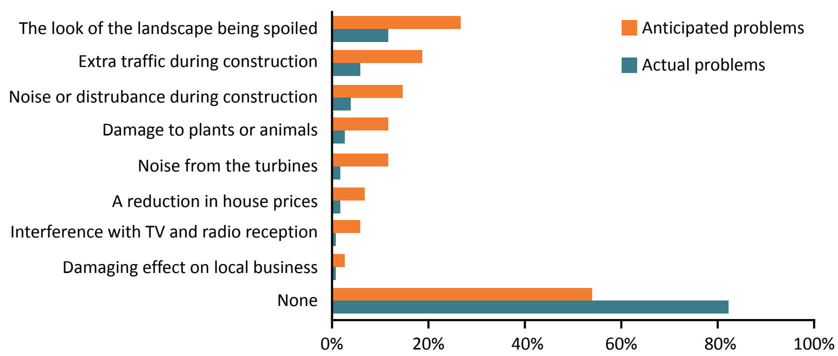


Base: Residents living within 20 km of a Scottish windfarm site (1,810)
Source: MORI

of a project can generally be controlled through the use of planning conditions. Damage to plants or animals, noise from turbines, and interference with TV and radio reception are of less concern to residents, and these impacts can be reduced through careful siting and use of modern technology. Research on the effect of onshore wind farms on house prices has produced mixed results: since there are a wide variety of different variables that could contribute to changes in house prices (such as changes in local crime rates, and the size and other characteristics of properties), the results are highly dependent on the methodology used. The most commonly cited issue was landscape impact, but even here the actual impact was less than anticipated (27% of people anticipated it to be a problem, but only 12% experienced this as an actual problem).

Figure 2.4: Anticipated versus actual problems with onshore wind farms[35]

Question: Which of the following problems, if any, did you think having a windfarm in the area might cause?
Question: And which, if any, have actually turned out to be problems caused by having a windfarm in the area?

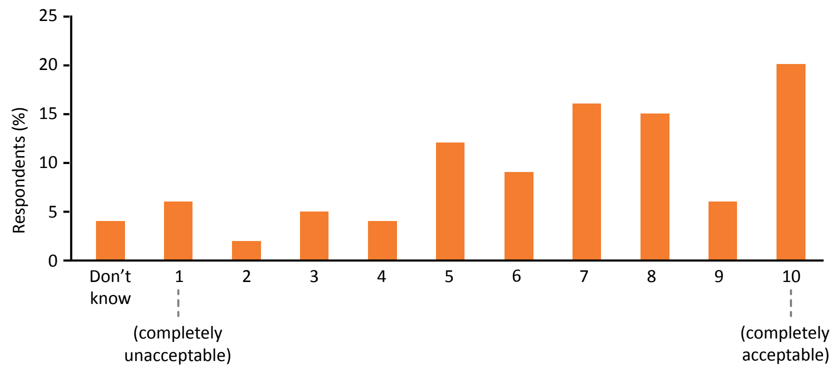


Base: All who lived in their property before the windfarm was developed (1,547)
Source: MORI

34 Ibid.

35 Ibid.

Figure 2.5: Responses to the survey question "To what extent do you find the look of wind farms on the landscape acceptable or not? Please give your answer on a scale of 1–10 where 1 means completely unacceptable and 10 means it's completely acceptable"[36]



In addition, a 2012 poll found that the majority (66%) of the general public find the look of wind farms in the landscape acceptable (Figure 2.5, percentage of people answering 6 or above).

Key findings

One of the reasons given in the 2015 Conservative manifesto for proposing to "halt the spread of subsidised onshore wind farms" was that new onshore wind developments "often fail to win public support".

However, public opinion is largely in favour of onshore wind, with two-thirds of the public supporting it. The level of objection amongst Conservative supporters is significantly higher than for the population in general, but despite this **more than half of Conservative voters support onshore wind farms.** Those that live closest to onshore wind farms are generally ambivalent towards them (although in general those in rural areas are more likely to be opposed than those in urban areas).

As with any new form of development, onshore wind developments are unlikely to gain 100% support, either locally or outside the local area. Whilst onshore wind is less supported than other forms of renewables such as solar, it receives far greater support than nuclear or fracking. The claim that onshore wind farms "often fail to win public support" is therefore correct, but this is not a compelling argument for halting onshore wind, given its cost-effectiveness (discussed in Chapter 3). Indeed, if energy policy was decided entirely on the basis of public support, then this would suggest that the government should also reconsider its position on nuclear and fracking.

Landscape and visual impacts are the most frequently cited long-term concern amongst communities faced with a proposed onshore wind development, however rates of concern generally fall once a wind farm has been built.

36 Ipsos MORI, *Wind Power Omnibus Research*, 2012, https://www.ipsos-mori.com/researchpublications/researcharchive/2946/RenewableUK-Wind-Power.aspx

3

The Economics of Onshore Wind

This chapter considers the economics of onshore wind, the Government's commitment to "halt the spread of subsidised onshore wind farms", and the proposed changes to subsidy mechanisms. We argue that curtailing onshore wind deployment is likely to increase the cost of decarbonisation to consumers.

Onshore wind is the cheapest low carbon technology

Evidence from analytical studies and the recent Contract for Difference (CfD) auction suggests that onshore wind is currently the cheapest major low carbon source of power available in the UK. DECC has developed estimates of the 'Levelised cost' of different energy technologies (see Box 3.1 for a definition), the latest version of which was published in 2013.

Box 3.1: Levelised cost of energy

Energy generation technologies have very different cost structures. Many low carbon technologies, such as onshore wind and nuclear have high up-front capital costs and low or negligible running costs; whereas fossil fuel technologies tend to have lower up-front costs but higher running costs (including fuel costs). Because of this, many policymakers and analysts use the 'Levelised Cost of Energy' (LCOE) to compare technology costs – a measure of the overall cost per unit of energy over the expected lifetime of the project (in £/MWh). This is calculated based on the full cost of developing, constructing, operating and decommissioning the project, set against the expected energy output over its lifetime.

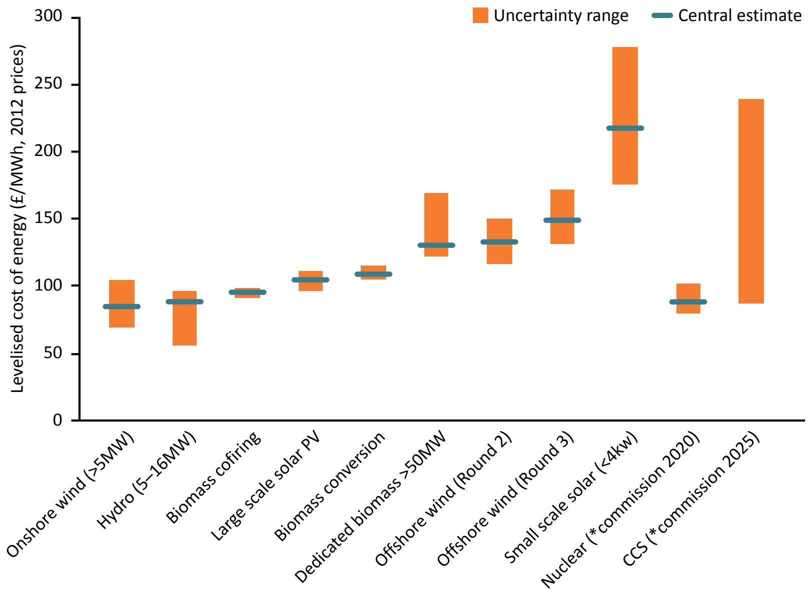
DECC suggests that onshore wind has a levelised cost of £85/MWh, which is lower than other renewable technologies such as solar PV, biomass conversion, and offshore wind (Figure 3.1). The only renewable technologies which potentially have lower costs are energy from waste and landfill gas (at £31/MWh and £50/MWh respectively), but these technologies have limited deployment potential in the UK, and so are not considered here as 'major' low carbon options for the UK going forward.[37]

DECC suggests that nuclear has a similar levelised cost as onshore wind, at £89/MWh, although it should be noted that this estimate relates to a 'theoretical' project commissioning in 2020. In reality, the next nuclear plant likely to be delivered in the UK is Hinkley Point C, for which government has agreed a subsidy contract at £92.50/MWh.[38] The cost of Carbon Capture and Storage from coal or gas power stations has a wide band of uncertainty, but is thought to be significantly more expensive than onshore wind at present.

37 DECC Renewable Energy Planning Database (February 2015 extract) shows 87MW of energy from waste capacity currently in planning, and 2MW of landfill gas capacity.

38 Note: the £92.50/MWh figure is a 'strike price'. See Box 3.2 for definition.

Figure 3.1: Current cost of low carbon generation technologies[39]



Whilst onshore wind is the cheapest of these technologies, it still costs approximately double the current market price of electricity (£40–45/MWh). A typical commercial-scale onshore wind project therefore obtains approximately half of its revenue from selling power, and the other half from subsidies. However, it should be noted that the current market price of electricity is below the level required to deliver investment in any new capacity, including fossil fuel generation such as gas. Therefore a potentially more relevant comparison is to the cost of alternative ways of delivering new capacity, rather than the current market price (this is discussed further below).

It is also important to note that Levelised Cost figures represent the *direct* cost of generation, but excludes wider costs such the costs associated with carbon emissions and power system costs. Generators are not exposed to the full costs they impose on the power system: for example the cost of balancing the system is spread across all generators on an even basis (rather than on the basis of the balancing requirements of individual technologies). System costs are considered further in Chapter 4 of this report.

The move to auctions has further reduced the cost of onshore wind

As outlined in Chapter 1, the Government has recently introduced a new mechanism to support the deployment of low carbon generation capacity in the form of the 'Contract for Difference', or CfD (see Box 3.2 for a description), which replaces the Renewables Obligation (RO).

The first CfD auction concluded in February 2015. The budget of £315 million[40] was allocated mainly to immature renewables (£260 million) with only a small share going to cheaper, mature renewables (£65 million).

In the immature renewables auction, the majority of funding went to two offshore wind projects totalling 1.2GW of capacity. A further 915MW of capacity

39 DECC, *Electricity Generation Costs*, 2013. Calculated at technology specific hurdle rates.

40 Measured in subsidy in the 2020/21 financial year, in 2011/12 prices.

Box 3.2: The Contract for Difference and 'strike prices'

Under the Energy Act 2013, the government introduced a new support mechanism for low carbon power generation: the 'Contract for Difference' (CfD). Unlike previous mechanisms, CfD contracts are allocated through an auction based on price. The first CfD auction round concluded in February 2015, with two separate auctions for 'mature' and 'less mature' technologies (also known as 'Pot 1' and 'Pot 2'). Onshore wind was included within the 'mature technologies' auction, alongside solar PV, energy from waste, hydro, landfill gas and sewage gas.

Under the CfD model, Government sets an overall budget for each 'allocation round', broken down into a number of technology 'pots'. Generators bid for the subsidy level they require in the form of a 'strike price'. Contracts are awarded to projects in ascending order of the strike price they bid until the available budget is exhausted. The clearing price in the auction sets the total revenue (£/MWh) that a generator will receive. The scheme is known as the 'Contract for Difference' since the generator is paid the difference between the market price of electricity and the agreed 'strike price'. In the case of onshore wind, the payments last for 15 years from the point of first generation.

There is often confusion between 'strike prices' and the Levelised Cost of Energy (see Box 3.1). LCOE is a measure of cost, whereas the 'strike price' defines the total revenue for a project whilst under a CfD contract. In general the strike price for a given technology will be higher than the LCOE due to differences in structure and assumptions.

was awarded to 'mature renewables', of which the vast majority went to 15 onshore wind projects (totalling 749MW), solar PV (72MW), and energy from waste (95MW).

Onshore wind delivered the lowest prices in the auction at £79.23/MWh for projects delivered in 2016/17, rising to £82.50/MWh for projects delivered in 2018/19 (Table 3.1).[41] This was substantially lower than the £114–120/MWh price for offshore wind in the 'less established technologies' auction (albeit that the cost of offshore wind has declined substantially compared to earlier projects).

Table 3.1: Summary of successful onshore wind projects in the 2014/15 CfD auction

	2015/16	2016/17	2017/18	2018/19	Total
Capacity (MW)	0	45	78	626	749
Administrative strike price (£/MWh, 2012 prices)	£95.00	£95.00	£90.00	£90.00	
Auction clearing price (£/MWh, 2012 prices)		£79.23	£79.99	£82.50	£82.04*
Reduction versus clearing price (%)		17%	11%	8%	9%*
Net subsidy payable (£/MWh, 2012 prices)		£26.35	£29.47	£33.57	
Equivalent LCOE (£/MWh, 2012 prices) – based on analysis by Policy Exchange		£72	£73	£75	£75*

Note: *Capacity weighted average

41 Note: two solar PV projects bid a lower price of £50/MWh but were subsequently abandoned by the developers.

The net subsidy payable to onshore wind projects under the CfD model is less than half of that for offshore wind (£30/MWh compared to £69/MWh[42]) demonstrating that onshore wind represents a much cheaper way to decarbonise than other less mature technologies. (Note: please see our recent report "The Customer is Always Right" for more detailed proposals on how to support less mature technologies).

Policy Exchange has previously argued strongly in favour of auctions as a method of allocating renewables subsidies (see our report "Going, Going, Gone"[43]), building on the experience of successful auctions around the world. The CfD auction delivered competitive prices for onshore wind and other renewables technologies, demonstrating the effectiveness of this model in driving down the cost of decarbonisation. Across the CfD auction as a whole, strike prices were 13% below the 'administrative prices' set by DECC. For onshore wind the reduction was between 8–17%, or 9% on average (Table 3.1). Analysis by Policy Exchange suggests that the strike prices for onshore wind equate to a levelised cost of around £75/MWh, which is considerably lower than the estimates of cost previously suggested by DECC (£85/MWh, see Figure 3.1).

More generally, as evidenced in a recent Policy Exchange report, the CfD has delivered low carbon capacity at a lower cost than previous mechanisms such as the RO.[44] A recent report by the Competition and Markets Authority also concluded that CfDs should provide a more efficient means of providing support than the RO, although it identified possible improvements to the auction design.[45]

Discussions with onshore wind developers as part of this research suggest that there are three main reasons why the CfD model has led to a reduction in cost (in general, and for onshore wind specifically):

- **Competition:** The RO is an open-volume (uncapped) mechanism available to all eligible projects. The price is set by government through consultation with industry based on third party assessments of cost. This approach was hampered by an 'asymmetry of information': there was no incentive for industry to provide accurate estimates of costs to government, making it difficult for government to set subsidies at an appropriate level. By contrast, the CfD model allocates support on the basis of a price auction, where there are winners and losers. The move to the CfD has created competitive pressure between projects, forcing bidders to price based on their best understanding of costs, and the lowest return they can accept. The demand for CfDs vastly outstripped the available budget – with the first CfD auction oversubscribed by nearly 4 to 1 in terms of bids versus available budget.[46] The competitive pressure has reportedly brought about a change in mind-set, with developers squeezing out costs and excess profits.
- **Risk reduction:** the CfD generally represents a lower risk to developers than the RO model. Unlike the RO, the CfD model insulates generators from movements in the wholesale price of electricity (a major source of revenue). This is, in effect, a significant transfer of risk from generators to government and therefore consumers. In addition, the CfD is secured in the form of a private law contract, offering a degree of 'change of law protection' to reduce risk to generators. Whilst the CfD is generally lower risk, one area in which risk has increased is in the allocation process, since by definition some bidders will fail to win

42 In 2017/18, based on DECC's project valuation assumptions as set out in the Final Allocation Framework for the 2014/15 CfD Allocation Round.

43 Guy Newey and Simon Moore, *Going, Going, Gone* (Policy Exchange, 2013).

44 Richard Howard, *The Customer is Always Right* (Policy Exchange, 2015).

45 Competition and Markets Authority, *Energy market investigation: Summary of provisional findings report,* 2015.

46 DECC, *CFD Auction Allocation Round One Results*, 2015.

a contract. Taking these together, it is estimated that the move from the RO to the CfD could result in a reduction in 'hurdle rate',[47] or cost of finance, of 0.85–1.7%.[48] That said, developers and financiers indicate that the UK energy market is seen as having a greater political risk than other European markets, and this has been exacerbated by recent policy changes. To an extent this may be undermining the theoretical benefits from moving to the CfD model.

- **Supply curve 'creaming':** It has been suggested that the winning CfD projects represent the lowest cost sites within a wide range of sites in the development pipeline. Under the RO model, all sites that were viable at the prevailing subsidy rate could proceed. Under the CfD model, only the most economic projects prevail if there is a limited budget. Developers identified that some projects designed for the RO will no longer be viable under the CfD. The successful projects are largely focused in Scotland, where there are higher wind speeds: 10 of the 15 winning onshore wind CfD projects are located in Scotland.[49] The auction also appears to have favoured larger projects that can capitalise on economies of scale: the average onshore wind project was just under 50MWs, and most projects were above 30MW in capacity.

Since the auction took place, the industry has speculated as to what might happen to prices in future auction rounds. In our view it appears likely that there will be further downward pressure on prices, for a number of different reasons:

- Firstly, as identified in a recent Policy Exchange report, there is limited if any funding left for future CfD rounds to 2020.[50] Therefore it is likely that future allocation rounds will have a small budget and are likely to be significantly oversubscribed.
- Secondly, there is a growing pipeline of sites that will have no alternative but to compete in the CfD. In the last CfD auction some developers still had the option to pursue the RO instead, which analysts have suggested may have set a floor price in the CfD auction.[51] However, the RO has now closed to solar projects and recent announcements mean that it will also close to onshore wind in March 2016 (this is discussed further below). Going forward, the CfD will become the only option for both technologies.
- Thirdly, as the CfD model becomes more familiar, there will be a greater understanding of the risks involved, potentially enabling developers and investors to achieve a lower cost of capital.
- Lastly, as the cost of onshore wind and solar PV reduces and converges, the competition between the technologies will further intensify.

The combination of these factors means that there is likely to be fierce competition in future CfD allocation rounds, putting further downward pressure on prices, ultimately reducing the cost of decarbonisation to the consumer.

Onshore wind cost reduction

An argument often put forward by developers of emerging technologies is that performance will improve and costs reduce as technologies mature and are deployed at scale. The most famous example of this is 'Moore's Law': the observation that the performance of computing hardware doubles every two

47 The hurdle rate is the minimum rate of return that an investor will accept on a project in order to take the risk of investing capital. The more risky the project, the higher the hurdle rate .

48 NERA Economic Consulting, *Changes in Hurdle Rates for Low Carbon Generation Technologies due to the Shift from the UK Renewables Obligation to a Contract for Difference Regime,* 2013.

49 DECC, *CFD Auction Allocation Round One Results*, 2015.

50 Richard Howard, *The Customer is Always Right*. (Policy Exchange, 2015).

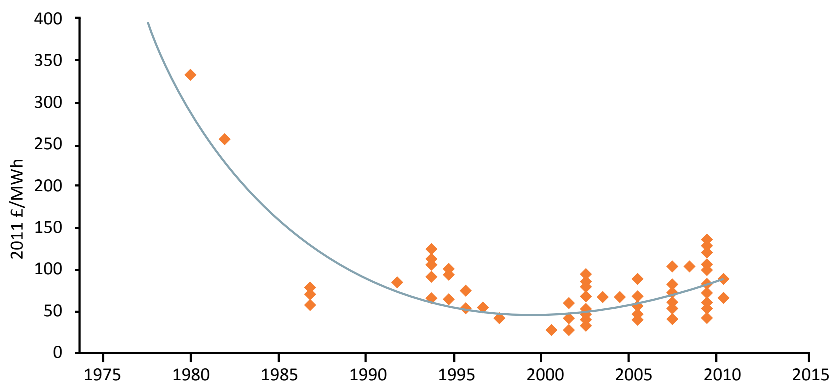
51 Baringa, *UK CfD auction: a triumph for competition?*, 2015.

years. There is a significant body of research considering the cost reduction potential of emerging energy technologies. Some studies are based on engineering assessments of future technological innovations, whilst other studies use the concept of a 'learning rate' similar to Moore's Law: predicting cost reductions over time or against cumulative deployment. A systematic review of the evidence base by UKERC suggests that costs generally fall through time and as deployment rises, although these effects can also be "overwhelmed in the short term by supply chain bottlenecks, build delays and 'teething trouble'" as well as movements in fuel and commodity prices.[52]

As a relatively mature technology, onshore wind has already benefitted from substantial improvements in performance and cost as the technology has been developed and deployed at scale. Substantial reductions in capital cost and levelised cost occurred in the 1980s as the technology was developed and deployed around the world.[53] But analysis by UKERC suggests that onshore wind costs have been broadly flat on a levelised cost basis since the 1990s (Figure 3.2). The trend in levelised cost is confused somewhat by the significant variation in wind resource across different sites.[54] The cost of constructing an onshore wind farm (capital cost) actually increased during the 2000s, due to factors including an increase in commodity prices, as well as onshore wind supply chain constraints. In the UK, in the late 2000s, this was compounded by a weakening of Sterling against the Euro, increasing the cost of European imports (which make up a significant share of capital costs).[55]

> "UK onshore wind costs are higher than in the leading global markets such as China, USA, Germany, Spain, and India"

Figure 3.2: Trend in levelised cost of onshore wind[56]



Other studies paint a different picture. For example the World Energy Council stated that onshore wind costs fell by 18% over the period 2009 to 2013.[57] Commentators have also suggested that further declines in onshore wind costs are possible in the future. For example Bloomberg New Energy Finance predicts a reduction in cost for European projects of 7% by 2020, 15% by 2030, and 22% by 2040 (in real terms).[58]

In addition to this, it is clear that the cost of onshore wind in the UK is now higher than elsewhere (Figure 3.3), suggesting that costs could reduce if the UK

52 UKERC, *Presenting the Future: An assessment of future costs estimation methodologies in the electricity generation sector*, 2013.

53 Jones, F., *UKERC Technology and Policy Assessment Cost Methodologies Project Working Paper: Onshore Wind Case Study*, 2012.

54 Ibid.

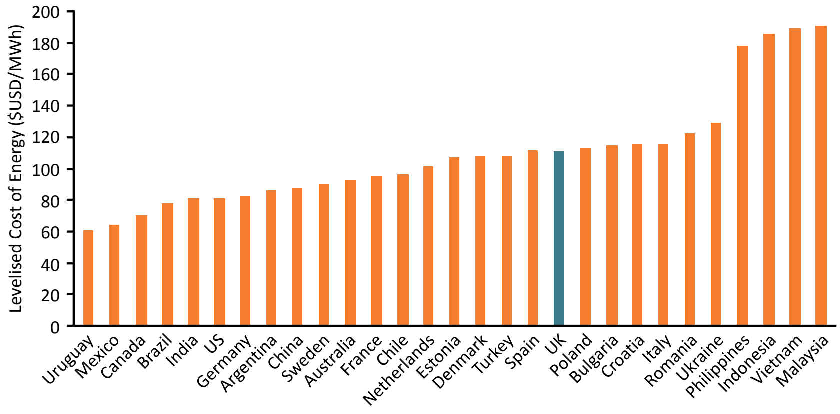
55 UKERC, *Presenting the Future: An assessment of future costs estimation methodologies in the electricity generation sector*, 2013

56 Ibid.

57 World Energy Council, *World Energy Perspective: Cost of Energy Technologies*, 2013.

58 Bloomberg New Energy Finance, *New Energy Outlook*, 2015.

Figure 3.3: UK onshore wind costs versus other main markets[59]



could 'catch up' with other countries. UK onshore wind costs are higher than in the leading global markets such as China, USA, Germany, Spain, and India; as well as many other European markets.[60]

A report by Frontier Economics[61] considered UK onshore wind costs relative to a sample of other European countries, and suggested a number of possible reasons for the difference in cost:

- **Development Costs (i.e. to plan and gain consent for the wind farm) –** Frontier Economics suggests that UK onshore wind development costs are in line with those in other countries. Their report suggests that development costs represent 3% of total capital costs: equivalent to the European average. However, developers we consulted as part of this research generally quoted significantly higher development costs in the UK, particularly if early payments for grid connections and radar mitigation are included. Moreover, it has been suggested that the high refusal rate for planning in the UK (see Chapter 5) means that some developers seek to recover the costs of unsuccessful developments through successful ones, in which case development costs could be significantly higher than the European average.
- **Capital Costs (i.e. to procure and construct the wind farm) –** Frontier Economics suggest that capital costs are generally 20–25% higher (£0.3–0.4m per MW) in the UK than elsewhere. This is equivalent to a difference in levelised cost of £15–20/MWh. There is some uncertainty over the reason for this difference, with some evidence of higher construction, infrastructure and foundation costs, and small differences in turbine costs. The difference is unlikely to be due to labour costs, which are generally lower in the UK than other North-West European countries such as Sweden, Finland and Denmark.[62]
- **Operating Costs –** Frontier Economics found that operating costs in the UK were at least £5,000-£10,000 per MW per year higher than in Denmark, Germany and the Netherlands (equivalent to £2–4/MWh in levelised cost terms). This can largely be explained by the difference in transmission charges (the charges that onshore wind developers pay for usage of the grid network) which are low or zero in these other countries, compared to an average of £10,000 per MW per year in the UK (or the equivalent of £4/MWh).[63]

59 Source: Bloomberg New Energy Finance.

60 Ibid.

61 Frontier Economics, *International support for onshore wind*. 2013. Considered costs in UK, Poland, Netherlands, Germany, Ireland and Denmark.

62 HM Treasury, *Infrastructure Cost Review: Technical Report*, 2010.

63 National Grid, *Final Tariffs 2015–16*. http://www2.nationalgrid.com/UK/Industry-information/System-charges/Electricity-transmission/Approval-conditions/Condition-5/. The average charge is £10,000/MW/year in a range from -£5,800 (i.e. a negative charge) to +£25,500 per MW per year

Developers also cited the relatively high land costs in the UK relative to other countries, which have progressively increased as onshore wind capacity has grown in the UK.

- **Financing Costs –** Onshore wind is highly capital intensive, and so the cost of capital has a significant impact on the cost of energy from wind power. Frontier Economics found that the financing costs in comparator countries are in the range of 6–8% (on a pre-tax real basis), compared to a figure of 9.6% assumed by DECC for projects in the UK. On this basis, Frontier Economics concluded that this could be a significant factor in explaining the difference in levelised costs. A key difference highlighted by Frontier Economics is that some European projects are accessing capital at sub-market rates from state-backed institutions, such as the European Investment Bank, and KfW in Germany. By contrast, the Green Investment Bank in the UK must offer finance to renewables projects at commercial rates (due to State Aid restrictions), and its mandate does not currently include onshore wind (with the exception of community-scale projects under 18MW).[64] The Government recently announced its intention to move GIB into private ownership, which would allow it to expand its remit to cover mature technologies such as onshore wind, but still at commercial rates. Another cause of the higher financing cost in the UK is simply due to perceived risk. Developers and financiers consulted as part of this project indicated that UK energy projects are seen as facing greater political and policy risk than similar projects in other European countries, and that this has been exacerbated by recent policy changes. This results in developers and financiers increasing the 'risk premium' they apply to UK projects, and therefore a higher cost of capital.

“Developers and financiers … indicated that UK energy projects are seen as facing greater political and policy risk than similar projects in other European countries”

Opportunities to reduce onshore wind costs in the UK

Building on this, there may be opportunities to reduce onshore wind costs in the UK; either through global reductions in onshore wind costs, or by the UK realising cost reduction opportunities already seen elsewhere. RenewableUK (RUK, the wind energy trade association) convened a Cost Reduction Taskforce to consider the potential for cost reduction in the UK, which reported its results in April 2015. Their report identified that onshore wind could be delivered at a levelised cost of £64–69 per MWh in 2020, down from an estimated £75–90/MWh in 2014.

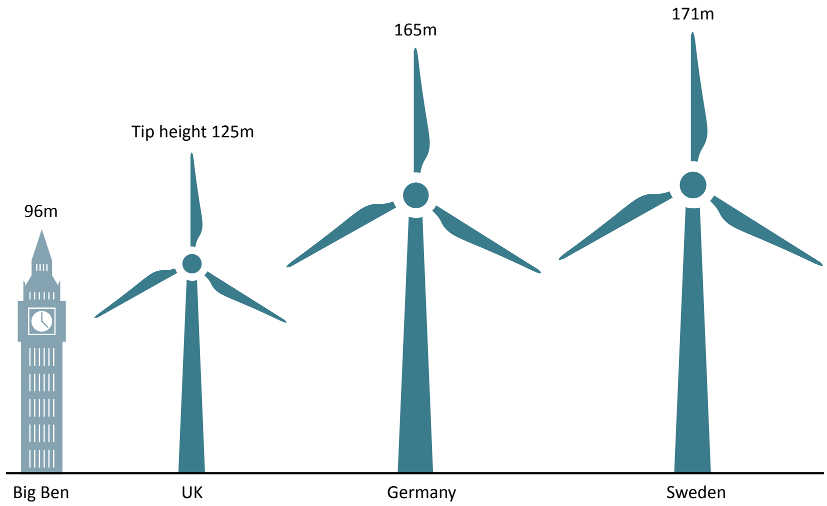
Policy Exchange has considered this evidence base alongside evidence from a number of developers and other sources.[65] **Our analysis of this evidence base suggests that there is significant potential to reduce the cost of onshore wind projects in the UK by 2020.** However, it is clear that some of the options for cost could increase landscape and visual impacts, and so may be less acceptable in planning terms. (Chapter 5 explores planning for onshore wind in detail).

As an example, it appears that the turbines currently being deployed in the UK are smaller than in other countries. Most operational UK wind projects have a 'tip height' of 125 metres or less (see Figure 3.4 for definition). Projects in

64 Green Investment Bank recently announced that its mandate will now extend to community scale onshore wind developments under 18MW http://www.greeninvestmentbank.com/investment-sectors/community-scale-renewables/

65 For confidentiality reasons, individual sources have been summarised and remain anonymous.

Figure 3.4: Average height of new wind turbines built in the UK and other countries



development are also generally at or below a 125 metres tip height, although there are a few exceptions up to around 145 metres. By contrast, in Sweden half of all onshore wind farm applications are for projects with a tip height of 170–200 metres, and in Germany the average tip height for projects under construction is 165 metres.[66] Height restrictions are enforced through the planning process, and a 125 metre tip height appears to have become the norm in the UK, whilst other countries have moved to larger turbines.

Larger turbines potentially offer significant savings in levelised cost compared to smaller turbines, since they usually have a lower capital cost per MW of capacity installed, and are also more efficient (achieving a higher 'load factor' or energy output per MW installed capacity). Developers have suggested that a 1 metre increase in height can reduce the levelised cost by 0.3–0.5%. As a result, even a modest increase in height can have a significant impact on the economics of a wind farm.

In addition, the market for onshore wind turbines appears to be splitting, with greater competition in the supply of large turbines than smaller turbines. Some smaller turbine models have been withdrawn from the market since they are no longer deployed in other markets. The UK is essentially being left behind as other countries are shifting towards larger turbines and the UK continues to deploy smaller turbine models, adding to costs. Taking these factors together, RUK estimate the potential savings from using larger turbines as £4–7/MWh (or a saving of 5–8%), although other sources reviewed point to even greater savings, potentially as high as £14/MWh.

The disadvantage of using larger turbines is that they potentially increase the visual impact of a wind farm, both in terms of the magnitude of the impact on the landscape, and the extent of the area affected. The relationship between the size of turbine and landscape and visual impact will be site-specific, since it depends on the topography and nature of the surrounding landscape. Guidance from Scottish Natural Heritage states that '*generally speaking, large wind turbines will appear out of scale and visually dominant in lowland, settled, or smaller-scale landscapes.... they are best suited to more extensive, upland areas, and set back from more sensitive upland fringes.*'[67]

66 RenewableUK, *Onshore Wind Cost Reduction Taskforce Report*, 2015.

67 SNH, *Siting and Designing Wind Farms in the Landscape*, 2014.

The landscape and visual impact of larger turbines can potentially be mitigated by using fewer larger turbines instead of many smaller ones. For example a wind farm with a 30MW capacity could either comprise fifteen 2MW turbines or ten 3MW turbines. Larger turbines generally achieve a higher load factor (or energy output per MW), which means that the reduction in turbines required to maintain a given energy output is even greater. This creates a subjective and site-specific choice over the appropriate scale of onshore wind development in a given location.

This is just one of many examples of how to reduce the cost of onshore wind. Table 3.2 summarises the key cost reduction opportunities, with an indication of the likely impact on cost (based on evidence from RUK and other sources), as well as a high level qualitative assessment of the likely visual and landscape impact.

Table 3.2: Summary of onshore wind cost reduction opportunities

Cost reduction opportunity	Cost reduction potential	Visual/landscape impact
Larger turbines/ optimal turbine size e.g. moving from 125m tip height to 150–200m tip height (2MW turbines to 3–5MW turbines).	**High**[68] Larger turbines have lower capital cost per MW, and also achieve higher load factors. The market for larger turbines is also more competitive. RUK estimate a saving of £4–7/MWh. Other sources point to greater savings; potentially as high as £14/MWh.	**Negative** Use of larger turbines may increase visual impact, depending on site characteristics. This may be partially mitigated by having fewer turbines per wind farm.
Reducing perceived risk Providing greater long term policy clarity in order to reduce perception of risk to developers/investors.	**High** Financing costs for UK projects are substantially above European comparators. Reducing the cost of capital by 1% results in a saving of £6/MWh.	**Negligible/None**
Optimised site design Micro-siting turbines to exploit the windiest locations (typically in elevated positions) and maximize energy output.	**Medium** Increases net energy output by exploiting windiest positions and reducing wake effects (i.e. the impact of turbines on energy capture in other turbines further down-wind). RUK estimate a saving of £3–4/MWh.	**Negative** Likely to increase visual impacts if turbines are sited in elevated positions in comparison with the surrounding area (depending on topography).
Grid connections Using overhead lines instead of undergrounding cables. Introducing competition in connection providers.	**Medium** Reducing the cost of the grid connection results in a direct saving in operational costs to the generator. RUK estimate a saving of £1–5/MWh.	**Negative** Replacing underground cables with overground pylons is likely to increase visual impact over a larger area.
Technical innovation Adoption of new designs, new technologies and best practice.	**Low** Improvements in energy output through better resource assessment and greater efficiency. Reduction in operations and maintenance costs through greater reliability. RUK estimate a saving of £2/MWh.	**Negligible/None**

68 For the purposes of this table: High = £5/MWh+, Medium = £3–5/MWh, Low < £3/MWh.

Table 3.2: Continued

Cost Reduction Opportunity	Cost reduction potential	Visual/landscape impact
Planning certainty Low approval rates for onshore wind result in additional costs to developers which increases their required returns.	**Low** Providing greater certainty in planning would reduce the cost and risk to developers. RUK estimate a saving of £1–3/MWh.	**Negligible/None**
Procurement Using more sophisticated procurement methods, including establishing arrangements with strategic suppliers.	**Low** Reduces capital cost by achieving economies of scale. Not explicitly considered in RUK study, but other estimates suggest a modest saving.	**Negligible/None**
Accelerated deployment reducing construction timescales.	**Low** Accelerates project revenues therefore reducing financing costs Not explicitly considered in RUK study, but other estimates suggest a modest saving.	**Negligible/None**
Operations and maintenance adopting proactive O&M strategies.	**Low** Optimising availability and energy output through more proactive O&M Not explicitly considered in RUK study, but other estimates suggest a modest saving.	**Negligible/None**

Repowering

The previous section considered the potential to reduce the cost of *new* onshore wind sites. However, there is a growing interest in the potential to 'repower' existing onshore wind farms as they near the end of their lifetime, which can also lead to cost savings.

Onshore wind farms typically have an assumed operational lifetime of 20–25 years from the time of installation. Towards the end of the project's lifetime the generator may experience deteriorating performance, alongside increasing operational and maintenance costs, and this can often act as the trigger to consider alternatives. The generator eventually faces a choice: should they continue to operate the site for 20+ years with reduced performance; decommission the site and return it to the state in which they found it; or 'repower' the site in order to give it a new lease of life?

'Repowering' involves the complete dismantling and replacement of the existing turbines (as opposed to a refurbishment of individual components, which is normal practice during the economic lifetime of a wind farm). The benefit of repowering is that a generator can replace older less efficient turbines with newer, more efficient turbines, usually leading to an increase in the output from the wind farm, whilst also reducing the cost of operations. Given the advances in technology since the sites were originally constructed, this means that the generator can increase the power output from the same site, even if the number of turbines is reduced. Repowering can also be cheaper than building on a new site: although the turbines and foundations are replaced in the process, there are often savings in terms of electrical infrastructure, access roads, communications, and development costs (e.g. surveys, wind data), although the savings are modest (in the order of 5–10%). Moreover, repowering reduces the need for new sites for onshore wind development, and can also be more straightforward in terms of planning and community acceptance. As we will show in Chapter 5, the evidence suggests that communities become more accepting of wind farms once they are in place.

For evidence of the scale of the opportunity for repowering, it is informative to look at the example of Germany. The first wind farms in Germany were constructed in the early 1990s and so there is now an increasing pipeline of projects that are nearing the end of their lifetime.[69] The first repowering projects took place in the early 2000s. Since then there has been a significant increase in repowering, and it now makes up 20–25% of the German onshore wind market. In 2014, of the 4.75GW of onshore wind capacity constructed in Germany, 1.1GW related to repowered sites. The total capacity of repowered projects now stands at 3.3GW. German projects have typically been repowered after 10–15 years of operation, and on average involve the replacement of 0.6MW turbines with 2.8MW turbines.[70]

In a UK context, there has been limited repowering activity to date, although it is growing over time. A small number of UK sites have already been repowered. For example, Scottish Power Renewables repowered the Carland Cross wind farm in Cornwall, replacing 15 smaller turbines with five larger turbines, but increasing the overall capacity by more than 50%. Developers are also working up plans to repower other sites. For example, E.On plans to repower two onshore wind farms, in both cases reducing the number of turbines by 50%, whilst doubling the power output. Similarly, RWE Innogy has plans to repower the Taff Ely onshore wind farm, replacing 20 existing turbines with 7 larger turbines, and in the process doubling the energy output from the site.

> "There is significant potential to increase the capacity of onshore wind in the UK by repowering existing sites as they come up for renewal"

Ultimately the potential for repowering is determined by the stock of older wind farm sites, which is significantly smaller in the UK than in Germany. Data suggests that there is around 0.95GW of capacity in the UK which has been operational for 10 years or more, plus a further 3GW that will reach 10 years of operation between now and 2020.[71] This compares to more than 16GW of onshore wind capacity that is already more than 10 years old in Germany.[72]

Overall, it appears that there is significant potential to increase the capacity of onshore wind in the UK by repowering existing sites as they come up for renewal (subject to obtaining a new planning consent, which can be challenging as the surrounding area changes and develops over time), and these repowering projects are likely to achieve lower costs than developments on new sites.

Key findings

Overall, our analysis suggests that there is significant potential to reduce the cost of onshore wind. The opportunities for cost reduction fall into the following categories:

69 Deutsche Windguard, *Status of Land-based wind energy development in Germany.* 2014.

70 Ibid.

71 Source: Bloomberg New Energy Finance.

72 Deutsche Windguard (2014).

- There are a number of opportunities which require action from industry rather than government (e.g. technological innovation, procurement, accelerated deployment, operations and maintenance). These measures have a modest impact in reducing cost, and also rely on developers achieving economies of scale.
- Some of the more significant areas of cost reduction could lead to an increase in the visual impact of onshore wind farm development (e.g. larger turbines, optimised site design, grid connections). They may also require policy changes, which could take significant time to implement. For example, a new policy to allow larger turbines would take several years to have any effect given the development timescales for new projects.
- Policy certainty also plays a significant role. Perceived policy risk has a direct impact on the cost of capital for onshore wind developments.
- Repowering of existing sites could also be effective in reducing the cost of onshore wind, but ultimately is limited by the pipeline of older sites. Planning permissions will also be required for repowering.

This presents two possible scenarios for the cost of onshore wind going forward. **If all of the cost reduction opportunities are realised, then it is plausible for the cost of onshore wind to fall from £75/MWh today to £60/MWh or below for projects delivered from 2020 onwards (on a levelised cost basis, 2014 prices).** Several developers we consulted as part of this study indicated that they are planning projects that are capable of achieving costs in this range. This relies on larger projects, in high wind speed areas, utilising larger turbines than is currently the norm. These cost reductions would take time to feed through to projects, so could be achievable by 2020 or thereafter. A more modest reduction in cost (e.g. to around £65–70/MWh) could be achieved by the industry without changes to policy or a shift to larger turbines.

Could onshore wind be viable without subsidy?

The Conservative manifesto stated an intention to "halt the spread of *subsidised* onshore wind farms", and to "end any new public *subsidy*" [emphasis added]. The word *subsidy* is important. As discussed earlier, onshore wind projects currently receive approximately half of their revenue from subsidies (the remainder from electricity sales). However, the onshore wind industry has for some time been considering the plausibility of developing projects in the absence of subsidy, and RUK has claimed that "onshore wind will be the least cost form of new generation by 2020."[73]

This raises an important question: what exactly does 'no subsidy' mean in a world where more or less all new power projects in the UK receive a public subsidy in one form or another? In the current market design, even fossil fuel generation plants now receive subsidies for providing capacity.[74] Given that there are restrictions on building new coal, the main source of new fossil fuel capacity going forward is likely to be gas. Therefore, an appropriate comparator is a new build gas power station, including the subsidies it receives (notwithstanding the fact that onshore wind is zero carbon, whilst gas generation is not). Effectively the Conservatives' pledge could be interpreted as 'no more subsidy than new build gas generation'.

73 RenewableUK, *General Election Manifesto,* 2014.

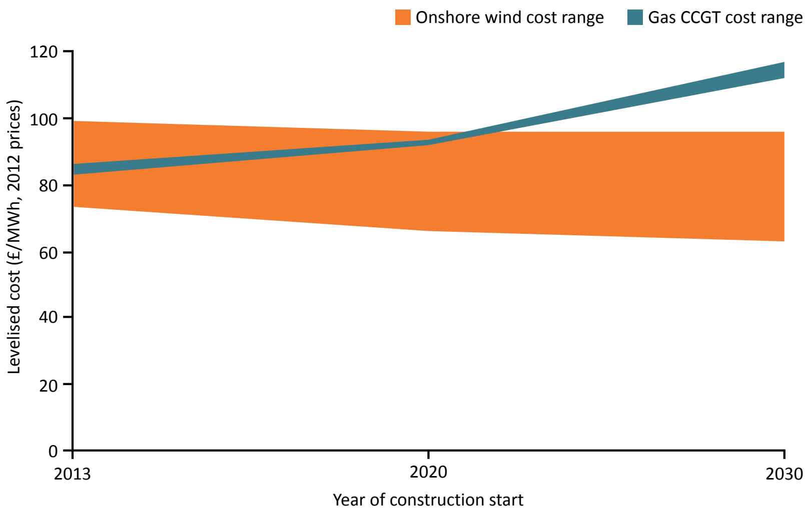
74 e.g. under the Supplementary Balancing Reserve and the new Capacity Mechanism.

Could onshore wind be cheaper than gas generation?

Under the Coalition government, the narrative for supporting renewables was that this would lead to a saving compared to fossil fuel generation. For example, in 2012 Ed Davey (then Secretary of State for Energy and Climate Change) argued that "without a move to renewable energy, bills would be higher because of a reliance on expensive and volatile gas prices".[75] In 2013 Ed Davey argued that "*Global gas price hikes are squeezing households….our strategy of shifting to alternatives, like renewables, and of being smarter with how we use energy is helping those who need it most to save money on their bills.*"[76]

In 2012 and 2013 this looked like a reasonable proposition. DECC's forecasts showed gas prices increasing considerably in the future, and coupled with the commitment to a strong carbon price in the UK (the Carbon Price Floor), this made it look like new and existing gas power stations would become increasingly expensive. The Committee on Climate Change (CCC) produced an assessment of the cost of energy technologies in 2013, which indicated that onshore wind already had similar costs to gas generation, and would become progressively cheaper whilst gas would become progressively more expensive (Figure 3.5).

Figure 3.5: Projections for the cost of onshore wind and gas generation[77]



However, more recent events have fundamentally altered the economics of gas power stations:

- **Wholesale gas prices:** The drop in global oil prices during 2014 led to a reduction in gas prices (both now and in terms of future projections). In 2012, DECC was projecting gas prices to increase from 63p/therm in 2012 to 79p/therm in 2014, and then 75p/therm by 2020 (in 2014 prices). The outturn price for 2014 was actually 56p/therm, some 30% below DECC's expectation. In September 2014, DECC downgraded its 2020 outlook to 60p/therm (a reduction of 20% compared to its previous projections).[78] The market has since fallen further, and some forecasters are now suggesting UK gas prices could stay low for a protracted period.

75 BBC News, *"Energy Bill to create 'low carbon economy' says Davey"*, 29th November 2012, http://www.bbc.co.uk/news/business-20539981

76 Channel 4 News, "Ed Davey: green taxes will save us money in the end", 27th March 2013, http://www.channel4.com/news/green-taxes-energy-prices-bills-renewable-ed-davey

77 Committee on Climate Change, *Fourth Carbon Budget Review – technical report*, 2013.

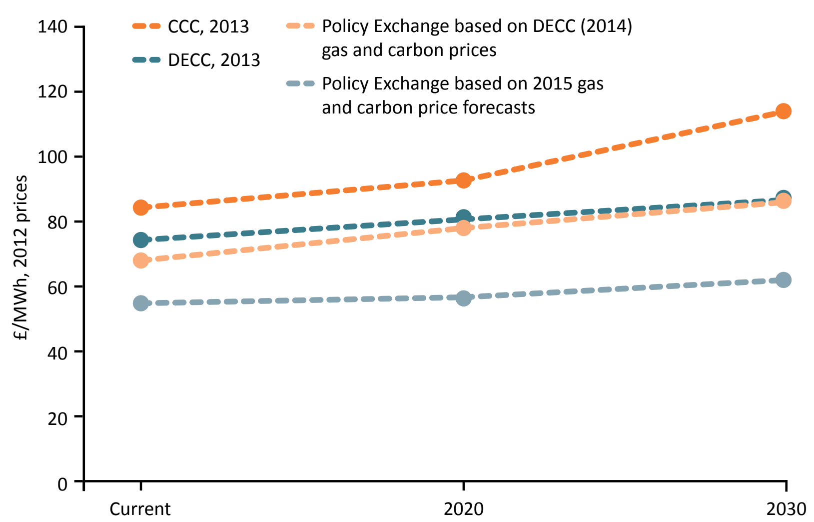
78 DECC, *Updated Energy and Emissions Projections – September 2014*, 2014.

- **Carbon prices:** the carbon price faced by generators in the UK is determined by both the EU Emissions Trading Scheme (EU ETS), and the Carbon Price Floor introduced by HM Treasury in April 2013 (the Carbon Price Floor equals the sum of the EU ETS price plus a 'Carbon Price Support'). When introduced, the Carbon Price Floor was set to rise to £30/tonne in 2020, and £70/tonne in 2030 (in 2009 prices). However, in the Budget 2014, HM Treasury froze the Carbon Price Support level until 2019 at a maximum of £18/tonne, resulting in a substantial reduction in the carbon price trajectory. There is uncertainty about what will happen beyond 2019, but independent forecasters are now assuming a carbon price substantially lower than the original trajectory defined by the Carbon Price Floor.

The combination of these factors has led to a rapid downward shift in the cost of a new build gas plant in the UK (Figure 3.6)[79]:

- Analysis by the CCC (based on 2012 price forecasts) shows a levelised cost of £85/MWh for a gas plant starting construction in 2013, rising to £93/MWh for a project starting in 2020.[80]
- DECC produced estimates of technology costs in 2013, suggesting a cost of £75/MWh in 2013, rising to £81/MWh in 2020.[81]
- DECC is yet to update its technology costs report, although it updated its gas and carbon price projections in 2014. Our analysis suggests that this would imply a levelised cost of a new gas plant of £68/MWh currently, rising to £78/MWh in 2020.
- If we factor in more recent forecasts for gas and carbon prices,[82] this results in a cost of a new build gas plant of £55/MWh now, rising to £57/MWh for a project starting construction in 2020.

Figure 3.6: Levelised cost of a new build gas CCGT[83]



The CCC recently produced a report in which it makes the claim that onshore wind could be 'subsidy free' from 2020 based on a price of £80/MWh.[84] However,

79 Note: in this analysis we hold all other assumptions equal – for example capital cost and operating cost – at the levels identified in the DECC (2013) Electricity Generation Costs report.

80 Committee on Climate Change, *Fourth Carbon Budget Review – technical report*, 2013.

81 DECC, *Electricity Generation Costs*, 2013.

82 Here we use projections from Aurora Energy Research dated April 2015.

83 Committee on Climate Change, *Fourth Carbon Budget Review – technical report*, 2013; DECC, *Electricity Generation Costs*, 2013. Note: CCC 2013 and Policy Exchange results are based on year of start of construction. DECC 2013 results are based on year of commissioning.

84 CCC, *Meeting Carbon Budgets – Progress in reducing the UK's emissions*, 2015.

this analysis relies on out of date DECC assumptions for gas and carbon prices, which do not factor in recent falls in gas prices, or the change in trajectory for carbon prices.

Our analysis, using independent gas and carbon price forecasts, suggests that the cost of a new build gas plant has dropped substantially: the projected cost of a project starting construction in 2020 has reduced by approximately 40% compared to estimates in 2013. Whilst onshore wind at a levelised cost of approximately £75/MWh may have looked cheap in 2013, it now looks expensive (albeit that this looks simply at direct cost, and does not fully reflect carbon and network system costs). Our analysis implies that the differential in cost between onshore wind and gas is currently around £20/MWh. Another way to look at this is simply to compare the subsidy received by each technology over and above the wholesale price: an onshore wind CfD project coming online in 2017/18 will receive a subsidy of £29/MWh,[85] compared to a payment for a new build gas plant under the Capacity Mechanism of £4/MWh.[86]

> “Our analysis implies that the differential in cost between onshore wind and gas is currently around £20/MWh”

Based on our analysis, there would need to be a substantial reduction in onshore wind costs in order for it to be cost competitive with a new gas power station. The most ambitious cost reduction scenario described above would put onshore wind on a levelised cost of £60/MWh, which may be sufficient for onshore wind to reach cost parity with a new build gas plant in 2020 or shortly thereafter. However, as outlined above, this will be challenging to deliver as it relies on the deployment of larger turbines.

Even in this scenario, it would not be possible to develop an onshore wind project based on the wholesale market price of electricity alone (which is currently £40–45/MWh). Onshore wind would still require some form of government support to de-risk the project – in fact almost no power generation capacity is currently coming forward in the absence of some form of government support or contract. A CfD contract would still be required to make up the difference between the market price and the lifetime cost of alternative new capacity (e.g. a new gas power station), but at this level should not be seen as a ‘subsidy’.

The economics of an onshore wind ban

The Conservative manifesto made a clear commitment to “halt the spread of onshore wind farms”, in part through a commitment to “end any new public subsidy”. Since coming into power, the Government has unveiled its intentions with respect to subsidy support mechanisms. In June it was announced that the closure of the Renewables Obligation scheme to new onshore wind projects will be brought forward from March 2017 to March 2016. The Government also alluded to the possibility of excluding onshore wind from the CfD regime, but has not yet provided firm details.

The renewables industry and business groups have been highly critical of the proposals, in particular highlighting the threat to investment, jobs, and investor confidence, as well as the potential impact on consumer bills. For example, RUK said that the proposal left “thousands of British jobs and millions of pounds worth of investment hanging in the balance.” Commentators suggested that the change could undermine investor confidence not only in the renewables sector,

85 Based on DECC’s project valuation assumptions as set out in the Final Allocation Framework for the October 2014 Allocation Round.

86 Based on an assumed load factor of 60% and the capacity auction clearing price of £19.40 per MW per annum.

but in infrastructure more generally. For example, the CBI commented that "cutting the Renewables Obligation scheme early sends a worrying signal about the stability of the UK's energy policy framework. This is a blow, not just to the industry, and could damage our reputation as a good place to invest in energy infrastructure."[87] Commentators also highlighted that the proposals go against public opinion: as shown in Chapter 2, the majority of people are supportive of onshore wind. There was particularly strong opposition to the proposals from Scottish stakeholders, such as the SNP, Scottish Renewables, and Scottish onshore wind developers, given the focus of the onshore wind industry in Scotland.[88] Scottish Renewables stated that £3 billion of investment in Scotland is under threat from the decision to close the RO.[89]

In considering these arguments it is important to distinguish the impact of the proposals over two timescales: namely the short term impact (to 2017) associated with the closure of the RO, and the longer term impact thereafter, potentially including changes to the CfD mechanism.

The early closure of the RO means that some planned projects will no longer be able to proceed under this mechanism, although the scale of this impact is somewhat uncertain. In an attempt to manage the early closure of the RO, the Government has rightly proposed a 'grace period', whereby developers with well-advanced projects (many of which will have made substantial investments to obtain consent) are still able to proceed under the RO. To be eligible for the grace period, a developer must demonstrate that a project has planning consent, a grid connection, and land rights. The government initially stated that 5.2GW of consented onshore wind capacity could in theory be eligible for the grace period,[90] although later clarified that some of this capacity is already being built, hence only up to 2.9GW of this could come forward under the RO grace period.[91] Independent analysis by Cornwall Energy suggests that the figure could be higher at 3.7GW. To put this in context, the average build rate of onshore wind has been around 0.95GW per annum since 2010,[92] so the pipeline of projects that are theoretically eligible for the grace period equates to several years' worth of projects. Consultants Baringa Partners commented that "the initial headlines with respect to the RO are bigger than the actual impact these changes will have."

However in practice there may be less deployment of onshore wind under the RO grace period than first expected. The changes to the RO are being taken forward through primary legislation as part of the Energy Bill. The legislative process itself is creating risk to projects, in as far as the amendments to the RO (including grace period provisions) could be changed at any point until the passage of the bill into law. This makes it difficult for developers and financiers wishing to take an investment decision for a new project in the intervening period, since they cannot be 100% certain their project will receive support. This problem appears to be most acute for projects trying to raise external debt finance, with banks unwilling to lend to new onshore wind projects under the RO, even if they meet the proposed grace period eligibility criteria, until the Energy Bill passes into law. It appears to be less of a problem for developers who are able to finance projects themselves, for example Vattenfall one of the largest developers of onshore wind in the UK, has already announced its intention to proceed with a 54MW project under the RO grace period.[93]

87 http://www.smartestenergy.com/News-Hub/Article.aspx?ArticleID=4460&ArticleTitle=Onshore%20wind%20subsidy%20cuts%20attacked#sthash.WHzzbw1t.dpuf

88 http://www.snp.org/media-centre/news/2015/jun/cross-party-condemnation-shore-wind-cuts

89 http://www.smartestenergy.com/News-Hub/Article.aspx?ArticleID=4460&ArticleTitle=Onshore%20wind%20subsidy%20cuts%20attacked#sthash.WHzzbw1t.dpuf

90 https://www.gov.uk/government/news/changes-to-onshore-wind-subsidies-protect-investment-and-get-the-best-deal-for-bill-payers

91 http://www.snp.org/media-centre/news/2015/jun/uk-renewables-spin-unravels

92 Source: Bloomberg New Energy Finance.

93 http://www.businessgreen.com/bg/news/2418992/vattenfall-confirms-plan-to-bring-northumbrian-ray-wind-farm-online-in-2017

Recommendation: The Government should fast-track the Energy Bill to minimise uncertainty concerning the early closure of the Renewables Obligation for onshore wind developers.

Beyond the early closure of the RO, the more fundamental question that remains is whether or not onshore wind will continue to be permitted under the CfD regime. Government has indicated that changes may be made to the CfD mechanism in respect of onshore wind, but has not yet provided firm details.

On economic grounds, logic would suggest that Government should continue to allow the deployment of onshore wind under the CfD mechanism. As documented earlier in this chapter, onshore wind is already the cheapest major form of low carbon generation in the UK and offers the potential for future cost reduction. Halting the deployment of onshore wind altogether would either increase the cost of meeting carbon targets (which the Government is legally committed to meeting), or increase the risk of missing them. A recent CCC report indicated that the UK is already falling short of the progress required to achieve carbon budgets in the 2020s.[94] In the absence of further growth in onshore wind, the UK would need to look to alternative decarbonisation options such as other renewables, nuclear, CCS, or energy efficiency. As shown in Figure 3.1, onshore wind is the cheapest of the low carbon generation technologies: by definition the move to alternatives would increase cost. For example, replacing 1GW of onshore wind with an equivalent amount of generation from offshore wind would increase the overall cost of decarbonisation to consumers by £75–90 million per annum (based on recent CfD auction prices). A recent CCC report recommended that "if the Government chooses to constrain low-cost options (e.g. onshore wind…) they should also set out which alternatives will be considered to replace them [and] an assessment of the increase in overall costs to consumers."[95]

> "Onshore wind is the cheapest of the low carbon generation technologies: by definition the move to alternatives would increase cost"

If onshore wind is to continue in some form, then the CfD represents the most cost-effective way to support it. Our analysis, presented earlier in this chapter, demonstrates that the introduction of the CfD model has already led to a reduction in the cost of onshore wind. **Conversely, if onshore wind was excluded from the CfD auction, it would reduce competitive pressure on other technologies in the auction, and result in substitution for solar PV and less mature technologies. Overall this would increase the cost of decarbonisation.**

The CfD was intended to be a technology-neutral auction, so making technology-specific decisions (such as halting onshore wind), runs completely against the policy intent. RUK pointed out that excluding onshore wind from the CfD would effectively mean "government rigging an auction, preventing competition and excluding the most cost-effective option." Indeed, European State Aid guidelines for energy and environmental policies state that aid to renewable energy projects must be granted on the basis of "clear, transparent and non-discriminatory criteria."[96] The State Aid approval for the CfD has been made on the basis that mature technologies are able to compete in a non-discriminatory auction.[97] A policy to exclude onshore wind from the CfD scheme may therefore

94 CCC, *Reducing emissions and preparing for climate change: 2015 Progress Report to Parliament*, 2015.

95 Ibid.

96 OJEU, *Guidelines on State aid for environmental protection and energy 2014–2020*, 2014.

97 European Commission, *State Aid – Contract for Difference for Renewables*, 2014.

run into State Aid and legal issues.

The CfD model also offers other benefits. Unlike other subsidy mechanisms, the cost of the CfD regime can be strictly controlled, as budgets are set in advance. Therefore it is not possible for onshore wind deployment to suddenly expand beyond expectations (as wind and solar have done in the past under other mechanisms).

There is also an interesting locational dimension to the CfD model: Scotland has the highest wind speeds in the UK, resulting in more cost effective projects. In the last CfD round, 10 of the 15 projects were located in Scotland, accounting for 73% of the total capacity, with the remainder in England (3%) and Wales (24%). Auction simulations indicate that this pattern would be repeated in future CfD auctions including onshore wind: with 80%+ of new capacity awarded to projects in Scotland, and less than 5% in England (the remainder in Wales).[98] The political problem concerning onshore wind largely relates to England (in particular, Conservative MPs and some Conservative voters in England). But in reality, the CfD model is unlikely to deliver much, if any, onshore wind capacity in England.

Recommendation: The Government should continue to allow new and repowered onshore wind projects to proceed under the CfD model, as a cost effective route to decarbonisation. Together with the early closure of the RO this will largely bring a halt to onshore wind development in England, but allow cost-effective projects to continue in Scotland and Wales. Ultimately, this will lead to a saving for UK consumers versus alternative ways to meet decarbonisation objectives.

Whilst we recommend that onshore wind should continue under the CfD model, Government needs to ensure that it is getting best value for money for consumers. It is clear from our analysis that onshore wind can achieve significant cost reductions, achieving a cost similar to that of a new build gas power station by 2020 or shortly thereafter. Onshore wind projects will continue to require a CfD contract, but as the strike price declines and approaches the cost of a new gas power station it should no longer be seen as a 'subsidy'.

It is likely that if onshore wind remains in the CfD auction then there will be a further decline in auction prices, due to intensifying competition and the removal of the option to proceed under the Renewables Obligation. However, Government may wish to take additional steps to drive the onshore wind towards a 'subsidy free' CfD. This could be achieved through setting a capacity 'maximum' in the auction for onshore wind, or by revising down administrative strike prices. In our view the latter option would be preferable, since it would have less of a distorting effect on the auction. It is also more likely to be compliant with State Aid guidelines, which require a 'non-discriminatory' auction.

Recommendation: The Government should revise down 'administrative strike prices' in the CfD auction to cap the amount payable to new and repowered onshore wind projects. The cap should taper downwards to achieve a reduction in subsidies to onshore wind, whilst also recognising that fossil fuel generators (such as gas) also receive subsidy payments.

98 Source: RWE Innogy.

Key findings

To summarise, onshore wind is currently the cheapest major source of low carbon power available in the UK – cheaper than other technologies such as solar, biomass, nuclear, or CCS. Onshore wind remains more expensive than fossil fuel generation, although there are a number of options to reduce its cost. If all cost reduction opportunities are realised then onshore wind costs could reduce towards the cost of new gas generation by 2020 or shortly thereafter, although as we have shown, current planning restrictions may inhibit the most significant cost reductions. In addition to new build projects, there is a growing opportunity to 'repower' existing projects, which can both increase energy output and reduce costs.

Government is committed to achieving its legally binding carbon budgets, and analysis suggests that the targets are already at risk. Halting onshore wind could lead the UK to pursue more expensive decarbonisation options, and additional costs to consumers. The Contract for Difference model is the most cost-effective way to support renewables projects including onshore wind. In our view, new and repowered onshore wind projects should continue to be eligible for support under the CfD model, albeit at a reducing rate. The CfD model is likely to favour onshore wind projects in Scotland and Wales over projects in England (where there is more opposition).

4
What Happens When the Wind Doesn't Blow?

Detractors of wind power often criticise it for being intermittent, unreliable, and unpredictable, and point to the additional costs it imposes on the power system. Indeed, part of the Government's justification for ending subsidies to onshore wind farms is that they "are unable by themselves to provide the firm capacity that a stable energy system requires."

It is true to say that the power output from wind farms is intermittent, or 'variable' to put it more accurately. The output from a wind farm varies depending on the wind speed, with generation starting at a wind speed of around 3 metres per second, reaching maximum power output at around 12m/s, and shutting down in high winds above 25 m/s.[99] Wind turbines typically produce electricity for 80–85% of the time, with output varying anywhere between zero and the installed capacity.[100] On average, UK onshore wind farms have a 'load factor' of 28% (i.e. they generate 28% of their theoretical maximum power output over the course of the year).[101]

Wind power output varies across geography and time. That said, electricity demand also fluctuates on a daily and seasonal pattern. The evidence suggests that wind power is somewhat correlated with demand, being "more available during the daytime and the winter season, when electricity demand is higher."[102] Having wind farms located in different areas reduces variability at national level, since the wind speed will vary across the country at any point in time. However, the crucial difference between wind power and many other forms of generation is that it is not 'dispatchable': the power output cannot be turned up if the system is short of capacity (although it can be turned down if supply exceeds demand).

A number of studies and government enquiries have investigated wind power intermittency and the potential impacts on the UK power system. The main impacts identified relate to system balancing (making sure that demand and supply can be balanced in real time) and system security (ensuring that there is sufficient capacity on the system for times of peak demand). It is worth saying that this is an incredibly complex area of research, and there is a paucity of research on the system costs of wind power (or other forms of energy for that matter). We are aware that DECC and the Committee on Climate Change have commissioned analysis of the system costs of different technologies, but this research is yet to be released.

99 Royal Academy of Engineering, *Wind Energy: implications of large-scale deployment on the GB electricity system,* 2014.

100 CSE, *Common concerns about wind power,* 2011.

101 DECC, *Digest of UK Energy Statistics*, 2014. Average for 2009–13.

102 Bassi et al, *The case for and against onshore wind energy in the UK,* 2012.

System balancing

System balancing is about ensuring that demand and supply balance out at every instant in time. To an extent this is achieved through market arrangements: energy suppliers purchase electricity from generators in order to satisfy the predicted demand of their customers, and generators forecast the likely power output from each power station or wind farm they own. National Grid also has a role, as system operator, to ensure that the market balances by purchasing balancing services from generators and large industrial energy users.

Key to system balancing is the prediction of both electricity demand and supply. Electricity demand can be predicted very accurately based on factors such as the time of day, temperature, and even television schedules.[103] The output from wind farms is inherently more difficult to predict, and relies on estimation using detailed wind forecasts. That said, the industry is getting progressively better at predicting wind output: National Grid produces 'day-ahead' forecasts with an average error of less than 5%.[104]

> "The industry is getting progressively better at predicting wind output: National Grid produces 'day-ahead' forecasts with an average error of less than 5%"

The variability and unpredictability of onshore wind creates additional system balancing costs, which ultimately are borne by consumers. There is limited evidence available on the scale of these costs, although the evidence that exists generally suggests that these costs are low. A study by the RAE concluded that "at current levels of wind penetration, this level of forecast error remains within the parameters that the system is designed to cope with."[105] However, the same study concluded that there may be a need for additional reserve capacity if wind capacity increases to as much as 26GW (note that the UK currently has 13GW of onshore and offshore wind capacity). A study by UKERC found that accommodating intermittent renewables capacity of up to 20% of total capacity would be "relatively straightforward" and that the additional cost system balancing would be in the range £2–3/MWh.[106]

System security

No form of power generation is 100% reliable or available all of the time. Even conventional power stations such as gas and coal are off-line from time to time, either due to routine maintenance or unexpected outages.

Both Ofgem and National Grid advise government on system security, producing regular reports and analysis. Energy security is considered at system level (rather than at the level of individual projects) identifying the likely peak demand for electricity and the amount of capacity required to meet this demand with an adequate "capacity margin". During the 1990s and 2000s the UK had a very high capacity margin, but as a result of recent plant closures it is estimated that the capacity margin could fall to as low as 5.1% in winter 2015/16.[107]

In calculating this margin, Ofgem and National Grid assign a 'de-rating factor' to conventional power plants as a measure of their reliability (Table 4.1).[108] An alternative measure is used for intermittent technologies, 'Equivalent Firm Capacity' (EFC), which denotes the amount of firm capacity that can be replaced by an amount of intermittent capacity to give the same level of system security. The EFC rating for wind is currently 22%, which means that 1GW of wind

103 Royal Academy of Engineering, *Wind Energy: implications of large-scale deployment on the GB electricity system*, 2014.

104 Ibid.

105 Ibid.

106 UKERC, *The costs and impacts of intermittency*, 2006.

107 National Grid, *Winter Review & Consultation*, 2015.

108 Ofgem, *Electricity Capacity Assessment Report*, 2014.

capacity provides an equivalent level of system security as 220MW of conventional thermal plant. On this basis onshore wind clearly provides far less benefit in terms of system security than a conventional power station, but its contribution is not zero (as it is for solar, which does not generate at all during times of peak demand on winter evenings).

Table 4.1: De-rating factors by technology[109]

	De-rating factor
Coal/biomass	88%
Gas (CCGT – Combined Cycle Gas Turbine)	87%
Gas (OCGT – Open Cycle Gas Turbine)	94%
Nuclear	81%
Hydro	84%
Pumped Storage	97%
	'Equivalent Firm Capacity'
Wind ('Slow Progression Scenario 2014')	22%
Solar PV	0%

The implication is that a system with a large amount of wind or solar capacity would require a greater amount of capacity overall than a system based predominantly on conventional power stations. Intermittent generation increases the size of the capacity margin required to maintain system security.[110] This has implications in terms of both cost, and the practical reality of operating a system with a large amount of intermittent renewable capacity.

Examples from other countries show that it is practically possible to accommodate far more wind onto the system than we currently have in the UK, and still maintain system security. For example, wind power provided 30% of the energy consumed in Denmark in 2012, compared to 10.1% currently in the UK (onshore and offshore combined).[111] Denmark has recently experienced periods of time where the total wind output exceeded its national electricity demand, and the system could still cope. That said, Denmark's power system is very different to the UK's: it has a huge capacity margin, and is also highly interconnected to neighbouring markets such as Germany, Sweden, and Norway (see below for further discussion of interconnection).

Research suggests that the additional cost of maintaining system security associated with intermittent technologies may not be that significant. A review of available evidence by UKERC concluded that the cost of maintaining system security adds around £3–5/MWh to the cost of intermittent generation, although this could rise as the market share of intermittent generation rises above 20%.[112] Recent evidence from the Capacity Mechanism, under which government procures additional backup capacity, suggests that the cost procuring capacity is relatively low. The 2014 Capacity Mechanism auction (for delivery of capacity in 2018/19) cleared at a price of £19,400 per MW per annum (or around £5/MWh for a gas plant): far below government and industry expectations.

109 Ibid.

110 UKERC, *The costs and impacts of intermittency*, 2006.

111 Royal Academy of Engineering, *Wind Energy: implications of large-scale deployment on the GB electricity system*, 2014.

112 UKERC, *The costs and impacts of intermittency*, 2006.

Longer term implications

The UK has been able to incorporate 13GW of wind capacity onto the system to date without presenting a significant problem, supplying 10.1% of the UK's electricity demand (onshore and offshore wind combined). The above analysis suggests that if the proportion of intermittent generation remains below 20%, then the costs of system balancing and system security are relatively low. However with more intermittent wind and solar in the pipeline the challenge of maintaining system security will increase.

Research suggests that deploying renewable energy at a much greater scale would have a transformational impact on the power system and require substantial infrastructure investment.[113] However, there is potential for new technologies such as interconnection, demand side response (DSR), and electricity storage to meet this challenge – in fact they are necessary enabling technologies for deploying renewables.[114]

Interconnectors create a physical connection between power markets, allowing power to flow to where it is needed. The UK already has 4GW of interconnection to Ireland, France and the Netherlands, and there are plans to expand the network of interconnectors potentially including connections to Norway, Denmark, Belgium, and possibly Iceland. As discussed in a previous Policy Exchange report, interconnectors increase geographic and technological diversification of power supply, enabling risk to be spread and reduced.[115] Interconnectors can be used both for short term balancing and to improve system security. To this end, interconnectors will be allowed to participate in the Government's Capacity Mechanism auction from 2015 onwards, which analysts suggest could further reduce the cost of procuring system security.

Storage of electricity could also play a major role in enabling intermittent renewables and reducing the requirement for conventional thermal backup capacity. This can come in the form of pumped hydro, or new technologies such as the home energy storage system being developed by Tesla.[116] The UK currently has 2.8GW of pumped hydro capacity – far less than Germany (6GW), France (4.5GW) or Austria (8GW),[117] and studies have shown that there is potential for up to 15GW of pumped storage capacity in the UK.[118]

Another important contribution could come from demand side management: whereby power users are incentivised either to reduce their demand at time of peak demand, or to shift their demand to another time of day. Demand side management will be facilitated by the rollout of Smart Meters across the UK. Analysis by National Grid suggests that the combination of Smart Meters and 'Time of use Tariffs' could result in up to 6.5GWs of Demand Side Response by 2030 across the residential, industrial and commercial sectors.[119]

All of these innovations will improve the flexibility of the system, allowing more intermittent capacity to be accommodated onto the system and at lower cost than would otherwise be possible.

Key findings

Overall this section suggests that the UK power system has coped with incorporating wind capacity to date. The notion that onshore wind is "unable to provide firm capacity" is misleading: policymakers think about security of the system as a whole, and no technologies are able to provide capacity 100%

113 Royal Academy of Engineering, *Wind Energy: implications of large-scale deployment on the GB electricity system,* 2014.

114 Imperial College / NERA Economic Consulting, *Understanding the Balancing Challenge* (DECC, 2012).

115 Simon Moore & Guy Newey, *Getting Interconnected,* 2014

116 http://www.teslamotors.com/powerwall

117 Scottish Renewables, *Pumped Storage – Position Paper,* 2014.

118 Utilityweek, *"Electricity storage gap looms"*, 2014.

119 National Grid, *Future Energy Scenarios,* 2015.

of the time. Onshore wind is less predictable and offers less system benefit than say a gas power plant, but to date this has been manageable. There are additional system costs associated with accommodating intermittent generation (which intermittent generators are only partly exposed to) although our analysis shows that these costs are modest.

The challenge of ensuring a balanced and secure system will increase as more intermittent capacity is added. However, there is significant potential from greater interconnection, storage, and Demand Side Response.

One note of caution is that generally we found there to be a lack of evidence in this area. We are aware that Government (DECC and the Committee on Climate Change) has recently commissioned further analysis of the system costs and benefits of energy technologies, and alongside this UKERC is updating its 2006 analysis on the costs of intermittency. These will be important contributions to the debate. Going forward it may be desirable to make policy changes in order to better reflect the system cost of different forms of generation.

5
Planning for Onshore Wind

A good plan isn't one where someone wins, it's where nobody thinks they've lost.

Terry Pratchett[120]

Chapter 2 found that public opinion is generally in favour of onshore wind. Chapters 3 and 4 concluded that onshore wind is the cheapest major low carbon source of power in the UK, and that issues with intermittency are manageable. There is therefore a compelling case for continuing to allow the development of onshore wind, whether through the repowering of existing sites, or the development of new cost-effective sites (in a move away from reliance on subsidies). Given the wind resource available and the relatively strong public and government support for onshore wind, new sites are most likely to be developed in Scotland and Wales.

This chapter focuses on the existing and likely future barriers to new onshore wind developments within the planning system. Since the onshore wind pipeline is primarily focused in Scotland, this chapter initially sets out the different planning contexts across the UK and trends in onshore wind planning applications over time. It then explores the implications of the Government's proposals to change the planning system to give local people "the final say" on onshore wind applications. Finally, we consider ways of encouraging community support for onshore wind developments, for example through improved community benefits, public engagement and shared ownership.

Context

Planning systems across the UK

The development of the modern British planning system began with the 1947 Town and Country Planning Act. For the first time, landowners did not have an automatic right to develop, but could instead apply for planning permission from the Local Planning Authority (LPA). However, the devolution of Scotland, Wales and Northern Ireland from 1997 onwards has resulted in an increasingly complex planning context in the UK. There are now many (in some cases major) differences between England, Scotland, Wales and Northern Ireland in their planning legislation, policy and guidance.

Table 5.1 provides examples of some of these differences, which have an important bearing on renewable energy technologies. Most importantly (given

120 Terry Pratchett, *The Amazing Maurice and His Educated Rodents* (Doubleday, 2001)

the focus of onshore wind in Scotland), is the fact that Scotland has its own planning legislation, and ultimately planning decisions rest with Scottish Ministers rather than Westminster. Moreover, commentators have argued that the planning system in Scotland has been more favourable to renewable energy development than the rest of the UK.[121]

Table 5.1: Examples of the differences in the planning systems of England, Scotland, Wales and Northern Ireland[122]

	England	Scotland	Wales	Northern Ireland
Primary planning legislation?	Yes	Yes	No (shares with England, though this will change when the Planning Bill gains Royal Assent – likely to be this year)	Yes
Regional planning?	No (a 'duty to cooperate' instead)	Yes (statutory)	The Wales Spatial Plan offers a regional planning framework over six regional areas	Previously operated at a national level (powers have recently transferred to councils), but the Regional Development Strategy offers a spatial planning framework
Public inquiries for appeals or 'called-in applications' conducted by…	Planning Inspectorate	Directorate for Planning and Environmental Appeals in Scotland	Planning Inspectorate	Planning Appeals Commission
Ultimate appeal decision rests with…	Secretary of State for Communities and Local Government	Scottish Ministers	Welsh Ministers	Planning Appeals Commission
Large-scale energy nfrastructure applications (e.g. NSIPs[123]) decided by…	Secretary of State for Energy and Climate Change	Scottish Ministers	Secretary of State for Energy and Climate Change	Department of the Environment

The devolution of planning powers to the devolved administrations (to varying degrees) means that any changes to the planning system introduced by the Government will mainly impact England (and potentially Wales), rather than Scotland and Northern Ireland. As Table 5.1 shows, however, there are also important differences in the ways that mid-scale and large-scale onshore wind

121 Richard Cowell et al., *Promoting Renewable Energy in the UK: What Difference Has Devolution Made?*, 2013, http://www.cardiff.ac.uk/cplan/sites/default/files/PromotingRenewableEnergyUK.pdf

122 Suzie Cave et al., *Comparison of the Planning Systems in the Four UK Countries*, 2013.

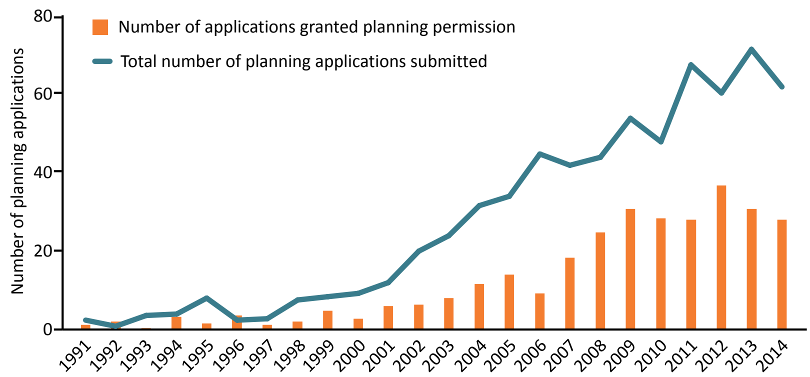
123 In England, Nationally Significant Infrastructure Projects (NSIPs) are defined in the Planning Act 2008. For onshore wind, they are developments of 50MW capacity or more.

developments are dealt with in the planning systems of the UK. These are outlined in the next section, and are important because the Government's recent policy proposals will affect large-scale and mid-scale developments differently.

Trends in onshore wind planning decisions

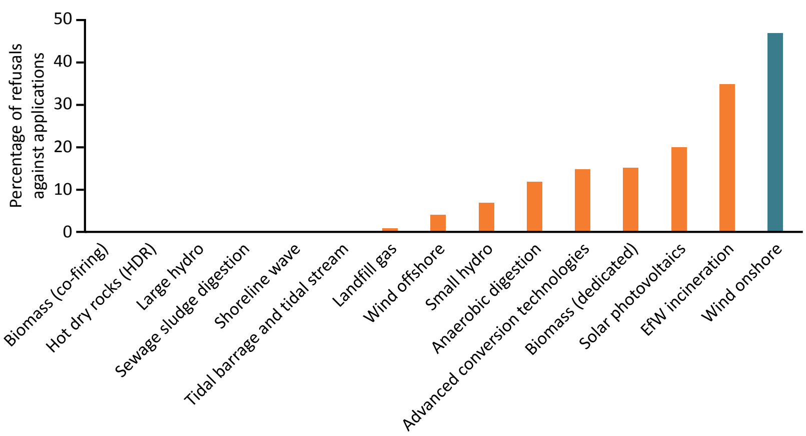
Data from DECC's Renewable Energy Planning Database shows that the number of onshore wind applications has been growing steadily over time since the 1990s (Figure 5.1). However, in recent years the number of developments granted planning permission has not kept pace with the number of applications.

Figure 5.1: Number of UK onshore wind planning applications submitted and granted planning permission over time[124]



Onshore wind developments have the highest rates of refusal (as a proportion of the number of planning applications) of any renewable technology, with 47% of applications since 1993 having been refused (Figure 5.2).

Figure 5.2: Average refusal rate (by number of applications) for different renewable technologies across the UK between 1993 and 2014[125]



124 DECC, "Renewable Energy Planning Database: June 2015".

125 Ibid.

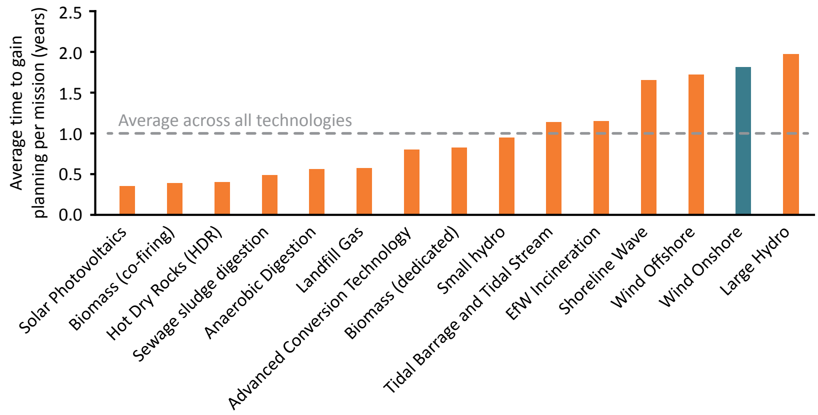
126 Ibid.

127 Ibid.

128 Ibid.

129 Ibid.

Figure 5.3: Average time needed for different renewable technologies to gain planning permission after application submission between 1990 and 2015[126]

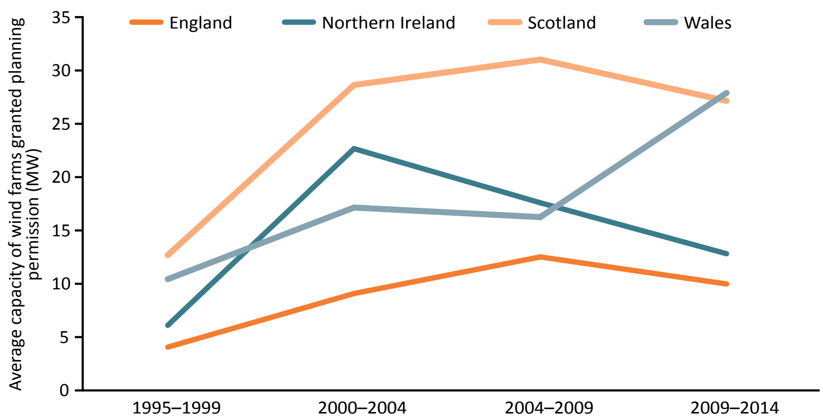


Onshore wind developments also take far longer than most other renewable technologies to gain planning permission (Figure 5.3). On average, it takes nearly 22 months for an onshore wind development to gain planning permission (compared to a cross-technology average of approximately 12 months), although there have been instances of sites taking as much as 10 years to work through the system.[127] Onshore wind developers interviewed as part of this research identified that some of the projects currently awaiting determination entered the planning system as far back as 2008.

The combination of high refusal rates and longer decision times represents a significant barrier to development.

Our analysis also reveals trends in the size of wind farms obtaining consent (Figure 5.4). The capacity of projects across the UK has generally been increasing over time. However, there are differences between the countries of the UK, with wind farms in England generally being the smallest (an average of 10.5MW per site). Scotland had until 2010 been consenting larger and larger sites (e.g. an average of 31MW per site for consents granted in the period 2005–09) but the size of successful projects has dropped since 2010.

Figure 5.4: Average capacity of wind farms granted planning permission between 1995 and 2014[128]

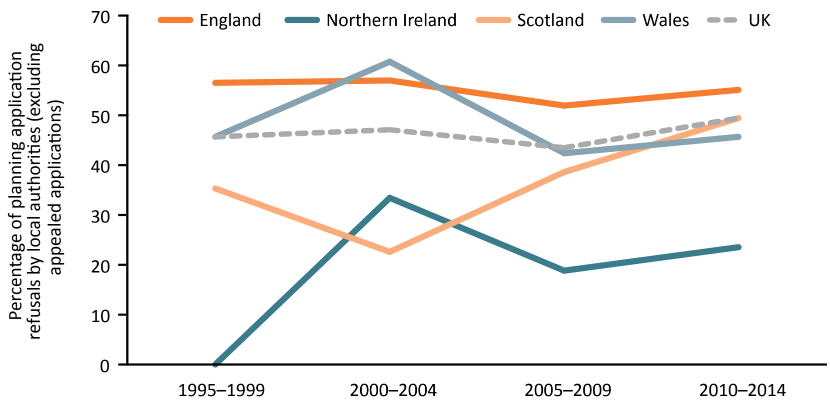


130 Michael Purdue, "The Case for Third Party Planning Appeals," *Environmental Law Review* 3 (2001): 83–89.

Local Planning Authority Decisions

Over the long term, refusal rates for onshore wind developments have been highest in England, followed by Wales, Scotland and Northern Ireland (Figure 5.5). This will have had an effect on developer certainty and willingness to risk bringing forward a planning application. Our analysis shows that in comparison to 2005–2009, the number of planning applications in 2010–14 increased by almost a fifth (19.3%) in England, but they doubled in Scotland.

Figure 5.5: Planning application refusal rates (in terms of number of applications) over time, excluding appealed applications[129]



Appeal decisions

Developers across the UK can appeal against LPA refusals or non-determination (failure to come to a timely decision); a right that was initially created when the 1947 Town and Country Planning Act was introduced.[130] In England, the vast majority of appeals are dealt with by the Planning Inspectorate. However, the Secretary of State for Communities and Local Government retains the power to make the final decision. The Secretary of State can also decide applications at two additional stages in the planning process:

- Planning applications can be 'called-in' before they have been decided by LPAs, if they conflict with national policy in important ways, or are nationally significant;
- Appeals can be 'recovered' from the Planning Inspectorate if they meet a range of criteria, including national controversy.[131]

Eric Pickles, the Secretary of State for Communities and Local Government from 2010 to 2015, took an interventionist approach to onshore wind developments.[132] In October 2013, he announced that renewable energy developments would be included in the appeals recovery criteria for a period of six months. This would enable analysis of the effectiveness of newly introduced community engagement guidelines. In April 2014, this temporary change to the appeals recovery criteria was extended by a further 12 months.[133]

Data from RUK reveals the scale of DCLG's intervention in English appeals (Figure 5.6): the percentage of capacity refused at appeal almost doubled in England between 2007–2009 and 2013–2015. In addition, of the 56 planning

131 Louise Smith, *Calling-in of Planning Applications (SN/SC/0930)* (House of Commons Library, 2014).

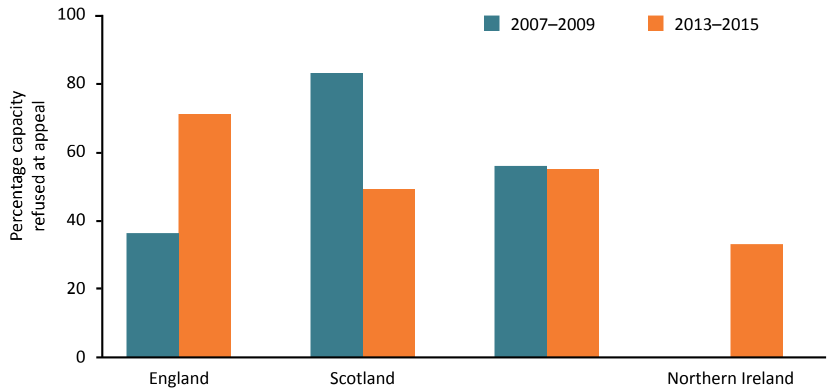
132 Communities and Local Government Committee, *Operation of the National Planning Policy Framework*, 2014, http://www.parliament.uk/business/committees/committees-a-z/commons-select/communities-and-local-government-committee/publications/

133 Hansard, Local Planning and Renewable Energy Developments, http://www.publications.parliament.uk/pa/cm201314/cmhansrd/cm140409/wmstext/140409m0001.htm#14040942000004, 9 April 2014

134 RenewableUK, "Onshore Wind Projects and Capacity Decided since 01-01-07 (May 2015)," 2015.

135 Hansard, Local Planning and Renewable Energy Developments.

Figure 5.6: Appeal decisions under the Town and Country Planning Acts[134]



applications recovered and called-in by Eric Pickles since June 2013, eleven decisions were made against the recommendations of the Planning Inspectorate: all were refusals. Between March 2014 and May 2015, a Communities and Local Government Select Committee investigation found that renewable energy schemes were more likely to be refused by the Secretary of State than other development types, such as housing. However, it also found that decisions were being made in line with planning policy.[135] Nevertheless, Secretary of State intervention at this scale contravenes the principle of localism, i.e. that planning decisions should be made more accountable and less centralised.

In conclusion, **onshore wind developments face many barriers in the planning system, from high refusal rates to interventions from DCLG.** Despite this, there is a large pipeline of projects that have already gained consent and are either under or awaiting construction (6.5GW across the UK, see Figure 1.2). Nevertheless, there is still a need to address planning barriers to allow for new low cost projects, repowered projects (see Chapter 3), and community projects. The next sections will examine the Government's proposals to change the planning system to offer local communities the "final say" on onshore wind applications, before exploring how greater community support can be encouraged.

Policy changes to give the public the final say

There are several existing ways in which the public can contribute to planning decisions:

- Contributing to consultations on the planning policies set out in the Local Plan (explored later in this chapter;)
- Contributing to a Neighbourhood Plan (explored later in this chapter);
- Pre-Application Consultation (PAC) – this is legally required for onshore wind developments of three or more turbines, or any turbines more than 15metres in height;
- Formally commenting on a submitted planning application;
- Challenging a local authority's grant of planning permission through judicial review; and
- Challenging a planning inspector or Secretary of State's grant of planning permission through statutory appeal.

136 Claire Haggett, "'Planning and Persuasion': Public Engagement in Renewable Energy Decision-Making," in *Renewable Energy and the Public: From NIMBY to Participation*, ed. Patrick Devine-Wright (London, UK: Earthscan,

None of these options give local people the power of veto over a planning application, but they offer the opportunity to provide input. That said, community consultation and engagement has historically been poor within the planning system.[136] The result is a 'democratic deficit': planning decisions (whether in terms of Local Plan policies or individual planning applications) tend to be disproportionately affected by a vocal minority of project opponents, since they have a greater motivation than the 'silent majority' for attending and contributing to planning discussions.[137]

The Conservative manifesto committed to giving local people "the final say" on wind farm applications. Two main sets of proposals were developed; one which focuses on transferring the power to decide large onshore wind development applications from the Planning Inspectorate to LPAs, and one which focuses on local or community backing for onshore wind developments.

Large-scale onshore wind developments

A media interview with the Secretary of State for Energy and Climate Change in May 2015 revealed that the Government would use primary legislation to transfer powers to determine onshore wind applications of greater than 50MW capacity from the Planning Inspectorate to LPAs. The idea is to bypass a "central Government quango which has the powers to over-ride the wishes of local people."[138] This has now been included in the Energy Bill.[139]

Box 5.1: Nationally Significant Infrastructure Projects

Onshore wind developments with a capacity of 50MW or more in England and Wales, are currently included within the definition of Nationally Significant Infrastructure Projects (NSIPs). Decisions on NSIP planning applications are made by the Planning Inspectorate, with the Secretary of State for Energy and Climate Change retaining the power to make the final decision (Table 5.1). In the case of onshore wind, the Planning Inspectorate and the Secretary of State must have regard to the National Policy Statement (NPS) for Renewable Energy Infrastructure when making their decision. This is a document that sets out the Government's policy for delivering major renewable energy infrastructure and guides decision-making in England and Wales. In Scotland, the decision on large-scale onshore wind developments is made by the Scottish Ministers, and in Northern Ireland by the Department of the Environment (Table 5.1).

However, there are very few developments in the UK that are above the 50MW threshold, and the vast majority of these are located in Scotland (Figure 5.7). Our analysis suggests that, by itself, the proposed change in the planning system will have very little effect (it only relates to England and Wales, since Scotland and Northern Ireland have their own planning legislation). However, the impact on Wales is uncertain, as the proposed Wales Bill would devolve planning decisions for onshore wind developments up to 350MW in Wales to the Welsh Government.[140] Given that the largest wind farm (operational, under construction, or awaiting determination) in Wales will be 228MW, this will effectively give control of all onshore wind developments in Wales to the Welsh Government.[141] The proposal would not, however, affect consented applications over 50MW awaiting construction, of which there are two in Wales and three in England, nor

2011), 15–28; Penny Walker, "Dinosaur DAD and Enlightened EDD – Engaging People Earlier Is Better," *The Environmentalist*, no. 71 (2009): 12–13. Haggett, "'Planning and Persuasion': Public Engagement in Renewable Energy Decision-Making"; Walker, "Dinosaur DAD and Enlightened EDD – Engaging People Earlier Is Better".

137 Bell, Gray, and Haggett, "The 'Social Gap' in Wind Farm Siting Decisions: Explanations and Policy Responses".

138 Christopher Hope, No more wind farms unless local people say yes, says new Energy Secretary, *The Telegraph*, http://www.telegraph.co.uk/news/earth/energy/windpower/11611050/Amber-Rudd-No-more-windfarms-unless-local-people-say-yes.html, 17 May 2015.

139 House of Lords, "Energy Bill [HL Bill 56]," 2015, http://www.publications.parliament.uk/pa/bills/lbill/2015-2016/0056/lbill_2015-20160056_en_1.htm. Ibid.

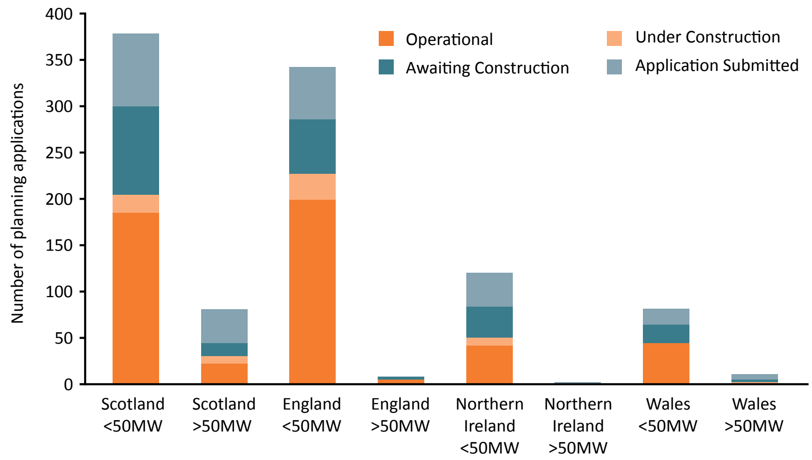
140 HMG, *Powers for a Purpose: Towards a Lasting Devolution Settlement for Wales*, 2015, https://www.gov.uk/government/publications/powers-for-a-purpose-towards-a-lasting-devolution-settlement-for-wales; Cabinet Office, Queen's Speech 2015: Background Briefing Notes, 2015, https://www.gov.uk/government/publications/queens-speech-2015-background-briefing-notes

141 DECC, "Renewable Energy Planning Database: March 2015," 2015, https://www.gov.uk/government/statistics/renewable-energy-planning-database-monthly-extract

142 DECC, "Renewable Energy Planning Database: June 2015".

143 Vattenfall, "Nocton Fen Project Has Stopped," 2015, http://us8.campaign-archive2.com/?u=2eb626f17fdcb93bb7098dd52&id=a493b52b6b

Figure 5.7: Total number of onshore wind developments until June 2015[142]



would it affect the 1GW of consented wind farms under construction or awaiting construction in England. Most importantly, **there are currently** no **onshore wind NSIPs awaiting a planning decision in England (although there are six in Wales as of March 2015). A proposed development of up to 69MW at Nocton Fen that had not yet submitted a planning application has been halted due to the recent policy changes.**[143]

The Government's proposal also seems to ignore the fact that it is actually the Secretary of State for Energy and Climate Change that has the power to over-ride the wishes of local people for large projects, rather than the Planning Inspectorate (Table 5.1). The Queen's Speech clarified that only onshore wind projects will be removed as an NSIP category.[144]

For smaller onshore wind projects in England, the ultimate decision-making power currently lies with the Secretary of State for Communities and Local Government (Table 5.1). For these projects, the National Planning Policy Framework (the current foundation of planning policy, which reduced more than 1,000 pages of planning policy to fewer than 100 pages) is the main applicable policy document. Nevertheless, the National Policy Statement (NPS) for Renewable Energy Infrastructure remains a material consideration in making decisions.[145] However, new planning guidance in March 2014 made clear that "the need for renewable or low carbon energy does not automatically override environmental protections".[146] Once large onshore wind projects are transferred to LPAs for determination, it would be more appropriate for the onshore wind information within the NPS to be transferred to the Planning Practice Guidance for Renewable and Low Carbon Energy.

Recommendation: The Government is committed to ensuring that all onshore wind developments in England are decided by Local Planning Authorities (Welsh Minsters are likely to determine all onshore wind developments in Wales in future). As a result, the information on onshore wind within the National Policy Statement for Renewable Energy Infrastructure (which sets out Government policy for delivering major renewable energy infrastructure) should be transferred to the Planning Practice Guidance for Renewable and Low Carbon Energy, which only applies to England.

144 Cabinet Office, *Queen's Speech 2015: Background Briefing Notes.*

145 DCLG, "National Planning Policy Framework," 2012.

146 DCLG, "Planning Practice Guidance for Renewable and Low Carbon Energy – Revised April 2014," 2014.

All onshore wind developments

The Government's proposed change to the planning system for large-scale (>50MW) onshore wind developments will, by itself, have a minimal impact in England. However, the Government's separate proposal to change the planning system for onshore wind developments of "one or more turbines" will have a significant impact. On 18 June, Greg Clark, the new Secretary of State for Communities and Local Government, released a Written Statement on onshore wind developments in England. This stated that, with immediate effect, planning permission should only be granted by LPAs if:

- "the development site is in an area identified as suitable for wind energy development in a Local or Neighbourhood Plan; and
- following consultation, it can be demonstrated that the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing."[147]

These criteria and their implications will be explored in turn in the following sections. However, it should be noted that whilst Written Statements and subsequent changes to planning practice guidance are a material consideration in planning decisions, they are not national planning policy.

What are Local and Neighbourhood Plans?

Local Plans "set out a vision and a framework" for an area's future development and are the responsibility of LPAs, although the public is consulted on proposed planning policies.[148] The National Planning Policy Framework provides guidance on what the Local Plan should contain. A recent DCLG written statement has also announced the intention for central government to "intervene to arrange for the [Local] Plan to be written", should a local authority have failed to produce one by early 2017. It is not clear what effect this will have for onshore wind.[149]

Neighbourhood planning is a relatively new initiative introduced in England via the 2011 Localism Act.[150] It allows communities to draw up plans for the use and development of local land within the context of the needs of the wider area.[151] These Neighbourhood Plans have the same legal status as the Local Plan and influence planning application decisions. As of May 2015, there have been almost 1,400 Neighbourhood Plan applications, of which 46 have now been adopted.[152]

What impact will the changes have?

The Written Statement proposes that LPAs can only grant planning permission if the development site is already identified in a Neighbourhood or Local Plan. It also provides further clarification on what this means in practice: "suitable areas for wind energy development will need to have been allocated clearly in a Local or Neighbourhood Plan. Maps showing the wind resource as favourable to wind turbines, or similar, will not be sufficient."

Despite Written Statements not being national planning policy, this is a significant hurdle for onshore wind projects in England to overcome. To begin with, as of May 2015, more than a third (39%) of English LPAs lack any form of adopted Local Plan, and just 23% of English LPAs had a Local Plan adopted after the introduction of the National Planning Policy Framework.[153] In theory,

147 House of Commons, *Written Statement (HCWS42)* (Hansard, 2015), www.parliament.uk/documents/commons-vote-office/June 2015/18 June/1-DCLG-Planning.pdf

148 DCLG, "Local Plans," *Planning Practice Guidance*, 2015, http://planningguidance.planningportal.gov.uk/blog/guidance/local-plans/?print=true

149 House of Commons, *Written Statement (HCWS172)* (Hansard, 2015).

150 HMG, *Localism Act*, 2011

151 DCLG, "National Planning Policy Framework".

152 Planning Resource, "Map: Neighbourhood Plan Applications," *Planning Resource*, 2015, http://www.planningresource.co.uk/article/1212813/map-neighbourhood-plan-applications

153 Planning Inspectorate, "Local Plans (Strategic Issues / 'Core Strategies') Progress – 31 May 2015," 2015, http://www.planningportal.gov.uk/planning/planningsystem/localplans

therefore, the Government's policy change could put an end to *all* new onshore wind applications to LPAs without a Local Plan, since there would be no chance of gaining planning permission.

In addition, there is a problem even with those LPAs that do have an up to date Local Plan. Whilst Local Plans should include strategic policies to deliver energy generation, there is currently no requirement for them (or for Neighbourhood Plans) to specify the type of energy generation technology.[154] Consequently, most Local and Neighbourhood Plans will not have clearly allocated "suitable areas for wind energy development".[155] There are also no guidelines given for just how detailed an assessment is required to identify suitable areas (presumably taking into account technical and economic feasibility), over and above maps of favourable wind resource. Detailed assessments (such as the one conducted by Hastings Borough Council in a failed attempt to allocate a wind farm site) are likely to be beyond the resources of all but the most determined Neighbourhood Planning groups.[156]

This change will meet the goal set out in the Conservative manifesto of halting any new subsidised onshore wind developments (at least those that have not already submitted planning applications). However, until Local and/or Neighbourhood Plans begin to allocate sites (which could take many years in the case of Local Plans), **this policy change risks preventing commercial developments from going ahead that do in fact have community support. It will also harm the ability of communities to develop their own small-scale onshore wind projects**, contradicting a recent statement by the current Secretary of State for Energy and Climate Change: "I do not wish to stand in the way of local communities coming together to generate low-carbon electricity in a manner that is acceptable to and supported by them, including through small-scale wind capacity."

There is a further worrying side to this proposal. **The NPPF introduced the core principle of a "presumption in favour of sustainable development". Yet the Government's proposal is effectively a presumption against sustainable development, at least in the short term.**[157] The consequences will only become clear over time as case law develops, but the contradiction is unlikely to benefit many outside the legal profession.

Recommendation: The condition for only granting planning permission to onshore wind developments on sites that are specifically allocated in Local or Neighbourhood Plans is counter to the National Planning Policy Framework's core principle of a "presumption in favour of sustainable development". It should therefore be either removed entirely, or at least removed for community-scale developments. All developments would still need to demonstrate community backing.

Consultation and community backing

> *The idea of citizen participation is a little like eating spinach: no one is against it in principle because it is good for you.*
>
> Sherry Arnstein[158]

For LPAs to grant planning permission, not only do sites have to be allocated in the Local or Neighbourhood Plan, but also demonstrate that "following

154 DCLG, "National Planning Policy Framework".

155 John Ainslie (RWE Energy) and Daniel Stone (CSE), Personal Communication, July 2015.

156 Chris Blandford Associates, *Upper Wilting Farm Wind Turbine Feasibility Assessment* (Hastings Borough Council, 2013), http://www.hastings.gov.uk/environment_planning/planning/localplan/evidence_base/additional/windturbinestudy/; Richard E Hollox, *Report on the Examination into the Hastings Local Plan Development Management Plan Revised Proposed Submission Version 10 March – 22 April 2014* (The Planning Inspectorate, 2015), http://www.hastings.gov.uk/content/environment_planning/planning/PDFs/ldf/finalrepormodified

157 Bond Dickinson, "Changes to Planning Policy for Onshore Wind Farms," 2015, http://www.bonddickinson.com/insights/publications-and-briefings/changes-planning-policy-onshore-wind-farms

158 Sherry R. Arnstein, "A Ladder of Citizen Participation," *Journal of the American Institute of Planners* 35, no. 4 (1969): 216–24. Ibid.

consultation…the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing."

This second requirement is made up of two very separate components. The first (consultation and addressing community concerns) is apparently identical to the existing requirement for Pre-Application Consultation, or PAC. PAC involves the developer providing the LPA with details of the consultation responses and "the account taken of those responses" as part of the planning application.

The second component (community backing), however, is not currently required as part of PAC legislation. Indeed, the wording of the Written Statement is problematic, since a developer may be able to demonstrate that it has adequately addressed community concerns (e.g. noise, house price impacts, etc.) in planning terms but still be unable to demonstrate community backing. This is particularly awkward since a minority of opponents can be more vocal (and some will never change their minds) than the majority of people who support or are indifferent to onshore wind.

The Written Statement explains that "Whether a proposal has the backing of the affected local community is a planning judgement for the local planning authority." This is difficult since there is no guidance given as to what threshold of opposition versus support is considered to represent "community backing". The potential consequence is exposing LPAs to the risk of legal action from both developers and the public in a Catch-22 situation. Developers could appeal against refusals given on the basis of insufficient community support, and members of the public could seek judicial review of permissions granted on the basis of community support being deemed sufficient.

Recommendation: DCLG should set out clearly what it means by community backing in this context, in order to reduce the risk of legal challenge by both developers and communities.

In the meantime, there is a strong case for developers to engage more effectively with communities, particularly since the planning system in general has a long history of poor community engagement, with a focus on one-way communication and (more recently) consultation, rather than participation.[159] This has disenfranchised communities and can increase opposition to developments.[160] Effective participation, however, can help identify the particular reasons why people object to an onshore wind development. Addressing these could be critical in swaying the opinions of Qualified Supporters and Place-Protectors (see Chapter 2).[161]

"almost 80% of the public agree that renewable energy developments should provide direct benefit to the communities in which they are located"

With the new planning requirement to demonstrate community backing, it will become even more important for developers to find ways to encourage community support for onshore wind. The remainder of this chapter explores existing and potential new ways to encourage community support through community benefits.

Increasing the community benefit of onshore wind

Effective community participation is necessary, but a second important strand is the provision of community benefits as a result of onshore wind development. For example, DECC surveys have revealed that almost 80% of the public agree that

159 Haggett, "'Planning and Persuasion': Public Engagement in Renewable Energy Decision-Making".

160 Patrick Devine-Wright, "Public Engagement with Large-Scale Renewable Energy Technologies: Breaking the Cycle of NIMBYism," *Wiley Interdisciplinary Reviews: Climate Change* 2, no. 1 (2011): 19–26. Ibid.

161 Haggett, "'Planning and Persuasion': Public Engagement in Renewable Energy Decision-Making".

renewable energy developments should provide direct benefit to the communities in which they are located.[162] This may be due to the fact that the benefits of renewable energy are felt at a global level, whereas the impacts are felt at the local level.[163]

The housing sector offers some useful insights. Just as the majority of the public support onshore wind developments, so do the majority support new housing. However, proposed developments in both sectors can attract considerable local opposition. As a previous Policy Exchange report on housing has argued, our "planning system does not do enough to recognise that the impact of development is focused on those closest to development nor reward communities for allowing new homes, despite the positive social impact of allowing development".[164] This also applies to onshore wind developments: it is local people who bear the brunt of the disadvantages of new developments, whether these are increased traffic or landscape effects. They should therefore be offered some form of benefit from hosting new developments.

The disadvantages of hosting onshore wind developments are commonly said to affect 'communities' and therefore it is 'communities' that should receive benefits from development. However, before discussing the different types of benefits that can be offered, it is important to define what exactly is meant by a 'community'.

What is a community?

There are two different, though not mutually exclusive, categories of community:

- **Community of Locality**: a community based around a shared location (for example, residents of a particular village or town, or within viewing distance of a proposed onshore wind development); and
- **Community of Interest**: a community based around shared attitudes, values, or interests that may or may not correspond with a particular geographical location (for example, members of the RSPB or a local walking group).[165]

Whilst planning tends to focus on the former (perhaps because it is easier to identify communities based on place), research suggests that the latter is at least equally important and both can object to planning applications.[166] It is necessary to consider the many different communities belonging to both categories that may be affected by an onshore wind development, both to help ensure fairness and to ensure that benefits are tailored to the different communities' wishes and/or requirements.

Benefits communities receive from onshore wind developments

Onshore wind developments can offer a wide range of potential sources of community benefits. For example, commercial developments could offer developer contributions and Community Benefit Funds (Figure 5.8), and community-led developments (with 100% community ownership) could generate funds that help to deliver other community projects. These typically, though not exclusively, benefit communities located close to the development site. The different sources can help deliver a variety of benefits for communities: for example developer contributions can help fund local environmental improvements.

The scale of benefits can be considerable: the Scottish community benefits register has revealed that the wind energy industry now contributes £8.8 million per year to community projects.[167] The impact of these benefits may be even

162 DECC, "Public Attitudes Tracker – Waves 1–13 Headline Findings".

163 Haggett, "'Planning and Persuasion': Public Engagement in Renewable Energy Decision-Making".

164 Alex Morton, *Making Housing Affordable: A New Vision for Housing Policy* (Policy Exchange, 2010).

165 Centre for Sustainable Energy, *Delivering Community Benefits from Wind Energy Development: A Toolkit* (Renewables Advisory Board, 2009).

166 Emily Talen, "Sense of Community and Neighbourhood Form: An Assessment of the Social Doctrine of New Urbanism," *Urban Studies* 36, no. 8 (1999): 1361–79.

167 James Phillips, "Scottish Wind Energy Industry Delivers Record £8.8m Boost to Local Community Projects," *BusinessGreen*, June 2015, http://www.businessgreen.com/bg/news/2413184/scottish-wind-energy-industry-delivers-record-gbp88m-boost-to-local-community-projects

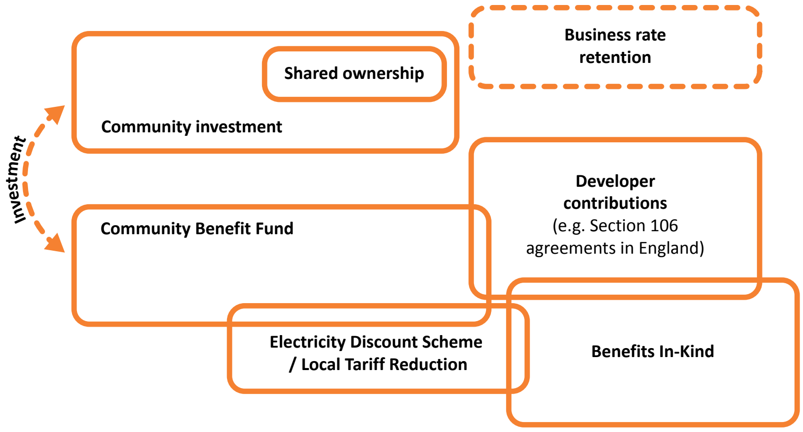
greater since community benefits are often used as match funding, and onshore wind developments tend to be located in rural and coastal areas that "are relatively disadvantaged".[168] Benefits are, however, considered separately from the planning process, i.e. they cannot influence planning decisions.

There is considerable overlap between, and flexibility amongst the different sources of community benefit. Business rate retention is a potential indirect benefit to communities, since it is kept by Local Authorities who may or may not use it to benefit the affected community. In order for LPAs, communities and developers to benefit from best practice, community benefit registers have been established in England, Wales and Scotland, though not yet in Northern Ireland.[169] These show the different types and amounts of community benefits that communities have agreed with developers. However, the input of data is entirely voluntary for both communities and onshore wind developers, which restricts the usefulness of the registers in terms of best practice dissemination.

Recommendation: There should be a mandatory requirement for developers to input data into the community benefit registers.

The next sections describe the main sources of community benefit (excluding business rate retention) from commercial onshore wind developments in more detail. They explore existing and potential barriers to communities gaining the most from these benefits and suggest ways forward.

Figure 5.8: Different sources of community benefits from commercial onshore wind developments



Community Benefit Funds

Community Benefit Funds (CBFs) are a way for developers to offer 'goodwill' funding for use by communities hosting onshore wind developments. However, they should not be viewed as bribes or a means of 'silencing NIMBYs' (in fact true NIMBYs and 'Place-Protectors' are unlikely to be swayed by CBFs).[170] There are several different ways for payments to be made, including lump-sum, fixed (annual payment per megawatt) or variable (linked to revenue) annual payments, or even combinations of these.[171] Prior to 2013, CBFs were an optional developer contribution, typically between £800 and £1,000 per MW per year.[172]

168 Richard Cowell, Gill Bristow, and Max Munday, *Wind Energy and Justice for Disadvantaged Communities* (Joseph Rowntree Foundation, 2012), http://ww.communityenergyscotland.org.uk/assets/0000/6655/JRF_Paper.pdf.wind energy and justice

169 Welsh Government, "Register of Community and Economic Benefits," 2014, gov.wales/topics/environmentcountryside/energy/renewable/wind/register/?lang=en; Local Energy Scotland, "Scottish Government Register of Community Benefits from Renewables," 2015, http://www.localenergyscotland.org/view-the-register; RenewableUK, RegenSW, and DECC, "English Register of Community Benefits and Engagement," 2015, http://www.communitybenefitsregister.org/

170 Wolsink, "Wind Power Implementation: The Nature of Public Attitudes: Equity and Fairness instead of 'Backyard Motives'".

171 Regen SW, *Community Benefits from Onshore Wind Developments: Best Practice Guidance for England* (DECC, 2014).

172 Centre for Sustainable Energy, *Delivering Community Benefits from Wind Energy Development: A Toolkit*.

The main advantages of CBFs are that they are:

- long-term – annual payments occur for the operational life of the onshore wind development, which is typically 25 years;
- flexible – the funding can be used for a wide variety of community projects (short- and long-term), and can be offered in the form of grants and/or loans for pump-priming other projects (including community investment schemes); and
- reliable – fixed annual payments and lump-sum payments offer communities a reliable and predictable source of income.

In addition, CBFs can attract match-funding from other sources, increasing the overall amount available for community use.[173] During times of difficult Local Authority spending decisions, CBFs could also help support non-statutory services, such as green space maintenance and keeping community centres open.

In October 2013, RUK developed a commitment with the onshore wind industry to offer a voluntary Community Benefit Fund commitment. This involves a package of at least £5,000 per MW per year (or the equivalent value of benefits in-kind) for the operational lifetime of onshore wind projects of five or more megawatts of installed capacity in England.[174] Scottish Renewables outlined a similar commitment in 2013.[175] The advantage of this industry standard is that it helps reduce the perception of CBFs as a 'shadowy bribe'.[176] However, the sum committed to is not universally adopted across the UK: Wales does not have such a commitment (instead it has a declaration that provides guidance for community engagement) and Northern Ireland has a voluntary £1,000 per MW commitment.[177]

The CBF of £5,000 per MW per year represents an estimated 2% of a projects' overall revenue. In a competitive auction such as the CfD mechanism (see Chapter 3 for discussion), the presence of projects with different CBFs may be distorting competition. The projects which offer the lowest community benefit may be able to outbid projects that offer more community benefit. The results of the first CfD auction suggest that this might indeed be the case, with at least one third of winning projects offering less than the £5,000 per MW per year industry standard. Over time, this should balance itself out, with fewer older projects bidding into the CfD. But to signal its intention to support community benefits, DECC should ensure that all onshore wind farm developments bidding for CfD contracts offer the same level of CBF support.

Recommendation: DECC should introduce a requirement for all onshore wind projects in future CfD rounds for a minimum Community Benefit Fund of £5,000 *per MW per annum* (this should not apply retrospectively to projects that have already been awarded CfDs).

Local tariff reduction and electricity discount schemes

One way of tying the benefits of a wind farm directly to a local community (a community of location, rather than of shared interest) is to offer electricity discounts or tariff reductions. This can be done in a range of ways. For example, Good Energy offers a specific tariff for residents within 2km of its Delabole wind farm in Cornwall that is 20% cheaper than its standard electricity tariff and offers a £50 'windfall' per household for years when the wind farm exceeds expected output.[178]

173 Ibid.

174 RenewableUK, *Onshore Wind: Our Community Commitment*, 2013, http://www.renewableuk.com/en/utilities/document-summary.cfm?docid=3E03FD17-1D22-4945-9D8F9A019D949C7A

175 Scottish Renewables, *Onshore Wind Community Benefit Protocol*, 2013.

176 vento ludens Ltd. and Docherty Consulting Ltd., *Securing the Benefits of Wind Power in Scotland*, 2012, http://www.ventoludens.co.uk/cms/upload/unternehmen/presse/Securing-the-Benefits-of-Wind-Power-in-Scotland-website.pdf

177 *Declaration for Community Benefits by Onshore Wind Farm Developers and Operators in Wales*, 2013; NIRIG, *Community Commitment Protocol*, 2013, http://www.ni-rig.org/news/nirig-launches-community-commitment-protocol/

178 Good Energy, "The UK's First Local Electricity Tariff Is Open for Business," *Good Energy Blog*, 2013, http://www.goodenergy.co.uk/blog/articles/2013/01/08/the-uk-s-first-local-electricity-tariff-is-open-for-business

However, the windfall payment required a derogation licence from Ofgem. As part of the Retail Market Review, Ofgem limited energy suppliers to offering four core tariffs.[179] As a result, any additional local tariffs and/or windfall payments would require a derogation. Ofgem has granted derogations of this nature, but generally only for relatively short periods of time (Good Energy's derogation for its Hampole local tariff will only last for two years).[180] The four core tariff rule is overly restrictive, and is counterproductive in the context of community benefits from renewable energy developments by reducing innovation and competition.

More generally, a recent report by the Competition and Markets Authority found that the four-tariff limit "may have an adverse impact on competition and consumer welfare".[181] As a result, it made a provisional recommendation for Ofgem to remove the restriction on tariffs to stimulate competition and innovation.[182] We agree that the current system is overly restrictive (in the context of local tariff reductions, and more generally).

Recommendation: Ofgem should implement the Competition and Markets Authority's recommendation to remove the Retail Market Review's tariff restrictions for domestic retail energy suppliers.

An alternative to bypass the requirement for a derogation is the use of electricity discount schemes. For example, RES offers a £200 discount to households, businesses and public buildings within a set distance of their onshore wind developments, regardless of energy supplier, tariff, or energy use. The discount is paid directly to the relevant energy supplier for the lifetime of the development and is deducted from bills, with special arrangements for properties with pre-payment meters.[183] This model does not require a derogation licence from Ofgem.

Developer contributions and benefits in-kind

Developers can make (or be required to make) contributions to infrastructure and the environment via obligations in legally binding planning agreements. In England and Wales, these are made via Section 106 agreements, in Scotland via Section 75 agreements, and in Northern Ireland via Article 40 agreements. Obligations may involve developers carrying out infrastructure improvements themselves, or providing LPAs with the funds to do so.

Planning agreements may also be used to secure developer contributions that go beyond what is necessary to make the development acceptable (benefits in-kind). For example, potential obligations could be used to secure local socio-economic (e.g. apprenticeships and local jobs), environmental (e.g. habitat creation) and amenity (e.g. recreation facilities and maintenance of cultural heritage features) improvements.[184] They may also be used to secure the management of the Community Benefit Fund by the LPA or other governing body.

Community ownership

> *'Your own pigs don't smell' say the Danes*
>
> Network for Alternative Technology and Technology Assessment[185]

The UK Government has previously expressed support for encouraging community energy in the UK. 'Community energy' encompasses a range of models including community-led development and shared ownership (see Table 5.3). In its 2014

179 Ofgem, "Simpler Choices," 2013, https://www.ofgem.gov.uk/simpler-clearer-fairer/simpler-choices

180 Maxine Frerk, "Decision on Good Energy Limited's Request for Derogation from Paragraph 4 of Standard Licence Condition 22B of the Electricity Supply Licence in Respect of Any Windfall Payments Payable in Accordance with the Terms of the Hampole Local Tariff" (Ofgem, 2014), https://www.ofgem.gov.uk/publications-and-updates/decision-good-energy-limited's-request-derogation-paragraph-4-standard-licence-condition-22b-electricity-supply-licence-respect-any-windfall-payments-payable-accordance-terms-hampole-local-tariff

181 Competition & Markets Authority, *Energy Market Investigation: Provisional Findings Report*, 2015, https://www.gov.uk/cma-cases/energy-market-investigation#full-provisional-findings-report

182 Competition & Markets Authority, *Energy Market Investigation: Notice of Possible Remedies*, 2015, https://www.gov.uk/cma-cases/energy-market-investigation#provisional-findings-and-possible-remedies

183 RES, "Welcome to the RES Local Electricity Discount Scheme website," 2015, www.res-leds.com

184 Centre for Sustainable Energy, *Delivering Community Benefits from Wind Energy Development: A Toolkit.*

185 "Renewable Energy in the UK: A NATTA Guide for Newcomers," 2005, http://eeru.open.ac.uk/natta/natta-guide.html

Community Energy Strategy, DECC stated that by 2015 "it should be the norm for communities to be offered the opportunity of some level of ownership by commercial developers."[186] Currently, this is a voluntary commitment for onshore wind developers, and Scotland is the trailblazer in this regard (Box 5.2). If the current voluntary approach is unsuccessful, there are powers in the Infrastructure Act 2015 to legally require developers in Great Britain to offer community ownership options (the Community Electricity Right).[187]

Box 5.2: Community Energy in Scotland

In January 2005, Scotland gained its first grid-connected, community-owned onshore wind farm, on the Isle of Gigha.[188] Six years later, Scotland introduced a target of 500MW of renewable energy in community and local ownership by 2020, with onshore wind identified as a key contributor. This could represent up to £225million of Feed-in Tariff revenue each year being directed to local communities.[189] The target is financially supported by the Renewable Energy Investment Fund (REIF), which offers loans, equity and guarantees for community renewables. Capacity-building is provided by the Community and Renewable Energy Scheme (CARES), which offers communities guidance, advice and grant support.[190] The Scottish Government estimates that there is already 361MW of renewable energy capacity in community ownership, as of May 2015.[191]

The evidence suggests that developments with some form of community ownership attract higher levels of support.[192] For example, community-led development is the prevailing model in Germany and Denmark, which are both considered wind energy pioneering countries.[193] There, community ownership is considered to contribute to the high levels of public support for onshore wind developments, particularly as development becomes more intensive and/or proposed in more controversial sites.[194]

In the UK there are more than 5,000 active community energy groups, many of which have developed their own energy generation schemes (known as community-led development).[195] However, the size, complexity and cost of most onshore wind developments (in comparison with, for example, solar PV) means that they are more likely to be delivered by commercial developers, rather than community groups. However, community ownership is still possible if commercial developers facilitate investment into their projects.

Discussions with commercial onshore wind developers revealed that some view shared ownership or community investment to be a useful route to raise capital for an onshore wind project – particularly smaller scale developers who cannot easily access bank finance. Other developers stated that whilst they do not *require* community investment to finance projects, they are nevertheless exploring the potential for community ownership as a route to increasing community engagement. However, several developers also highlighted that the administration of community ownership schemes represents a significant additional cost, and some are concerned about the complexity it adds to developments.

Another issue is that wind farms in the UK tend to be located "in sparsely populated areas with high relative poverty". This means that many of the communities that host onshore wind developments may be limited in their ability to invest significant sums in ownership of energy assets.[196] It is also important to

186 DECC, *Community Energy Strategy: Full Report*, 2014.

187 DECC, *Community Energy Strategy Update*, 2015, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/275163/20140126Community_Energy_Strategy.pdf

188 Charles R. Warren and Malcolm McFadyen, "Does Community Ownership Affect Public Attitudes to Wind Energy? A Case Study from South-West Scotland," *Land Use Policy* 27, no. 2 (2010): 204–13.

189 Scottish Government, *2020 Routemap for Renewable Energy in Scotland*, *Energy*, 2011.

190 APS Group, *Good Practice Principles for Community Benefits from Onshore Renewable Energy Developments* (The Scottish Government, 2013).

191 Scottish Government, *Europe 2020: Scottish National Reform Programme 2015*, 2015, http://www.gov.scot/Publications/2015/05/6659

192 Dave Toke, "Community Wind Power in Europe and in the UK," *Wind Engineering* 29, no. 3 (2005): 301–8; Warren and McFadyen, "Does Community Ownership Affect Public Attitudes to Wind Energy? A Case Study from South-West Scotland"; Cowell, Bristow, and Munday, *Wind Energy and Justice for Disadvantaged Communities*; SLR, *Wind Energy: International Practices to Support Community Engagement and Acceptance*, 2014.

193 The European Wind Energy Association, *Wind in Power*, 2015, http://www.ewea.org/statistics/; Centre for Sustainable Energy and Garrad Hassan, *Community Benefits from Wind Power: A Study of UK Practice and Comparison with Leading European Countries* (DTI, 2005); Toke, "Community Wind Power in Europe and in the UK".

194 Centre for Sustainable Energy and Hassan, *Community Benefits from Wind Power: A Study of UK Practice and Comparison with Leading European Countries.*

195 DECC, *Community Energy Strategy Update.*

196 TLT Solicitors, *Bankable Models Which Enable Local Community Wind Farm Ownership* (Renewables Advisory Board and DTI, 2007), http://www.communitypathways.org.uk/resource/bankable-models-community-wind-ownership; Cowell, Bristow, and Munday, *Wind Energy and Justice for Disadvantaged Communities*. Ibid.

bear in mind that some communities may simply be unwilling to take on shared ownership and instead prefer a simple CBF offer. Alternatively, some communities may lack the skills and expertise to take on shared ownership. To this end, Government has developed a number of schemes which offer capacity building and financial support to community energy organisations, with the most significant schemes provided in Scotland (Table 5.2).

Table 5.2: Support offered to community energy organisations (whether involved in community-led development or community ownership) in the different countries of the United Kingdom[197]

Country	Financial Support	Capacity Building
England	Rural Community Energy Fund (£15 million) Urban Community Energy Fund (£10 million)	Community Energy England
Scotland	Renewable Energy Investment Fund, including Local Energy Investment Fund pilot (£103 million) Community and Renewable Energy Scheme (£5.35 million for community-owned projects)	Community Energy Scotland Local Energy Scotland (helps manage the Community and Renewable Energy Scheme)
Wales	Ynni'r Fro scheme (£15 million)	Community Energy Wales
Northern Ireland	Unknown	Unknown

Community ownership models and business structures

There is a wide range of different community ownership models (and hybrids of models), which vary in the extent and type of community ownership. Each model has its own advantages and disadvantages (Table 5.3) and will be appropriate in different circumstances. Since no two communities are the same, the diversity of models available is an important advantage when attempting to increase take-up by communities and commercial developers. As a result, DECC's Community Energy Strategy deliberately kept a broad remit, and this should continue to be the case.

Regardless of the ownership model, if a community is to own, part-own or invest in a commercial wind farm, they will need to establish some kind of formal community organisation. There are a wide range of potential business structures to choose from, depending on the community's aims.[198] Many of these are also eligible for tax relief, which increases their attractiveness for investors. However, there are issues with some of the most commonly formed structures that could affect the viability of community ownership of future renewable energy schemes.

For example, in many cases, community energy organisations have been formed as co-operatives, which were eligible for Enterprise Investment Scheme (EIS) or Seed Enterprise Investment Scheme tax relief (allowing investors to deduct 30 or 50%, respectively, of the cost of their investment from their income tax bill). From 1 April 2015, these tax relief systems are no longer available for community energy projects, having been replaced by the similar Social Investment Tax Relief (SITR) tax

197 DECC, *Government Response to the Shared Ownership Taskforce*, 2015, https://www.gov.uk/government/publications/government-response-to-the-shared-ownership-taskforce

198 Resource Centre, "Not-for-Profit Organisations," 2015, http://www.resourcecentre.org.uk/information/legal-structures-for-not-for-profit-organisations/

relief system (allowing investors to deduct 30% of the cost of their investment from their income tax bill). However, co-operatives are not eligible for SITR.

Compounding this, the Financial Conduct Authority (FCA) has recently blocked several applications for renewable energy co-operatives. Due to their small size, co-operatives sell electricity to the national grid rather than directly to members, which does not satisfy the "member participation" or "unique member benefits" requirements of the Co-operative and Community Benefit Societies Act 2014.[199] There is also concern that the financial promotions offered by co-operatives are not regulated to the standards of investment propositions in other sectors.[200]

Instead, it is possible for community organisations to register as charities, as Community Interest Companies (CICs) or as Community Benefit Societies (CBSs), all of which are eligible for SITR. However, CICs cannot issue withdrawable shares since they are not registered by the FCA. In addition, CBSs are not allowed to distribute profits, dividends or other surpluses to their members (although they can pay interest on share capital "sufficient to attract and retain investment").[201] Because of this, the overall return from investing in a community energy project (including tax relief) could be similar to that offered by less risky investments, which could limit the capital that CBSs can raise through share offers.

These issues remain unresolved, despite industry and NGO calls for clarification.[202] DECC has said that it is working with the FCA to respond to industry concerns and the FCA is consulting with stakeholders.[203] However, until solutions are found, FCA regulation represents a significant barrier to community ownership of renewable energy developments, contrary to Government's policy to support community energy.

Recommendation: DECC should ensure that a quick resolution is found to the issue of community ownership structures, to both reduce uncertainty and help meet community ownership goals.

Key findings

This chapter has explored the past and likely future planning context for onshore wind developments. There are significant barriers to onshore wind developments in the planning system, including long decision times and high rates of refusal. However, there remains a considerable pipeline of consented projects that are awaiting construction.

In terms of future developments, the Government's proposals to give local people the "final say" on onshore wind developments will effectively halt all new onshore wind applications in England in the short term, including those submitted and/or supported by local communities. It will also prevent repowering of existing wind farms and the development of new, low-cost sites with larger (and more efficient) turbines.

There is therefore a need to address some of the barriers in the planning system. This can be achieved through a combination of genuine public engagement, and community benefits tailored to meet the needs and wishes of the affected community. Important types of community benefit are Community Benefit Funds (CBFs) and community ownership options. However, there are several policy issues with both of these.

The onshore wind industry has signed up to voluntary CBF funding standards, but these vary across the different countries of the UK. In addition the CfD

199 DECC, *Government Response to the Shared Ownership Taskforce.*

200 DECC, *Community Energy Strategy Update.*

201 DECC, "DECC Overview on Co-Operative Societies and Community Benefit Societies," 2015, https://www.gov.uk/government/publications/community-energy-strategy-update/decc-overview-on-co-operative-societies-and-community-benefit-societies

202 Community Energy England et al., *Unblocking the UK Community Energy Revolution*, 2015

203 DECC, *Community Energy Strategy Update.*

auction model may penalise developments that offer higher levels of community benefit. Onshore wind is the only energy sector to have a voluntary commitment to offer communities ownership opportunities. Yet FCA regulation, and delay in resolving the problem, is affecting the ability of communities to invest in, and benefit from, such schemes.

Table 5.3: Different levels of community ownership of onshore wind development[204]

Community Ownership Model	Community-Led	Joint Venture	Developer-Led		Third-Party Providers	Investment Funds
	100% community ownership	Both community group and developer have equity stakes in the development	Shared revenue	Split ownership		
UK Examples	Isle of Gigha Windmills, Scotland	Neilston Community Wind Farm, Scotland	Kilbraur Wind Energy Co-operative, Scotland	EDF & Fenland Green Power Co-operative, Lincolnshire	Abundance Generation Energy4All P2P ISAs (if introduced)	Triodos Renewables Renewable energy pension wrappers
	A mixture of grant funding, loan finance and equity finance[2]	Neilston Development Trust secured 28.3% of the development from Carbon Free Developments via loans	A share offer raised the co-operatives' stake in the development to £1.6 million	A loan and share offer allowed the co-operative to own a quarter of the 8 turbine development	Allow the general public to invest in particular energy schemes (sometimes with lower investment thresholds for local residents)	Allow the general public to invest in a range of renewable energy schemes
Project Location	Specific Project/s					No specific project
Community Type	Community of locality →					Community of interest
Potential Advantages	• Fits the needs of the community more closely • Community retains full control and the full benefits of the development	• Direct sense of community ownership over 'its' turbines and/or development • Developer carries early-stage risks, and brings skills and expertise • Developer gains from constructive community relationship • Avoids the risk of owning just a single turbine • Income source for other community initiatives • Builds some community capacity and energy literacy			• Enables wider public participation • Can support smaller projects that would otherwise struggle to gain commercial finance	• Avoids risk of investing in just one development • Enables wider public participation • Can support smaller projects that would otherwise struggle to gain commercial finance
Potential Disadvantages	• Only suitable for small-scale projects due to the size of the funds required • Community retains full control and the full burden of responsibility/risk for the development • Considerable time investment required	• Risk of losing investment • Delayed returns • Not all members of a community will be able to afford the investment and so not all will be able to benefit • Difficulties in raising sufficient capital/equity • Expense of administration • Developer concerns about complex ownership/funding structures • Burden of maintenance falls on the community in the split ownership model • Difficulties with separate grid connections and eligibility for CfDs and the RO in the split ownership model • Community does not own any physical assets in the shared revenue model			• Less sense of community ownership over projects	• Little sense of 'local' community ownership over projects • Benefits only available to those able to invest

204 Mark Bolinger, "Community Wind Power Ownership Schemes in Europe and Their Relevance to the United States," *Lawrence Berkeley National Laboratory*, 2001; DECC, *Guidance on Community Ownership Models under the Feed-in Tariffs Scheme*, 2015, https://www.gov.uk/government/publications/guidance-on-community-ownership-models-under-the-feed-in-tariffs-scheme; Theresa Meacham, *Renewable Energy: Community Benefit and Ownership*, *SPICe Briefing*, 2012; Shared Ownership Taskforce, *Report to DECC*, 2014, http://www.renewableuk.com/en/utilities/document-summary.cfm?docid=CB5A9C2C-FA70-46CE-83757D293D992E3E

205 Isle of Gigha Heritage Trust, Frequently asked questions about the Gigha Windmills, http://www.gigha.org.uk/windmills/TheStoryoftheWindmills.php, 2015.