

Small and Medium Wind UK Market Report

March 2015



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Executive Summary

The Small and Medium Wind Market Report is our annual review of the industry progress of the sub-500kW wind sector. First published in 2008, these reviews chart a sector which has grown and matured into a successful industry with world-leading standards and an established manufacturing base.

The UK should be proud of the small and medium wind sector. British companies are involved in the manufacture and installation of turbines, both here and abroad. For every turbine installed in the UK, one is also exported overseas, a fantastic example of how the low-carbon economy is powering Britain at home and internationally. Last year, 2,237 small and medium wind turbines were installed in the UK, while 2,614 were exported to markets like Europe, the USA, and Asia. This export success demonstrates how action to underpin and promote a domestic market can help boost exports and our balance of trade.

However, many UK companies remain frustrated that the continued growth and many achievements of this sector don't receive the recognition they deserve. They are concerned about the stability of the UK market, and about the commitment of Government to its continued growth and international success.

Patterns in Industry Growth

Small and medium wind turbine installations had a total generating capacity of 248MW at the end of 2014. 248MW is over double the capacity delivered in 2012, a

remarkable sign of growth. This deployment means that small and medium wind delivered over 391GWh of energy across 2014, resulting in savings of 168,257 tonnes of carbon dioxide. This is a significant contribution to the Government's renewable energy and carbon reduction targets, in addition to the 3,500 jobs provided by the sector. However, overall progress masks significant changes in the contributions of different parts of our industry in the past two years.

In the 100–500kW wind sector, the last two years have seen an eightfold increase in capacity. This is a fantastic achievement, and demonstrates the extent to which medium wind turbines are increasingly attractive to rural businesses and independent generators as a route to decarbonisation and lower-cost energy. However, the small wind industry struggled throughout 2013, with a shocking 55% decrease in capacity deployment in the sub-100kW market; a struggle which continued throughout 2014.

By the end of 2014, 27,819 turbines had been deployed across the UK. While significant, the rate of deployment has been falling. In 2013, the total deployment rate fell by 47%,

with only 1,985 turbines installed compared to 3,743 in 2012. In 2014, this annual deployment number increased to 2,237, still far below the rates achieved in 2012. This drop in the annual deployment of turbines is obviously a disappointment, and reverses the trend of an annual deployment increase every year from 2008 to 2012.

Differing Rates of Growth

The last three years have seen many market changes, with some winners and some losers. The small and medium wind sector has grown because of support via the Government's Feed-in Tariff (FiT) scheme. But changes in the structure of the FiT after the Phase 2B review in December 2012 have impacted parts of our industry very differently.

The 2012 review implemented significant changes. It introduced lowered tariff levels for wind generation, amalgamated the tariff brackets for all turbines under 100kW and introduced a capacity-driven degression mechanism. At the time, the Government justified these changes because they thought it would help to manage FiT costs, while leading to a growth in small wind deployment. Unfortunately

however, they have significantly damaged deployment rates and the sector as a whole.

These falling deployment rates have meant that many small wind turbine companies have been forced to cut staff numbers, agree to company mergers, or move out of the sector. Every effort is being made by the industry to stay afloat, and after two years of decline, many companies are now heavily reliant on export markets.

In contrast to small wind, the pattern of growth in the medium wind market is very different. The strong progression of the medium wind sector is clearly seen across capacity, revenue and turbine deployment statistics, and the employment and GVA that this growth brings is a welcome contribution to the UK economy. Unlike the small wind industry, medium wind has only one domestic manufacturing company and no export market at present. Nevertheless, with continued support from Government, it is hoped that this will change in future years. A stable market will help bring further manufacturing into the UK.

Solutions for the Market

In November 2014, RenewableUK launched its Small and Medium Wind Strategy. This document highlighted the potential of the industry and offered a summary of recommendations to steer the direction of the Feed-in Tariff review. We expect this review will commence in summer 2015, and is an opportunity for a much-needed restructuring of the FiT. RenewableUK is calling for two key urgent changes: the reinstatement of the 15kW FiT bracket; and an increase to the degeneration capacity thresholds. These two policy changes should help the small wind

industry regain a foothold in the UK market, and will ensure a sustainable future for the medium wind sector. Importantly these changes can be made in a cost-neutral way to ensure that the sector can thrive while the consumer remains protected.

Future Potential

The small and medium wind industry offers great potential to the future UK economy. UK manufacturing companies are exporting small wind turbines all around the globe, and an increase in exports is expected to continue in coming years as overseas relationships develop and previously explored opportunities come to fruition.

As for medium wind, the impressive growth experienced by the sector has already encouraged one manufacturer to open a factory in the UK. This highlights the potential for further UK manufacturing if the market remains steady. This indicates that medium wind manufacturing could be a future export opportunity for the UK.

While much of 2013 and 2014 saw mixed achievements in small and medium wind, the industry needs to look to the future and overcome the challenges it is facing. Government urgently needs to recapture momentum and take the opportunity of the Feed-in Tariff review to put the industry back onto the right path. It is vital that the needs of the industry are recognised in order to ensure a long-term and sustainable future for small and medium wind in the UK.

Market Highlights

2,237

The number of small and medium wind turbines deployed in the UK in 2014

248_{MW}

Small and medium wind cumulative deployed capacity between 2005 and 2014

2,614

The number of small and medium wind units exported in 2014

27,819

The number of small and medium wind turbines deployed in the UK between 2005 and 2014

**£174.26
million**

The UK's small and medium wind market revenue in 2014

30,189

The number of small and medium wind units exported by UK manufacturers between 2005 and 2014

89.5_{MW}

The additional UK capacity deployed in 2014 from small and medium wind turbines

**£6.24
million**

The UK's small and medium wind manufacturing export revenue in 2014

48%

The UK export revenue growth for 2014 in UK small wind manufacturing

Introduction

Reporting History

RenewableUK published its first small wind market report in 2008. Since then, the annual report has become a highly valuable tool for the industry. In 2012 the report's scope extended into medium wind following the emergence of the 100kW to 500kW market in the UK.

This combined UK Small and Medium Wind Market Report is now in its third year, with this edition looking at 2013 and 2014 trends.

The report examines the current size of the UK small and medium wind sector by means of deployment numbers and installed capacity. It offers commentary on recent policy reforms, and researches the trends in domestic and export markets. It also presents an overarching view of the challenges and opportunities of the sector, and the reforms required to ensure there is a sustainable platform for the industry to build on.

Industry Background

With a strong agricultural community, high wind speeds and rising electricity prices, the UK is in an ideal position to take advantage of the benefits offered by small and medium-scale wind developments. Following the introduction of the Government's Feed-in Tariff scheme in 2010, the opportunities of small-scale distributed energy generation have been opened up to a larger proportion of the UK population. Landowners, communities and businesses are now in a position to generate their own electricity, rather than having their energy prices controlled by large retail electricity suppliers.

Table 1: Definition of micro, small and medium wind turbines ¹

	Power (kW)	Annual energy production (kWh)	Total height (m)
Micro wind	0–1.5	Up to 1,000	10–18
Small wind	1.5–50	Up to 250,000	15–50
Medium wind	50–500	Up to 2,400,000	25–65

The UK micro and small wind industry has been in existence for many decades, powering off-grid sites and micro-scale applications such as the sailing industry. Medium wind on the other hand, has only emerged in recent years, following the introduction of the Feed-in Tariff. The definitions of micro, small and medium wind are in Table 1.

The UK is a leading manufacturer of small wind turbines, but there are also a number of overseas turbine manufacturers in existence. These turbines have varying designs and set-ups. Firstly, a turbine can either be 'on-grid' via a connection to the mains supply, or it can be 'off-grid' and used solely for onsite usage. Turbines can also be broadly split into two different designs: vertical axis wind turbines (VAWT) and horizontal axis wind turbines (HAWT). It should also be noted however, that many new and innovative designs are entering the small and medium wind market, such as shrouded turbines, tethered turbines, and Archimedes structures. One of the many strengths of this scale of the industry is the drive for diversity in technology innovation.

Methodology

This study reports on turbine scales in the 0kW to 500kW range. The data reported in this study was obtained directly from manufacturers through email contact. This information has allowed RenewableUK to estimate the total number of UK installations and deployed generation capacity at the end of 2014. Further data such as employment and GVA has been obtained from RenewableUK's recent Small and Medium Wind Strategy Report. The overall data is presented in line with the initial Feed-in Tariff size bands:

- 0–1.5kW
- 1.5–15kW
- 15–100kW
- 100–500kW

For the purpose of estimating deployed capacity, this study assumes that each turbine sold in 2014 was also installed, and that the installation took place within the same calendar year as the sale. It must be noted however, that depending on a manufacturer's sales cycle, an installation may occur after the calendar year in which it was sold.

A Year in Policy

Financial Policy

Feed-in Tariff Review

The Feed-in Tariff scheme is the primary support mechanism introduced by Government to incentivise deployment of small and medium-scale (<5MW) renewable energy generation in the UK. The scheme was launched in April 2010, and a review referred to as 'Phase 2B' came into effect in December 2012. This review implemented significant changes to tariffs and structures for non-PV technologies such as wind, hydro and anaerobic digestion. It introduced lowered tariff levels for wind generation; amalgamated the tariff bracket for all turbines under 100kW; and introduced a capacity-driven degression mechanism effective from April 2014.

These changes were deeply disappointing to the small and medium wind industry, and the reduced rates have had a damaging impact on deployment rates within the small wind sector. These trends are revealed and analysed in later chapters.

The Government is required to undertake a periodic review of the Feed-in Tariff in 2015. This is likely to commence after the May 2015 General Election, although the Government is starting to engage with industry now to consider content of the review. In response to this review, RenewableUK launched the Small and Medium Wind Strategy in November 2014. The report summarises the scope of the industry, its benefits, and its future potential. The report draws attention to the significantly untapped contribution small and medium wind can provide to the UK by 2023 via GVA, employment and carbon savings. The report is intended to help inform the Feed-in Tariff review in order to create a system that

is both effective and affordable. RenewableUK is engaging with the Department of Energy and Climate Change (DECC) on this report and will be calling for the adoption of the recommended actions. The full report can be found at: www.renewableuk.com/smallmediumwindstrategy

Northern Ireland Renewables Obligation

In July 2014, the Department of Enterprise Trade and Investment (DETI) in Northern Ireland published a consultation paper setting out proposed Renewable Obligation Certificate (ROC) banding levels for onshore wind, hydro and anaerobic digestion with a maximum installed capacity up to 5MW and solar photovoltaic up to 250kW. The response to the consultation, published on 29 January 2015, confirms that existing ROC levels for small-scale onshore wind, anaerobic digestion and hydro technologies will remain unchanged until the closure of the Northern Ireland Renewables Obligation (NIRO) to new applicants from 1 April 2017. On 18 December 2014, DETI also confirmed that existing ROC banding levels would be retained until 1 October 2015 and not 1 April 2015 as previously intended. The proposed changes will be adopted in The Renewables Obligation (Amendment) Order (Northern Ireland) 2015, which is intended to come into operation (subject to Assembly approval) later this year.

Support for Community Energy

DECC released Britain's first Community Energy Strategy in January 2014. This strategy revealed how Government plans to broaden the support available for community energy projects. These plans include:

- £10 million Urban Community Energy Fund to kick-start community energy generation projects in England;

- £1 million Big Energy Saving Network funding to support the work of volunteers helping vulnerable consumers to reduce their energy;
- a community energy-saving competition, offering £100,000 to communities to develop innovative approaches to saving energy and money; and
- a "one-stop shop" information resource for people interested in developing community energy projects.

Following the launch of the Community Energy Strategy, there have been a number of joint Government-industry initiatives throughout 2014 to improve engagement with local communities across the UK. An English Community Benefit Register was launched on 13 November and is expected to record community benefits from projects above 5MW in size. A Shared Ownership Framework was also launched on 3 November which is a self-regulated mechanism that is expected to be offered by all wind developments with a project cost of over £2.5 million (excluding grid and aviation costs).

Government also carried out a recent consultation on support for community energy projects under the Feed-in Tariff scheme. One of the main proposals within this consultation was to implement an increase to the maximum capacity ceiling for community projects under the FiTs scheme from 5MW to 10MW. RenewableUK raised concerns about this particular proposal, noting that the change would have unacceptable State Aid implications and a detrimental impact on the Feed-in Tariff budget. Following the consultation, Government decided not to pursue its proposal, and is

therefore keeping the FiT ceiling at 5MW. RenewableUK welcomed the approval of alternative initiatives that will enhance support for community projects up to 5MW. These include:

- Extending the definition of “community organisation” to include registered charities and the wholly owned subsidiaries of registered charities. This will make it easier for a wider range of community groups to access the community provisions in the FiTs scheme;
- Introducing an additional exemption MPAN (Meter Point Administration Number) criterion within the determination of ‘site’ in the FiT scheme to allow two community projects (or one community project and one commercial one), each up to 5MW, to share a single grid connection and receive separate FiTs. This will help reduce upfront costs and complexity and encourage communities to either wholly or partly own assets in line with wider policies on shared ownership;
- Extending the preliminary accreditation validity periods for community projects by six months for all technologies, resulting in a total validity period of 18 months for community wind projects. This will increase the certainty on offer to community energy developers and investors with regard to the available tariff and will give developers more time to engage local communities and to focus on raising the right type of finance locally.

Subject to Parliamentary approval, the above measures will come into legal effect from 1 April 2015.

The Green Deal

In January 2013, the Government launched the Green Deal energy

efficiency scheme, whereby households and businesses take out loans to install energy efficiency measures or micro-generation systems in order to reduce energy bills. Unfortunately, the first phase of the Green Deal received minimal up-take, and was criticised for being overly complex and ineffective. In response to these criticisms, DECC launched the ‘second phase’ in June 2014. Under this phase, homeowners could claim up to £7,600 cashback to improve their home’s energy efficiency. This included gas boilers, double glazing, and insulation and replacement doors. The fund closed 6 weeks later on July 24th when the allocated funding budget was reached. DECC will monitor voucher redemption rates and consider whether to launch a further offer of Phase 2 should further funds become available. Phase 1 of the scheme remains open.

Planning Policy

England—New planning guidance under the NPPF

Following the publication of the National Planning Policy Framework (NPPF) in March 2012, Planning Practice Guidance (PPG) to accompany the NPPF was published as a web-based resource in March 2014. This continued the trend of Government reducing the volume of policy, as well as guidance. The renewable energy element of the PPG was published separately in July 2013, and was incorporated into the online PPG. The completed guidance includes provisions on compulsory pre-application consultation for all wind energy projects subject to EIA screening. The PPG is much shorter than previous guidance and is therefore subject to varying interpretations.

England – New legislation and guidance: Compulsory pre-application consultation for wind energy developments

Following the conclusion of DECC’s Onshore Wind Call for Evidence in June 2013, compulsory pre-application consultation for wind energy development was introduced as a further means of demonstrating the industry’s commitment to meaningful community engagement. The provisions were introduced via a Town and Country Planning Amendment Order, which came into force on 17 December 2013. The Order implemented provisions in the Localism Act 2011 which introduced the concept of extending compulsory pre-application consultation, a key element of the Planning Act 2008, to developments outside the scope of the Act. The thresholds in the Order are equivalent to the EIA screening thresholds, and make it mandatory to carry out pre-application consultation with the local community for planning applications for wind turbine development involving more than two turbines, or where the hub height of any turbine exceeds 15 metres. Guidance on the Order was published online in March 2014, as part of the NPPF Planning Practice Guidance.

Wales

The Welsh Government introduced the Planning (Wales) Bill in October 2014. The Bill proposes to transfer the consenting powers for energy projects of between 25 and 50MW, which are currently held by Local Planning Authorities, to Welsh Ministers. The Bill follows the publication earlier this year of the second part of the Silk Commission’s report on Devolution, which recommended the transfer of consenting powers for 50–350MW projects from UK Secretaries of State to Welsh Ministers. Taken together, these represent the most significant reforms to the planning system in

Wales since the establishment of the Welsh Assembly in 1999. The Welsh Government has also committed further reform on environmental management arrangements, and is expected to introduce these in an Environment Bill prior to the Assembly elections in May 2016.

Scotland

The Scottish Government published its third National Planning Framework (NPF3) and Scottish Planning Policy (SPP) policies in June 2014. NPF3 and SPP highlight the importance of developments across renewable heat, electricity and transport in order to make Scotland more successful and sustainable. The revised Scottish planning policies confirm the role of the planning system in driving transition to a low-carbon economy and meeting targets.

Northern Ireland

Following legal advice, the Planning Bill 2013 was withdrawn. The Bill had been intended as an interim measure until it was possible to commence the 2011 Planning Act, which will be implemented as planned in 2015. Alongside the implementation of the Planning Act, a number of other changes will take place including long-anticipated local government reform. This combination of changes will mean that the 11 new councils (elected in shadow form in May 2014) will be responsible for the majority of planning decisions after 1 April 2015. A range of consultations on the form and content of planning policy are ongoing and all policy needs to be in place by 1 April 2015.

The Competition Commission made a final determination on the Northern Ireland Electricity (NIE) 5th Price Control in April 2014. The determination brought to an end two years of uncertainty around the resources available for network development, but did not allow for certain costs which

are likely to impact upon NIE's ability to innovate and connect all renewables generation in a timely manner. The Single Electricity Market (SEM) Committee brought forward proposals for the high-level design of the new 'integrated' SEM, which is required in order to make the market compatible with the European Target Market by the end of 2016.

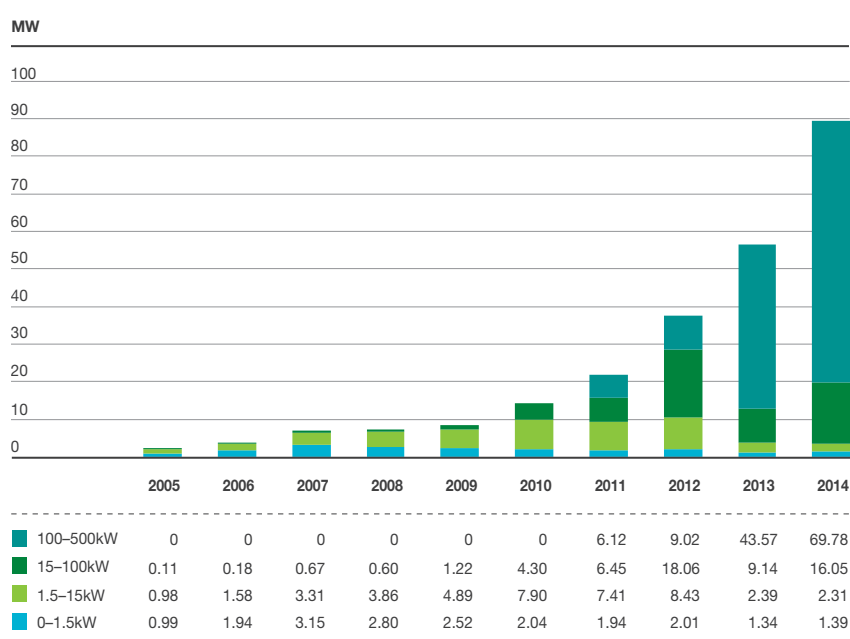
The Industry's Growing Contribution to the UK Power Supply

This chapter looks at the capacity of small and medium wind turbines installed in the UK. In total, the small and medium wind sector has deployed over 248MW of capacity since 2005. There were 38MW of capacity installed in 2012, 56MW in 2013, and 89MW installed in 2014.

Since the end of 2012, the total electricity generation from small and medium wind turbines increased from 146GWh to over 391GWh, an equivalent to approximately 93,342 UK households' electricity consumption². It is also estimated that the level of energy generated from small and medium wind turbines would have emitted 168,257 tonnes of carbon dioxide in 2014 if it had been sourced from the national grid³. This is equivalent to 74,066 cars being removed from the roads⁴.

It is clear that the overall capacity increase year-on-year is positive; however the graph below reveals how the structure of this deployment has changed dramatically in the past two years. Due to a fall in the capacity deployed in the 1.5–15kW turbine bracket, the average size of turbine in the small and medium wind sector has grown from 10kW in 2012 to 40kW in 2014. This reveals a trend for increasing turbine size in response to market demand due to FiT structures.

Figure 1. Annual deployed UK small and medium wind turbine capacity (MW)



Small Wind

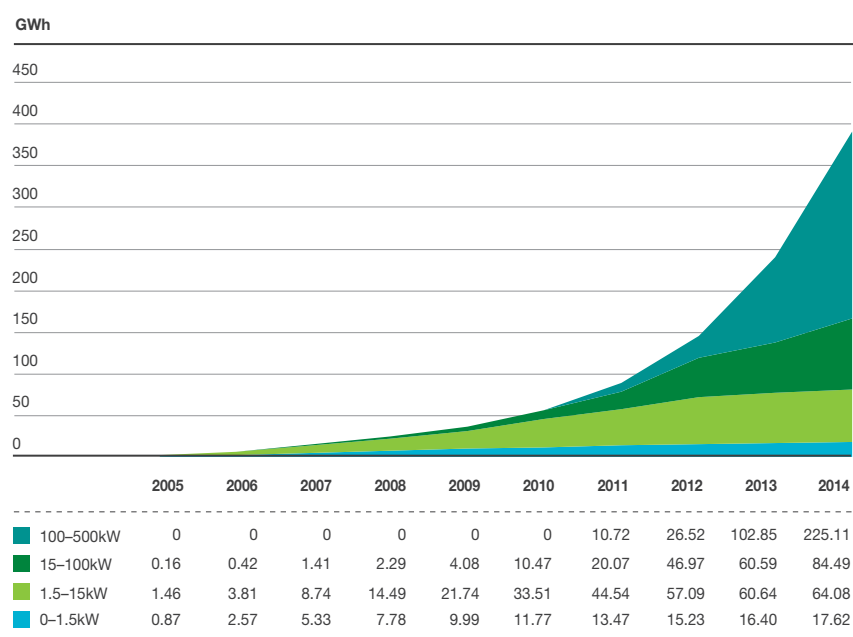
The growth experienced by the small wind sector in previous years has been dramatically reversed throughout 2013 and 2014. Following the implementation of Phase 2B of the Feed-in Tariff in December 2012, the deployed capacity of turbines within the sub-100kW sector decreased over 2013 by a combined total of almost 55% compared with 2012. When broken down, this represents a 49% capacity decrease in the 15–100kW bracket, a 72% capacity decrease in the 1.5–15kW bracket, and a 33% capacity decrease in the 0–1.5kW bracket. In 2014, the 15–100kW sector has managed to turn around these declining trends by increasing capacity deployment by 75% when compared to 2013. As a result, it is not far from achieving figures similar to its peak in 2012. The 0–1.5kW bracket has increased very slightly, but remains low. The 1.5–15kW bracket on the other hand, has continued its decline with a further 3% decrease in installed capacity. The reasons for this are discussed in later chapters.

Medium Wind

In comparison to small wind, the 100–500kW medium wind bracket has seen a continuation in growth since 2012, with a fourfold increase in annual capacity in 2013 when compared to 2012. This increased by a further 60% in 2014. This exceptional growth in the sector reveals the high market demand for turbines of this capacity and scale.

Due to the expected continuation of growth within the medium wind sector (100–500kW), the contribution of the industry towards national renewable energy generation and carbon targets is significant.

Figure 2. UK small and medium wind energy production (GWh)



Nevertheless, recognition also needs to be given to the additional contributions that the small and medium wind industry makes in terms of employment, UK manufacturing, export revenue and GVA. All of these factors make the industry a valuable sector to the UK as a whole, and indicate that it needs to be protected from the negative impacts of the 2B review.

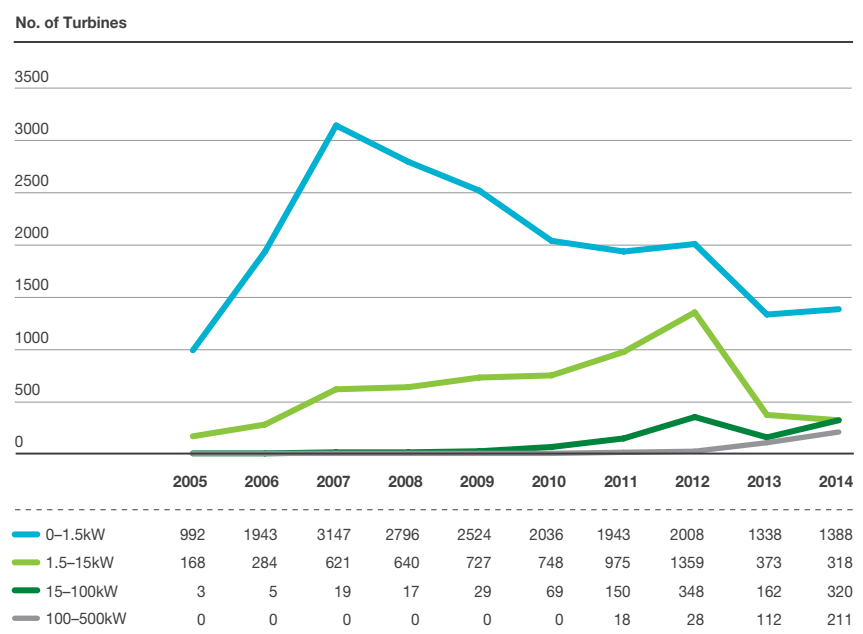
Annual Deployment of Small and Medium Wind Turbines

This chapter looks at the number of turbine installations throughout 2013 and 2014. At the end of 2014, a cumulative total of 27,819 small and medium wind turbines were installed in the UK.

Following the trends of the annual deployed capacity statistics in the previous chapter, in 2013 the number of annually deployed small and medium wind turbines declined by 47%, from 3,743 turbines in 2012 to 1,985 turbines in 2013. This has reversed the trends experienced since 2008, whereby turbine numbers deployed had increased year-on-year. This pattern of fluctuation is shown in Figure 3.

All sector scales have experienced deployment decline since 2012, apart from the medium wind bracket.

Figure 3. Annual number of deployed UK small and medium wind turbines



Small Wind

When broken down, the 2013 statistics reveal a 53% decrease in the 15–100kW bracket, a 73% decrease in the 1.5–15kW bracket, and a 33% decrease in the 0–1.5kW bracket.

In 2014, there was a further shift in trends within the small wind sector. The number of deployed turbines increased significantly for the 15–100kW bracket, remained stable for the 0–1.5kW bracket, yet decreased further for the 1.5–15kW bracket, by 15%. The continued decline in deployment from the 1.5–15kW bracket is of great concern, as this is the scale of turbine that is manufactured primarily in the UK. An overall deployment decline of nearly 77% since 2012 has made the market highly unstable.

Medium Wind

The medium wind sector in comparison has experienced a six-fold increase in deployment since 2012, with 211 turbines installed throughout 2014. The speed at which the industry has grown is commendable. It has built on the skills and experience of the small wind industry, which has enabled a fast learning curve and a prosperous sector within the renewables industry. The Government needs to continue to support this sector in order to carry on benefitting from significant renewable generation and carbon savings, as well as encouraging the future potential of UK manufactured medium wind turbines.

Until the Government introduces positive policies for the small wind sector, many industry members within this particular scale do not see a way forward in the UK market. The majority of surveyed manufacturers

indicated that changes to the Feed-in Tariff were the single biggest issue for the industry. As a result, the upcoming Feed-in Tariff review is vitally important. The contrasting trends between the small wind sector and medium wind sector clearly show that the current structure does not sufficiently support all scales fairly; therefore it is essential that Government changes the current mechanism. RenewableUK has proposed a number of recommendations in the Small and Medium Wind Strategy Report, and the key recommendations regarding the Feed-in Tariff review are as follows:

- The reinstatement of the 15kW Feed-in Tariff bracket;
- An increase to degression capacities for the sub-500kW wind sector;
- Recognition that not all pre-accredited projects will be installed.

Government needs to recognise that failure to implement these recommendations will further damage the small wind industry, and will potentially begin to have similar negative effects on the future of medium wind deployment. Although the medium wind sector is currently doing well, Government needs to continue supporting the sector to ensure it remains prosperous. If it does, then the potential for international turbine manufacturers to relocate their facilities to the UK is a great opportunity for the economy.

In the 1.5kW to 15kW scale, an overall deployment decline of nearly 77% since 2012 has made the market highly unstable.

Case Study of Gaia Wind

The push for more efficient and affordable turbines

Gaia-Wind is a UK wind turbine manufacturer with more than 20 years of experience in small wind turbine design and innovation. The GW-133 turbine was designed in Denmark in the 1990s and is now manufactured in Glasgow after a strategic move to the UK. The GW-133 model is exported all over the world, and as far afield as Tonga. The current installation base is now over 1,000 turbines, with the majority of these powering farms, businesses, rural properties and community projects in the UK.

Market needs for product innovation

The significant decline of the small wind market during 2013 and 2014 has created a challenging environment for many UK turbine manufacturers. Deployment rates have decreased by a staggering 77% since 2012 and many companies have had to respond to this crisis via company mergers, staff reductions or export market expansion.

Gaia-Wind has recognised that keeping ahead of technology and cost innovations is essential to the success of the company. As a result, it has embarked on an R&D project entitled 'TwentyTwenty'. This aims to increase the efficiency of the turbine at the same time as decreasing the cost, with the objective of reducing the levelised cost of electricity from the turbine to a point where it is competitive with the retail price of electricity. Gaia-Wind was awarded a capital grant from DECC's Energy Entrepreneur Fund (EEF) in 2013 in order to fund this work.

Innovative ways of reducing turbine costs and improving performance

Following the DECC award, Gaia-Wind has been researching and developing improvements to its existing GW-133 wind turbine, focusing on technical innovation and improved sourcing and supply chain engagement.

To improve the technical proposition of the turbine, Gaia-Wind has focused on improved rotor blade design and aeroelastic modeling. Improving the blade shape, the stall characteristics and the manufacturing methods have all led to a considerable improvement in the annual energy production (AEP), expected to be in the region of 10–15%. The use of design loads backed up by aeroelastic modelling has also greatly helped Gaia-Wind to achieve product certification in Japan and expand its export market potential.



Photo: Gaia-Wind test site

Gaia-Wind has recognised that keeping ahead of technology and cost innovations is essential to the success of the company.

As part of this project, an increased level of collaborative engagement with existing and new suppliers has also been developed via targeted discussions, sharing of knowledge and supplier input. This has yielded some tangible results. Cost reductions have also been driven down by introducing competition through dual sourcing and accelerated life testing, especially for some of the major cost components.

Planning for the future

Funding support from DECC will run until April 2015, and some developments and innovations from this research will be immediately incorporated into the existing GW-133 turbine. Following further engineering, certification and testing, a full launch of a new GW-133 turbine model will be made, with an expected additional annual production volume of 750 turbines worldwide.

Through successful delivery of its TwentyTwenty project, Gaia-Wind will ensure the robustness of the GW-133 to a reduced Feed-in Tariff in the UK market, plus increased viability in other export markets without subsidy, ensuring the sustainability of the company by competing against the rising retail cost of electricity.

Breakdown of the Market

Ownership Trends

Small and medium wind turbines serve a range of distributed power needs under diverse ownership and operating scenarios. The ownership trends for small wind and medium wind turbines are very different due to the large differences in scale, investment and on-site energy needs. As a result, ownership trends have been broken down into the two separate graphs below.

Figure 4. Ownership trends of small wind turbines

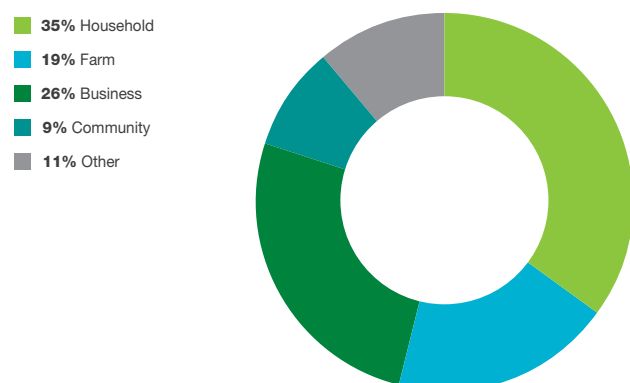
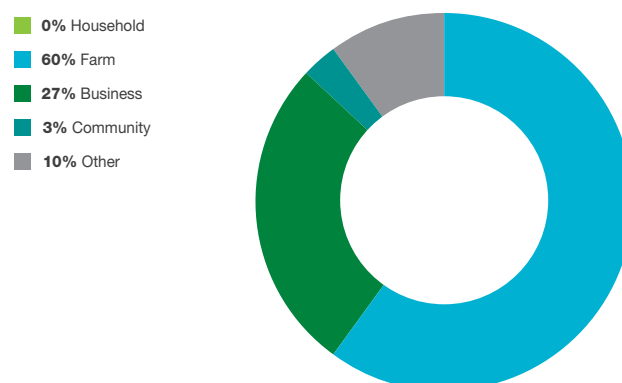


Figure 5. Ownership trends of medium wind turbines

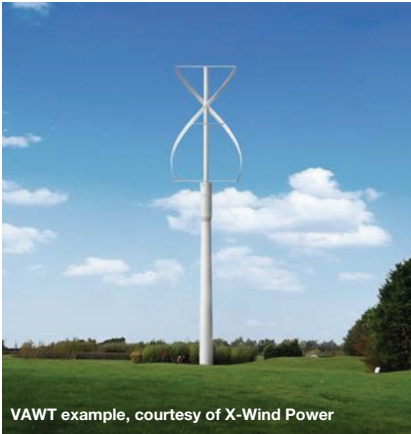


Small Wind

In 2014, small wind turbines were most commonly installed by households (35%), followed by businesses (26%) and farms (19%).

Medium Wind

Medium wind ownership trends differ quite significantly, with farms taking the majority at 60%, followed by businesses (27%), “other” applications (10%), and community ownership (3%). It is assumed that “other” ownership comprises of investor-led wind projects; however it is likely that some of the farm-sited turbines may also come into this category, making it difficult to analyse this in any great depth. Unlike small wind, there is no household ownership at this larger scale.



System Design Trends

The VAWT market has had a mixed level of success in the UK market. Over the course of 2013, research data shows that no vertical axis wind turbines were installed in the UK, and only four were installed in 2014. This continues a downward trend which has been in place since 2009. Despite these patterns, RenewableUK is aware of a significant number of VAWT products in development. Technical innovations within the VAWT sector is therefore expected to increase deployment in the future.

The results of our survey in Figure 7 reveal that building-mounted turbines remain minimal. As many as 1000 building mounted turbines were installed in 2007, but this has dropped to only 30 in 2014, with little indication of growth in the near future. Until siting and performance challenges are addressed, it is unlikely that this application will play a significant part in the UK small wind market.

Figure 6. Comparative number of annually deployed HAWT and VAWT

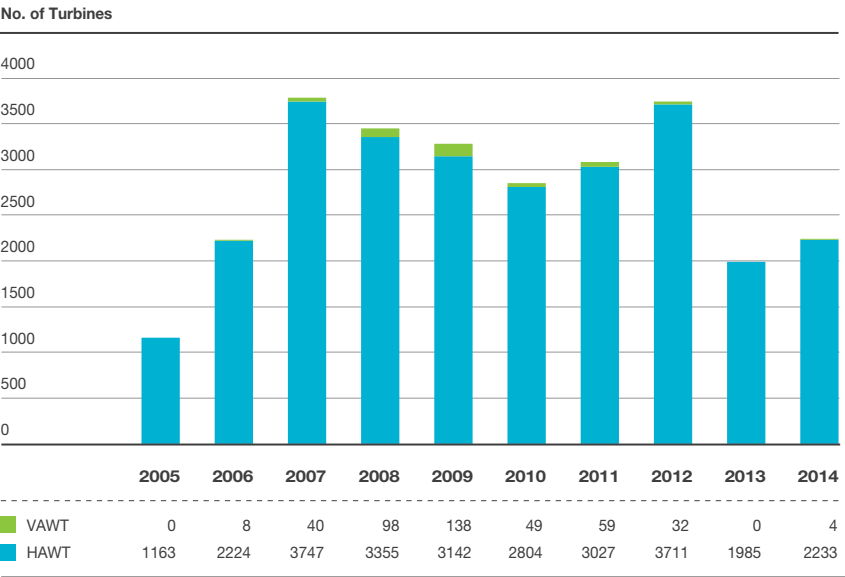
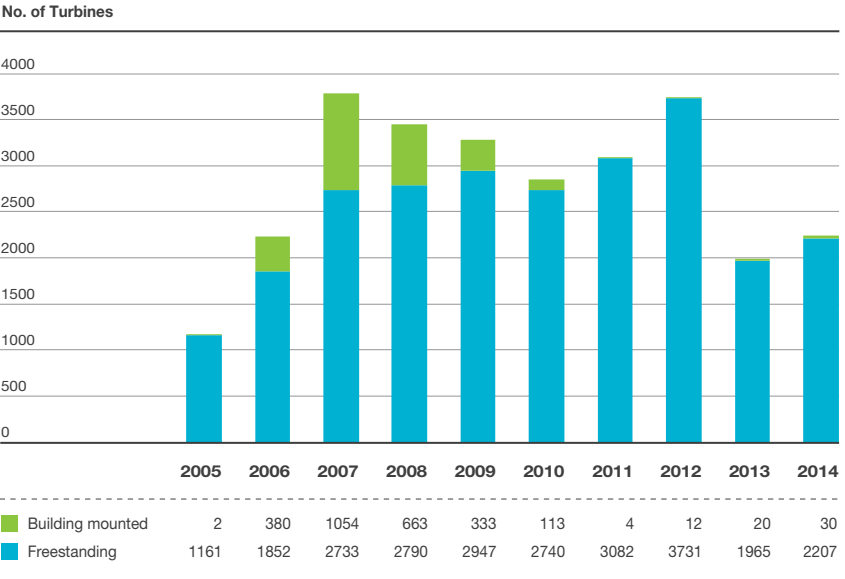


Figure 7. Comparative set-up design between building-mounted and freestanding turbines

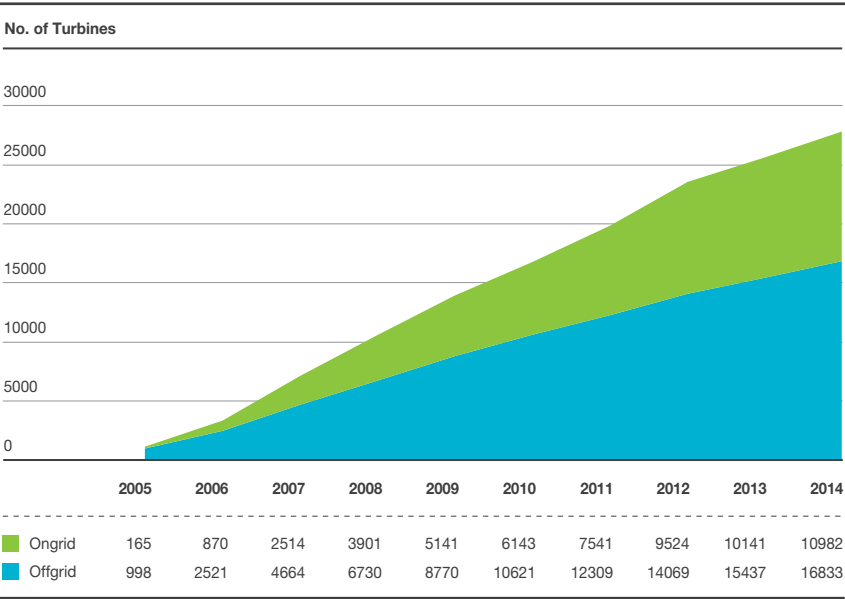


Grid Connection Trends

The results of our survey shown in Figure 8 show that there are cumulatively more off-grid turbines than on-grid turbines within the small and medium wind sector. The large proportion of off-grid installations are because of the large number of micro-wind turbines on applications such as yachts. As a result of this market trend, all off-grid installations in 2013 and 2014 were in the sub-20kW category. Any turbine larger than 20kW was always connected to the grid.

It is interesting to note that the balance has consistently remained at 60% off-grid, 40% on-grid each year since 2012. In the distant future, there is the potential of growth in medium wind off-grid applications due to the increasing difficulty of mains grid connection. The development of storage mechanisms may provide a viable option for larger-scale off-grid applications in the future.

Figure 8. Cumulative number of on-grid and off-grid turbines



Small and Medium Wind Employment Figures in the UK

RenewableUK recently completed its Small and Medium Wind Strategy. As part of this study, employment figures for the industry were estimated and predictions for future employment figures were made. The results of this study show that in mid-2014, the small and medium wind sector and its associated supply chain employed 3,500 people (about 1,800 directly employed in the sector and 1,700 in the supply chain).

There is a noticeable difference between these employment figures and those generated by the Working for a Green Britain (September 2013) report which were quoted in the previous Small and Medium Wind Market Report. The main differences relate to the time periods in which the two surveys were conducted and to the methodologies used to derive the figures in each study. Since the Working for a Green Britain report was published, there have been a large number of redundancies within the small wind sector due to a drop in turbine deployment. Modelled using the methodology from the strategy report, these redundancies have been estimated to result in a 19% decline in employment within the sector, from around 4,300 in 2012 to 3,500 at the end of 2013. It is disappointing that employment figures within the small and medium wind industry have decreased. Last year's market report revealed a threefold employment increase since 2010; this achievement has now been reversed due to the ineffective structure of current Government policy.

Projecting forward to 2023, the Small and Medium Wind Strategy proposes three different employment scenarios. These are broken down into high, medium and low scenarios, the lowest of which has been referred to

as the 'business-as-usual' scenario due to the drastic decline in the small wind market in the past two years. As a result, this low 'business-as-usual' scenario would see employment cut by over 40% to 2,000 individuals by 2023. In comparison, an optimistic development path would result in an estimated 10,156 individuals employed. This net difference in employment (i.e. the number of jobs lost due to lack of policy support) is over 9,200 jobs. As a result, it is clear that the industry still has the potential to offer significant employment opportunities in the UK, if it receives the positive policy support it requires.

It is disappointing that employment figures within the small and medium wind industry have decreased.

Case Study of Norvento

The opportunity of the UK medium wind market

Norvento Enerxia was established in 1981 and is a family owned, technology led business. It is a vertically integrated group of companies; designing, manufacturing, marketing, constructing and operating renewable energy power plants. In Spain it is more commonly known for large-scale onshore development; however the company recently turned its attention to other market opportunities in onshore wind, and in particular the medium wind sector.

Norvento recognised that a large proportion of technology in the medium wind sector dated back 20 years. Consequently, it realised the huge potential in developing a range of smaller-scale wind turbines that incorporated the latest technical advances of larger-scale wind. As a result of this refocus, Norvento launched the 100kW capacity 'nED100' turbine in November 2013.

Why the UK market?

The flagging Spanish renewables market gave Norvento both an opportunity to attract top-flight engineering from the large wind sector and a need to expand into a new market that offered commercial potential and stability.

Norvento targeted the UK as a new market opportunity due to its good wind resource, positive FiT scheme and established network of distributors, planners, developers and O&M (operations and maintenance) providers. The capacity scale of the nED100 and its technical ability meant that the turbine was well suited to the UK market.

Norvento recognised that a large proportion of technology in the medium wind sector dated back 20 years.



Future potential

The project pipeline for Norvento continues to look healthy throughout 2015 and 2016, with a UK planned deployment capacity of 4MW. This growth is supported by a new workforce of eight UK staff located in Norvento's offices in Bristol and London. Further expansion of this UK base is planned as deployment increases in the future. Norvento is also expanding its network of agents and O&M partners and developing local contractor relationships to strengthen its presence in what it sees as a very promising market.

In 2015, Norvento will be launching new upgrades to its nED100 and announcing the culmination of its design certification process. Both of these moves show Norvento's commitment to the UK market, and the company's continued investment into the UK's medium wind sector.

Comparison of Domestic and Export Markets

Domestic Markets

In 2012, the UK small and medium wind sector witnessed healthy growth across all size bands, totalling £105.65 million in sales. In 2013 however, Figure 9 reveals that the impact of the deployment decline in the sub-100kW bracket reduced UK sales revenue for the first time since records began in 2005. Revenue totalled £101.69 million in 2013, which is a reduction of nearly £5 million in comparison to the previous year. In 2014, the total UK sales revenue jumped drastically to £174 million, which is a far healthier trend than the previous year. Nevertheless, the breakdown of this figure reveals that this growth is largely the result of the medium wind market, as the sub-15kW sectors have continued to generate declining revenue.

Breaking down these revenues into separate brackets reveals the disparity of these sales (Figure 10). The 0–1.5kW bracket saw a 39% revenue decline between 2012 and 2014, the 1.5–15kW bracket a 74% decline and the 15–100kW bracket a 40% decline. Comparatively, the 100–500kW bracket saw an eight-fold increase in UK sales revenue compared to 2012. This is unsurprising in light of the high installation and capacity rates discussed previously from this sector scale.

Figure 9. Market revenue size (UK and export)

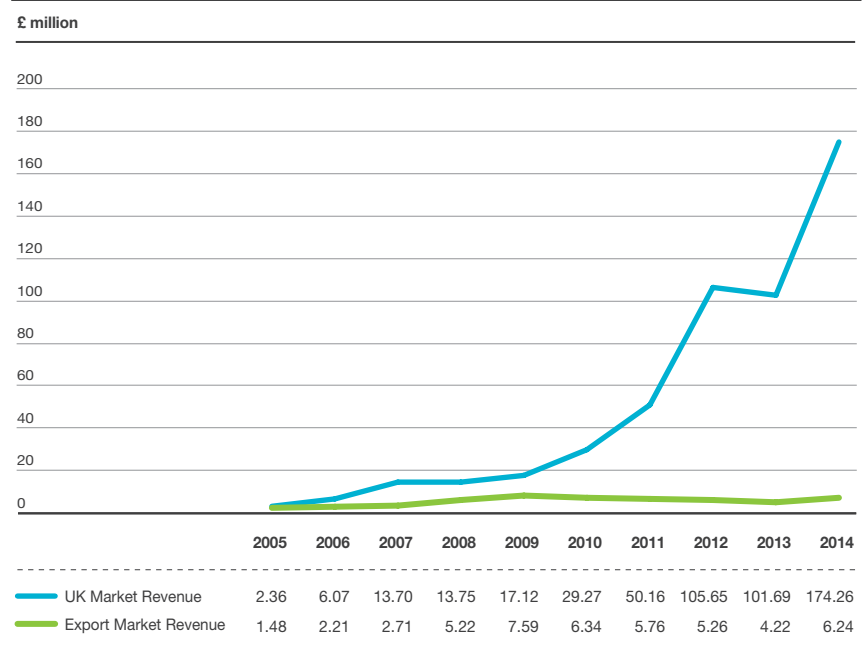
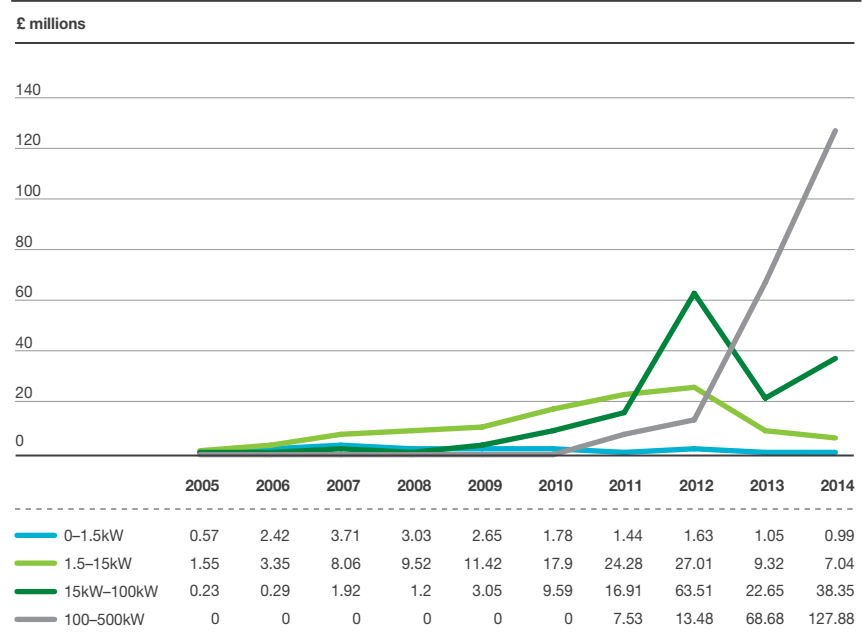


Figure 10. Breakdown of domestic sales revenue



Export Markets

The UK is home to 15 wind turbine manufacturers, producing turbines from several hundred watts to 225kW in size. The micro and small wind export market has existed in the UK for many decades, whereas the medium wind industry only has one domestic manufacturer who is currently focusing on domestic supply, but plans to expand next year.

In the 2013 market report, it was anticipated that micro and small wind export sales would increase in order to account for the declining UK market. The statistics displayed in Figure 11 show that this prediction has occurred for the 1.5–15kW bracket, but not for the microwind bracket. The declining export of micro-scale turbines is predicted to be the result of the downturn in the global economy and luxury markets such as sailing equipment. The 1.5–15kW bracket however, has made great efforts to expand its export potential in order to ensure a sustainable turnover. The number of exported units within this scale of turbine has increased from 119 in 2012 to 138 in 2014. This has resulted in an additional revenue stream of over £2.1 million. As export relationships develop and previously explored overseas opportunities come to fruition, this is expected to grow year on year. It is recognised that gaining a foothold in foreign markets can take considerable time, especially in the light of new certification requirements or technical adjustments; therefore continued growth is anticipated in the future.

Data also shows that 2014 saw the first turbines exported from the 15–100kW bracket. Looking even further into the future, it is anticipated that medium wind turbines from the 100–500kW bracket will also be

Figure 11. Export revenue by sector scale

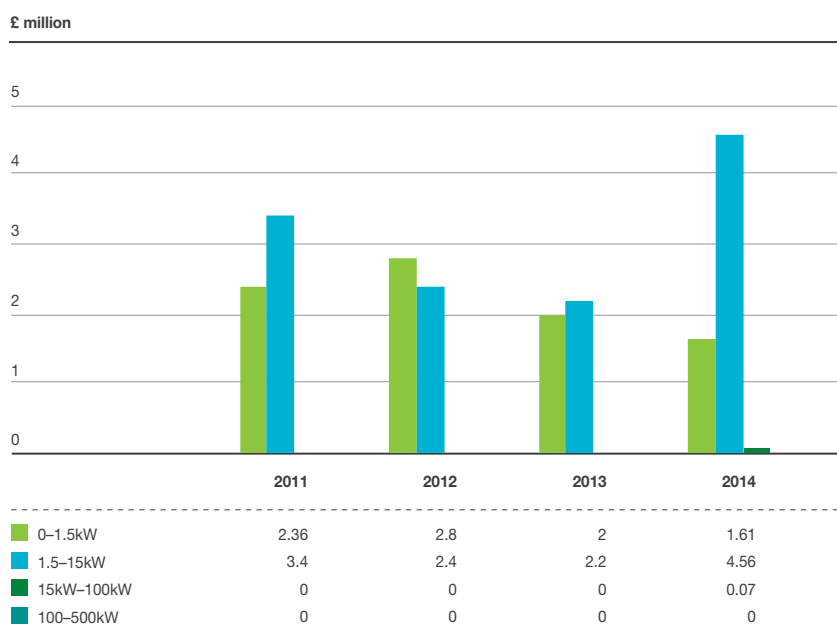
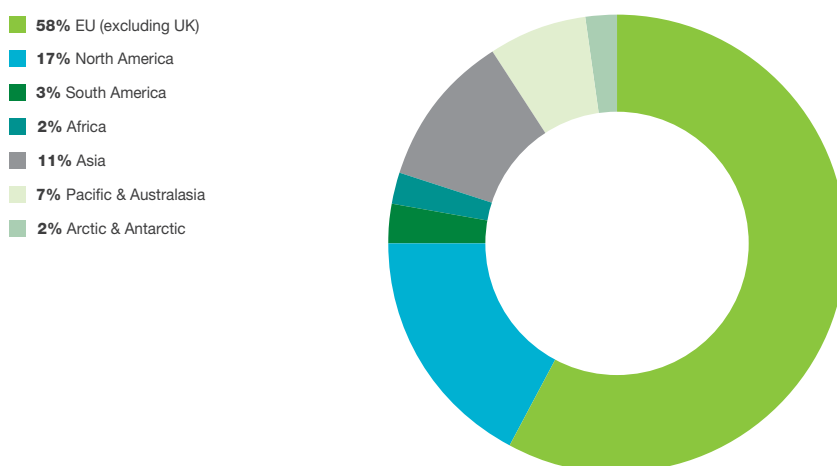


Figure 12. Export markets for UK manufactured turbines



Antarctic micro-wind turbine site. Courtesy of Marlec Eng Co Ltd



Without a healthy and steady domestic market, manufacturers will be forced to relocate overseas to where the market is stronger...

exported from the UK. The potential of growth within this domestic manufacturing base is significant, with the promise of employment, revenue and supply chain opportunities to the UK economy if the sector receives suitable policy support from Government.

As shown in Figure 12, the key export markets for UK manufacturers remain the EU and North America. However, increases in Asia have been seen due to a new Japanese Feed-in Tariff. Export increases have also been seen in the Arctic and Antarctic. The remote and harsh locations that some of these turbines are deployed in proves the durability and sturdiness of these UK-manufactured products; hurricane-prone countries such as Tonga and the severe climates of the Arctic and Antarctic really test the robust construction of these turbines. Export success stories such as these provide an example of British excellence in manufacturing.

UK manufacturers remain focused on export market opportunities. However to maintain a manufacturing base in the UK, the domestic market needs to stay strong. Without a healthy and steady domestic market, manufacturers will be forced to relocate overseas to where the

market is stronger, meaning potential export benefits to the UK will be lost. In 2014, 2,237 turbines were installed in the UK and 2,614 turbines were exported overseas. The proportion of turbines being exported overseas is growing in comparison to the proportion being installed in the UK. This shift in the market could be dangerous if the balance of domestic versus exports reaches a tipping point, as it will simply not make sense for manufacturers to be located in a different country to their main market. Government needs to ensure that a healthy balance is maintained in order to aid the long-term sustainability of the UK small and medium wind manufacturing industry.

Conclusion

The small and medium wind industry is pivotal to encouraging householders, small business and farmers to play their part in the distributed energy revolution. This does not only result in reduced energy bills, security of supply and business diversification for the turbine owners – it also provides significant employment, GVA and export market opportunities throughout the UK.

It is also important to remember the carbon savings provided by the sector. The 391GWh of electricity provided by the small and medium wind industry saved 168,130 tonnes of carbon dioxide in 2014.

This sector has great future potential if it is given the necessary policy backing from Government. With practical support, the next ten years could see the small and medium wind industry grow to employ over 10,000 people, deliver over 800 million of GVA to the UK economy and help save over 2.5 million tonnes of carbon.⁵

The medium wind sector is already on its way to achieving this potential. With an eight-fold increase in UK sales revenue between 2012 and 2014, this industry segment is progressing well. With 70MW of capacity deployed in 2014 alone, the sector is contributing significantly to renewable energy and carbon targets, despite its infancy in the market. Government needs to ensure that appropriate levels of support are maintained for this industry in order to realise the future benefits it can offer to the UK, especially the potential of increased UK manufacturing.

Small wind has unfortunately suffered a different trend throughout 2013

and 2014 and has experienced a challenging period of declining deployment and UK market retraction. UK companies that operate within this sector scale have struggled to maintain a sustainable business model and have been forced to make significant changes to the way they operate, via reduced staff numbers, company mergers, or concentration on different technologies. And of course there have been companies that have not had these options, and have consequently entered into liquidation.

It is vital that Government recognises the needs of the industry to ensure a long-term and sustainable future. The small and medium wind industry is a long-standing UK success story that has evolved over many decades. As a world-leader in industry standards and a major exporter of turbines across the globe, the UK should be proud of this sector. Government is right to challenge industry to deliver on cost reduction, but it needs to better understand the opportunity that can be realised by offering greater policy support to the sector.

Our Small and Medium Wind Strategy proposes 19 broad ranging recommendations to bring the industry back on track, from tax breaks to planning amendments.

What happens in the 2015 FiT review will define the future of the small and medium wind market. Basic amendments during the Feed-in Tariff review and simple wider support mechanisms would help to ensure that increased economic benefits are secured and that achievements within the sector do not ebb away. It will be on the next Government's watch to put the industry back onto the right path.

Table of Data

	UK 2005	Total 2005	UK 2006	Total 2006	UK 2007	Total 2007	UK 2008	Total 2008	UK 2009	Total 2009	UK 2010	Total 2010	UK 2011	Total 2011	UK 2012	Total 2012	UK 2013	Total 2013	UK 2014	Total 2014
Number of sold units in that year																				
0–1.5 kW	992	3032	1943	4567	3147	6021	2796	5745	2524	6686	2036	5247	1943	4720	2008	5104	1840	5160	1388	3862
1.5–15 kW	168	210	284	346	621	674	640	895	727	1012	748	929	975	1184	1359	1478	1257	1706	318	456
15–100 kW	3	3	5	5	19	19	17	17	29	29	69	69	150	150	348	348	439	444	318	322
100–500kW	0	0	0	0	0	0	0	0	0	0	0	0	18	18	28	28	100	100	211	211
TOTAL	1163	3245	2232	4918	3787	6714	3453	6657	3280	7727	2853	6245	3086	6072	3743	6958	3636	7410	2235	4851

	UK 2005	Total 2005	UK 2006	Total 2006	UK 2007	Total 2007	UK 2008	Total 2008	UK 2009	Total 2009	UK 2010	Total 2010	UK 2011	Total 2011	UK 2012	Total 2012	UK 2013	Total 2013	UK 2014	Total 2014
System application																				
Ongrid	165	205	705	745	1644	1763	1387	1848	1240	2298	1002	1853	1398	2314	1983	2421	1997	2631	841	964
Offgrid	998	3040	1523	4173	2143	4951	2066	4809	2040	5429	1851	4392	1688	3758	1760	4537	1639	4779	1396	3887

	UK 2005	Total 2005	UK 2006	Total 2006	UK 2007	Total 2007	UK 2008	Total 2008	UK 2009	Total 2009	UK 2010	Total 2010	UK 2011	Total 2011	UK 2012	Total 2012	UK 2013	Total 2013	UK 2014	Total 2014
System setup																				
BM	2	2	380	384	1054	1091	663	853	333	1194	113	542	4	7	12	15	22	25	30	30
FS	1161	3243	1852	4534	2733	5623	2790	5804	2947	6533	2740	5703	3082	6065	3731	6943	3614	7385	2207	4821

	UK 2005	Total 2005	UK 2006	Total 2006	UK 2007	Total 2007	UK 2008	Total 2008	UK 2009	Total 2009	UK 2010	Total 2010	UK 2011	Total 2011	UK 2012	Total 2012	UK 2013	Total 2013	UK 2014	Total 2014
System design																				
HAWT	1163	3245	2224	4910	3747	6674	3355	6557	3142	7579	2804	6194	3027	5999	3711	6916	3541	7310	2233	4847
VAWT	0	0	8	8	40	40	98	100	138	148	49	51	59	73	32	42	95	100	4	4

	UK 2005	Total 2005	UK 2006	Total 2006	UK 2007	Total 2007	UK 2008	Total 2008	UK 2009	Total 2009	UK 2010	Total 2010	UK 2011	Total 2011	UK 2012	Total 2012	UK 2013	Total 2013	UK 2014	Total 2014
Sales (£ thousand)																				
0–1.5kW	573	1678	2425	3923	3713	5595	3033	5359	2648	6590	1779	5513	1442	3800	1634	4461	1665	4745	991	2605
1.5–15kW	1552	1929	3354	4066	8062	8892	9516	12407	11424	15067	17905	20508	24280	27686	27014	29450	27386	35315	7045	11603
15–100kW	235	235	292	292	1920	1920	1200	1200	3051	3051	9590	9590	16907	16907	63512	63512	75812	75912	38348	38416
100–500kW	0	0	0	0	0	0	0	0	0	0	0	0	7530	7530	13485	13485	52325	52325	127878	127878
TOTAL	2360	3842	6071	8281	13695	16407	13749	18966	17123	24708	29274	35611	50159	55923	105645	110908	157188	168297	174262	180502

TOTAL = UK deployment and export from UK manufacturing

BM = Building mounted turbine

FS = Free standing turbine

HAWT = Horizontal axis wind turbine

VAWT = Vertical axis wind turbine

Contributors

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References

- 1 It should be noted that these definitions have changed from the previous report. This is because changes to the FIT brackets at the end of 2012 have created a general re-structuring of small and medium wind turbine scales.
- 2 Assuming average household energy consumption of 4,192 kWh/year (DECC).
- 3 Assuming carbon saving figure of 430g/kWh (DECC).
- 4 Figures for cars removed from the roads are based on annual emission rate per car of 2.27 tonnes of CO₂ (SMMT).
- 5 Small and Medium Wind Strategy, RenewableUK, November 2014.
Available at: www.renewableuk.com/en/publications/index.cfm/Small-and-Medium-Wind-Strategy-report-2014



RenewableUK

Greencoat House, Francis Street
London SW1P 1DH, United Kingdom

Tel: +44 (0)20 7901 3000

Fax: +44 (0)20 7901 3001

Web: www.RenewableUK.com

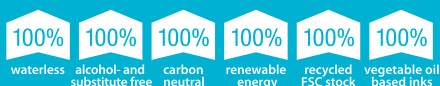
Email: info@RenewableUK.com

Our vision is for renewable energy to play a leading role in powering the UK.

RenewableUK is the UK's leading renewable energy trade association, specialising in onshore wind, offshore wind, and wave & tidal energy. Formed in 1978, we have a large established corporate membership, ranging from small independent companies to large international corporations and manufacturers.

Acting as a central point of information and a united, representative voice for our membership, we conduct research, find solutions, organise events, facilitate business development, advocate and promote wind and marine renewables to government, industry, the media and the public.

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