

**Scottish Renewables Briefing
Onshore wind – the UK’s missed
manufacturing opportunity**

***Britain’s lack of wind turbine manufacturing capacity is the result, in large part, of a short-sighted approach to energy policy in the 1980s and prohibitively high property taxes.***

***While money was spent on the industry and early turbine designs showed promise, these two significant barriers were enough to scupper a home market for turbine technology.***

***And while European and US manufacturers powered ahead – most notably in California, where 12,000 turbines were installed under a generous support scheme in the five years from 1981 – the UK lost its chance to compete in a world market which was worth $110 billion in 2016 alone*[[1]](#footnote-1).**

**Post-war**

Electricity was first produced from wind energy in Aberdeenshire in 1887, when Professor James Blyth installed a 10m high wind turbine in the garden of his summer home in Marykirk. Not only was the electricity used to power Blyth’s home, but the surplus was offered to the town to power street lighting.

But it was energy security concerns in the post-war years which sparked interest in wind energy on a national scale.

“UK concern about energy supply security in the early post-war years led to a wind power programme that continued through to the early 1960s. It was started in 1948 when a national wind-power committee was set up … to select sites and design and test prototype wind turbines with ratings up to 100kW.”[[2]](#footnote-2)

These turbines were successful to a degree, but failed to reach even the basic performance of a Danish design of the same type[[3]](#footnote-3).

By the 1960s, oil prices had fallen from a post-war peak and energy security had slipped from the UK’s radar. Development of the atomic bomb meant engineers had a head start on producing nuclear power from plutonium, and the promise of “electricity too cheap to meter” diverted attention from renewable power.

Funding for the national wind power committee ended, and the issue wasn’t raised again until the early 1970s.

**1973-1990: The oil crisis and beyond**

The 1970s oil crisis battered the global economy and helped trigger a stock market crash, soaring inflation and high unemployment, ultimately leading to the fall of a UK Government.[[4]](#footnote-4)

Its impact on the development of the UK’s wind energy industry was equally dramatic – bringing energy security back to the fore.

For the first time, though, there was another factor at play: growing concern over the impact of emissions from coal-fired power stations, caused by the acid rain which had begun to fall across the developed world.[[5]](#footnote-5)

But while environmental concerns were to become the backbone of the wind industry’s raison d’etre, it was the oil crisis’ impact on energy security which most pointedly focused minds on renewables’ potential.

Across Europe, programmes for the development of wind energy technology began in earnest, in Sweden in 1975 and in both Germany and Denmark in 1976.

In the UK, the oil crisis prompted government to review sources of renewable power. By 1976, its judgement was that the two technologies which held most promise were wave power and solar thermal. Indeed after 2000 the opportunities for capturing electricity from the wind were judged to be “small”.[[6]](#footnote-6)

Offshore wind, however, was judged to have merit by the Department of Energy, which identified and funded three strands of wind energy activity.

The first was the production of a multi-megawatt onshore turbine for high-wind sites, built by a consortium called the Wind Energy Group, or WEG. The 3.7MW device was installed at Burgar Hill in Orkney in 1988, 11 years after it was first conceived, and five years after a 300kW device was erected at the same site by Howden, a Glasgow manufacturing company famous for its industrial fans.[[7]](#footnote-7)

WEG and Howden enjoyed some success exporting turbines to the USA, fuelling the Californian boom in wind power in the early 1980s. However:

“Though the two prototypes performed well [WEG’s] MS-3 – handicapped by the absence of a UK home market for wind turbines – just could not compete with Danish manufacturers, who by then had been producing wind turbines in volume for almost a decade. WEG would have to wait until 1992 before they would have the opportunity to supply their turbines to some of the UK’s first wind farms.”[[8]](#footnote-8)

**Policy and property taxes – the perfect storm**

Until the 1983 Energy Act, individuals had been prohibited from connecting renewables generation equipment to the grid.

“The Energy Act gave them this right, and required the regional electricity boards to publish the prices they would pay for electricity supplied to them. After allowing for the various fixed and other charges that the Area Boards made, the net result was equivalent to the payment of at best about 1.8p/kWh, which was only about two-thirds the price paid in Denmark.”[[9]](#footnote-9)

A second, and larger, problem for the creation of a UK home market for wind technology was the prohibitively high scale of property taxes, or rates, imposed on them.

“For wind turbines owned by anyone other than an electricity utility the standard method of assessment was… based on the cost of the installation and led to the property taxes… being set at a level equivalent to about 1.6p/kWh.”[[10]](#footnote-10)

The problem is obvious – there was no way to install a wind turbine in the UK and pay for its maintenance, much less pay back the capital costs associated with its purchase and installation.

This situation continued through the 1980s, as other countries moved ahead with supportive policies and tax rebates – and as wind power began to take hold in the minds of the electricity-consuming public.

**Denmark ascends**

In Denmark, a combination of thoughtful policies and a private sector with a desire to diversify has produced a thriving wind power industry.

Vestas, the world’s largest turbine manufacturer, started its life as a blacksmith’s shop in 1898, before moving into agricultural machinery in 1950, then wind in 1979.

In the same year:

“To encourage small-scale wind turbine developments the Danish Parliament passed legislation in the summer of 1979 that gave purchasers a 30% subsidy, provided the turbine was of an approved type … By 1980 there were a dozen manufacturers producing grid-connected wind turbines.”[[11]](#footnote-11)

Well-considered but not unduly-onerous guidance allowed the connection of these turbines to the grid, and:

“This, plus the stimulus provided by the 30% subsidy and the generally positive experiences of early customers, encouraged a substantial increase in the number of turbine sales from 18 in 1979 to over 100 in 1980, and they remained at or above this level throughout the 1980s.”[[12]](#footnote-12)

Tax exemptions, too, promoted turbine ownership within communities:

“By 1996 there were around 2,100 such cooperatives in the country [and] … by 2001 over 100,000 families belonged to wind turbine cooperatives, which had installed 86% of all the wind turbines in Denmark.

“Opinion polls show that this direct involvement has helped the popularity of wind turbines, with some 86% of Danes supporting wind energy when compared with existing fuel sources.”[[13]](#footnote-13)

While domestic Danish turbine sales were strong in the 1980s, it was the purchase of large numbers of Vestas machines by American companies determined to cash in on a 7 cents/kWh incentive offered in California which provided the most powerful catalyst for the Danish industry’s meteoric rise.

“[Danish agricultural product manufacturers’] tradition of engineering robust and reliable agricultural equipment helped to ensure that Danish wind turbines were as robust and reliable as was possible for a completely new product.

“Competition in Denmark to supply the small home market led to the steady development of larger and more cost-effective wind turbines, and Danish manufacturers were therefore well placed to benefit when the market for wind turbines in California suddenly emerged. Though the Californian wind power boom of the early 1980s … caused some acute growing pains, Danish wind turbine manufacturers ended the decade as very clear market leaders.”[[14]](#footnote-14)

**Denmark today – the UK’s lost opportunity[[15]](#footnote-15)**

2016 was the Danish wind industry’s best year since the global financial crisis in 2008-2009 and turnover, exports and number of full-time employees increased.

In 2016, 32,898 people were employed in the Danish wind industry – an increase of 6.2% from the previous year – and its turnover increased from €14.2 billion in 2015 to €15.7 billion in 2016.

Just fewer than 7% of Denmark's total exports of goods are wind-related products – the largest share in the EU-15 group of countries.

Between 2015 and 2016 exports increased from €6.4 billion to €7.4 billion, and since 2006 exports from the wind industry have increased by 42%.

In 2016, the wind industry exported more than €4 billion worth of goods to EU countries and an additional €1.8 billion to countries outside the EU.

**Conclusion**

It is clear to see that Denmark’s journey to a dominant position in the global wind turbine manufacturing sector holds lessons for the UK.

The innovative technology in which it invested in the 1970s and 80s is now mainstream: wind is predicted to provide almost a third of Europe’s total electricity generation by 2040[[16]](#footnote-16).

As our energy system undergoes a seismic shift to a smart, flexible, low-carbon future, new energy policy is being drafted at Westminster and Holyrood. It is vital that we learn the lessons of the past: that investing in innovative technology – particularly when the UK has world-leading expertise – then supporting it as it moves from the lab to commercialisation can pay enormous dividends.

Failing to do so will only see history repeating itself, with UK skills and technology heading abroad, to be imported at a premium when innovation has once again become mainstream.

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1. <https://www.worldenergy.org/wp-content/uploads/2017/03/WEResources_Wind_2016.pdf> [↑](#footnote-ref-1)
2. Peter Musgrove, Wind Power, 2010 (p.82) [↑](#footnote-ref-2)
3. <http://ele.aut.ac.ir/~wind/en/pictures/juul.htm> [↑](#footnote-ref-3)
4. <https://www.theguardian.com/environment/2011/mar/03/1970s-oil-price-shock> [↑](#footnote-ref-4)
5. Likens, G. E.; Bormann, F. H.; Johnson, N. M. (1972). "Acid rain". Environment. 14 (2): 33–40. [↑](#footnote-ref-5)
6. Peter Musgrove, Wind Power, 2010 (p.137) [↑](#footnote-ref-6)
7. Peter Musgrove, Wind Power, 2010 (p.142) [↑](#footnote-ref-7)
8. Peter Musgrove, Wind Power, 2010 (p.153) [↑](#footnote-ref-8)
9. Peter Musgrove, Wind Power, 2010 (p.154) [↑](#footnote-ref-9)
10. Peter Musgrove, Wind Power, 2010 (p.154) [↑](#footnote-ref-10)
11. Peter Musgrove, Wind Power, 2010 (p.108) [↑](#footnote-ref-11)
12. Peter Musgrove, Wind Power, 2010 (p.109) [↑](#footnote-ref-12)
13. http://www.ewea.org/blog/2012/07/denmark-50-wind-powered-electricity-by-2020/ [↑](#footnote-ref-13)
14. Peter Musgrove, Wind Power, 2010 (p.123) [↑](#footnote-ref-14)
15. http://www.windpower.org/en/knowledge/statistics/industry\_statistics.html [↑](#footnote-ref-15)
16. <https://www.iea.org/media/presentations/180925_Wind_Europe.pdf> [↑](#footnote-ref-16)