# ARE WE BLOWING IN THE RIGHT DIRECTION?

**The UK recently overtook Denmark to become the world leader in offshore wind power, yet problems still plague the industry. Professor PETER CROSSLEY, Director of the Joule Centre for Energy Research & Development, examines the drive to make wind power a viable source of energy.**

In addition to the UK's ample provisions for harnessing tidal and wave power, the country also boasts Europe's best wind resources. Though planning constraints continue to hamper growth of onshore wind farms, Britain's position as an island means that offshore wind production is a substantial growth area. Countries of similar climates, such as Spain and Germany, already have well-established wind industries. In fact, recent high winds in Spain led to so much wind-energy production that energy prices dropped by 11%.

While the UK comparatively lags behind, there is a strong indication that wind power will emerge as the renewable energy with the greatest potential to deliver the UK's target for 15% renewable energy use by 2020 (Britain's contribution to the EU 20%-by-2020 renewables requirement). According to BERR, wind has overtaken hydropower as the second-largest renewable-energy generation source (after biofuels) in the UK, in output terms, with a 30% growth (90MW) in offshore generating capacity between 2006 and 2007 alone.

## SCHEMES AND DRIVERS

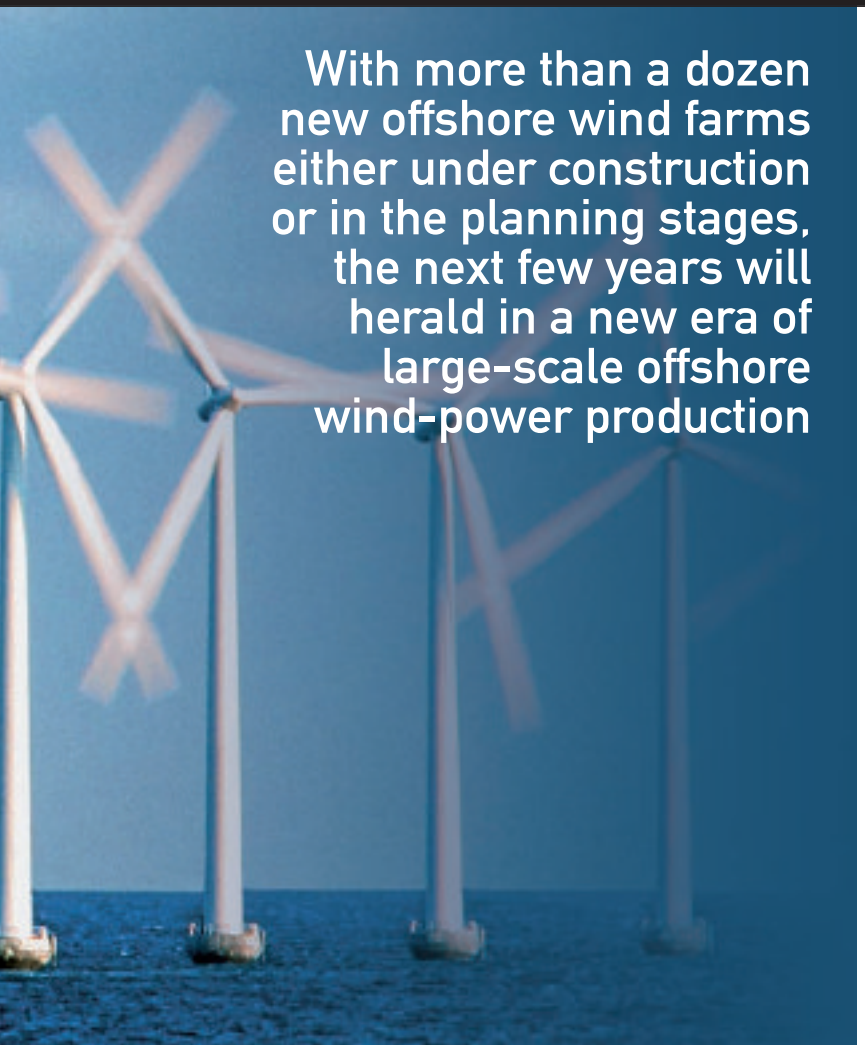
In the past decade, the main driver for growing the industry has been the governmental Renewables Obligation (RO), which requires licensed electricity suppliers to source a percentage of the electricity they supply from renewable sources. BERR reports that, in the five years following its introduction, the RO has increased the level of RO-eligible renewable generation in the UK from less than 2% in 2001 to around 4.4%. Furthermore, offshore wind, which previously received one RO Certificate per MWh, will see an increase to 1.5 ROCs/MWh from 1 April 2009.

The Offshore Wind Accelerator (OWA) scheme, announced last October, is also set to have a tangible effect on the feasibility of widespread wind-power generation. The £30M initiative by the Carbon Trust and five international energy companies is intended to reduce the cost of transforming wind into usable energy by at least 10%. The OWA will comprise research, development and demonstration activities designed to reduce the costs of offshore wind energy. This could entail using wind turbines that cost less to install, finding better ways to access the farms while they are being built, and minimising the amount of energy that is leaked as it travels from the turbine to the shore.

Crucially for the integration of small-scale wind power into the energy industry, the Government has announced an amendment to its Energy Bill that would introduce a feed-in tariff. Under this legislation, producers of energy from small-scale wind turbines would be paid an above-market rate for every unit of energy they produce. This is a notable incentive, which has proved successful in other countries, such as Spain.

## MULTI-FACETED INDUSTRY

It is important to remember that the wind-power



**With more than a dozen new offshore wind farms either under construction or in the planning stages, the next few years will herald in a new era of large-scale offshore wind-power production**

industry is multi-faceted. Most people equate wind power with the now-clichéd image of huge farms of turbines against the horizon. While these large-scale projects, sited either on land or offshore, form an essential part of the growth of wind power, the reality is that the potential for real use of wind power also extends to community- and business-led small-scale generation of energy.

In fact, the industry is so diffuse and comparatively new that research and development remains crucial. Universities, commercial organisations and other stakeholders within the energy industry must be brought together in order to form useful collaborations that can drive wind power to its full capacity in the UK. While linking into the national agenda, this collaboration should be regional, in order that scientists and stakeholders best-placed to understand the intricacies of the region are the ones conducting the research. The North West, for example, exists in close proximity to the windy Irish Sea and rural areas that would benefit from community-led wind-power generation.

Based in Manchester, the Joule Centre works with universities across the North West in order to facilitate energy R&D. The Centre awards research grants (ranging from £7,000 to more than £300,000). The grants are designed to ensure the continued progress and investment in sustainable energy research technology in the North West, whilst also making a valuable contribution to increasing knowledge in the wider community of energy and the environment.

We believe that the UK's renewables research sector is threatened by stagnation. After all, we can no longer rely on sinking money into large-scale, speculative projects that might not generate useful findings for more than ten years. The urgency of the energy-dependence situation is too great. We need instead a shorter-term approach to energy research, which includes wise use of the Joule-Centre's 'Seed Corn' pots of research money, for projects lasting a single year. The recent crop of 2008 Seed Corn grants includes several projects specifically concerned with wind power.

## RESEARCH AND STAKEHOLDER ENGAGEMENT

In one project, which began in January 2009, Dr Xiongwei Liu's team at the University of Central Lancaster are building important skills in the wind-power sector. In their study, they are examining the innovation of small wind-turbine technologies – notably, issues associated with their use in isolated communities. In recognition of the barriers to implementation that exist in small-scale wind power, Liu's team are examining the following: a need for customised rotor design to suit individual site conditions; a need for active, intelligent operational control to respond to variable wind conditions; direct drive excitable magnet generators; a need for economic manufacturing of many individual designs; low-maintenance/long-life systems; and, finally, ways to overcome public misconceptions over small-scale wind turbines.

Another Joule Centre research project taps into a key issue in the wind-power industry: the need to optimise transmission of power from offshore wind-farm networks. An electrical utility grid is generally unable to accept a large amount of wind power without imposing strict conditions. Voltage fluctuation, reactive power compensation and fault ride-through are the main areas of concern. Accordingly, Dr M Barnes and his team at the University of Manchester are currently studying sustainable energy infrastructure and supply technologies, with a particular focus on offshore HVDC grids.

As the wind-power industry as a whole grows, the UK is notably seeing an increase of enthusiasm surrounding community-owned wind projects. These not only bring local residents the direct economic benefit of creating power for their area, but also allow them to engage with renewables in an active way. Conferences and forums, which engage businesses and community stakeholders, are likely to play an important role in the wind-power industry's future.

## EXPANSION AND SETBACKS

Many of the UK's onshore wind farms are undergoing expansion, such as Black Law Wind Farm in Lanarkshire, which has secured permission to add a further 12 turbines to its site. There are also many more brand new farms under construction. Clyde Wind Farm, near Abington, once completed, will be Europe's largest onshore wind farm, with an output of 548MW. However, offshore wind remains at the centre of the UK's hopes for a profitable wind-power industry.

With more than a dozen new offshore wind farms either under construction or in the planning stages, the next few years will herald in a new era of large-scale offshore wind-power production. The London Array, sited off the Kent and Essex coasts, in the outer Thames Estuary, should provide a massive 1,000MW of energy when complete. While the London Array has become a beacon of what could be achieved with wind power – it could supply enough energy for a quarter of homes in the Greater London area – it also underscores the expense involved in growing the industry. *The Financial Times* recently reported that finances for the project are "on a knife-edge".

Indeed, while wind is clean and free, the mechanisms to extract power from that wind are more costly – both in financial and environmental terms. With the substantial carbon footprint involved in the manufacture of wind turbines (especially small-scale turbines), plus the disruption of ecosystems caused by large-scale wind farms, there is ongoing discussion over whether it is conscionable to build the industry at such a rapid rate. The mounting construction costs for offshore wind farm infrastructure are also a direct contradiction to the perception of wind power as 'free'.

Expense still remains the major barrier to comprehensive wind-power production, with high capital costs and further maintenance costs making it an option that is not competitive in the short term. Estimates by Centrica, the owner of British Gas, suggest that each megawatt of wind power capacity costs £3M to build – more than the equivalent cost for a nuclear power station, which boasts a more consistent operating capacity. Despite this, wind power is still destined to form an important part of the UK's long-term renewable-energy plan. The crux now is to drive the industry into maturity, with necessary R&D that can help to make wind power more effective and, importantly, financially viable. **www.joulecentre.org**

## In the next issue:

**Renewables around the world**

The UK last year dropped from 4th to 6th place on the Ernst & Young Renewable Energy Country Attractiveness Indices, falling behind the US, Germany, India and China. With renewable energy widely recognised as a sector with huge potential for economic growth, how is the rest of the world responding – and does the UK risk falling behind?