Offshore Wind – Market Status

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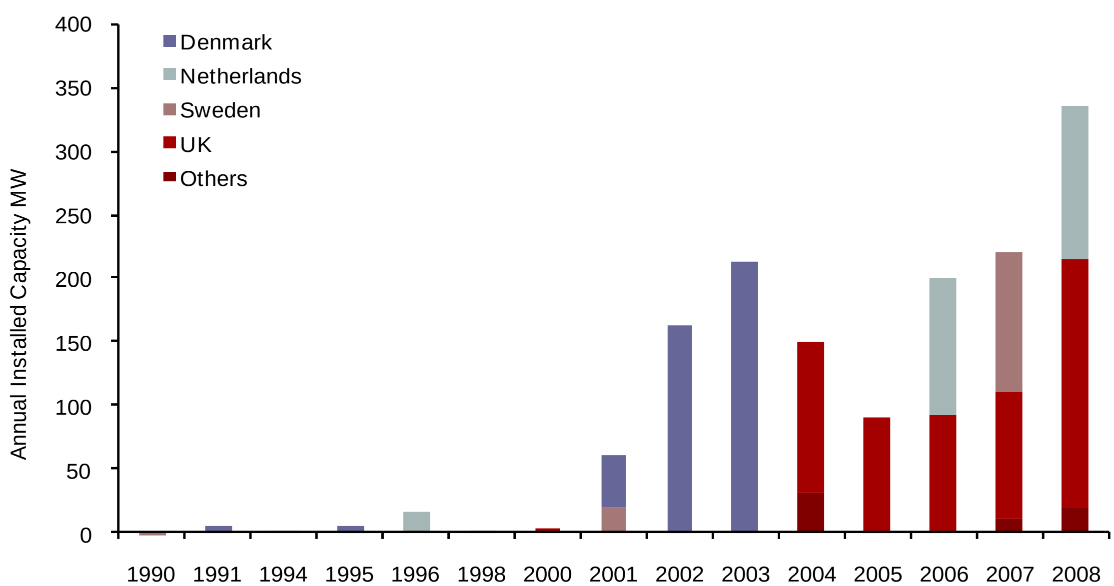
Introduction

Offshore wind activity is at an all time high with significant year-on-year growth now being seen in terms of capacity installed. However, the industry is struggling with the costs of development which have more than doubled in five years. Steven Kopits and Adam Westwood, from energy analysts Douglas-Westwood, highlight some of the key countries and discuss the current state-of-play in the industry.

Market Developments

The offshore wind market is finding its feet across the globe, with major projects completed and under construction in the UK, swiftly gathering momentum for renewables under the Obama administration in the United States, increasing focus and investment in China, and new projects planned in Germany, Belgium and other European countries. From virtually nothing in 2000, the industry today can boast of 1.5 GW installed capacity, of which 334 MW—more than 1/5th—was installed in 2008 alone. An additional 1.5 GW is currently under construction, and Douglas-Westwood forecasts more than 5 GW in the water by 2012.



Graph 1: Historical Installed Offshore Wind Capacity, MW, 2000 – 2008

The United Kingdom, in particular, has assumed the mantle of leadership in the industry. With seven operating wind power plants sporting 530 MW of capacity, the UK leads the industry by far. And the gap will grow. The UK has six projects totalling 1.2 GW under construction, and looks to add another 900 MW by 2012.

The offshore industry can trace its lineage to the Danes, for it was Denmark who first championed offshore wind in scale. From 2001 to 2003, Denmark built 500 MW of offshore wind with its groundbreaking Horns Rev and Nysted projects. After taking a pause to gain experience in the operation and integration of wind power into its energy portfolio, the Danes will be back from 2009, and we expect them to add nearly one GW of capacity by 2012.

Germany looks to move from a testing and field trial phase to construction of operating wind farms in the next few years. From 2004 to 2008, the country installed only three offshore turbine – all nearshore. These include a 4.5 MW prototype turbine at Ems Emden in 2004 and a 5 MW turbine was installed at Hooksiel in 2008. But Germany is moving past the prototype stage, and Germany's first significant project, the 60 MW Alpha Ventus wind farm, is currently under construction and is expected to be operational by the end of 2009. Germany is will continue to become a key player, and Douglas-Westwood sees the country installing 1.4 GW by 2012, second only to the UK globally.

In the United States, the Obama administration has breathed life into the offshore wind industry. During the Bush administration, access to offshore lands was precluded by an inter-agency dispute. This current administration intervened to resolve the conflict, with the Minerals and Mining Service (MMS) awarded jurisdiction to lease the outer continental shelf for offshore wind where much of US offshore wind is slated. The agency opened its doors to receive applications at the end of June. Cape Wind of Massachusetts (which is not subject to a full review by the MMS) is the farthest along. Originally proposed in 2002, Cape Wind intends to build a 420 MW, 130 turbine project at Horseshoe Shoals in Nantucket Sound, perhaps the best offshore wind site in the entire United States in every respect save one: It lays within line of site of the Kennedy compound on Nantucket Island. More than seven years of litigation has dogged the company, but Cape Wind has prevailed and was recently awarded a certificate by Massachusetts clearing all state level issues. As COO Craig Olmstead told us cheerfully, "Only two lawsuits left to go!" Having survived through sheer determination and grit, Cape Wind can expect to be first in the water.

China starts from far back, but is coming on strong. The country excels in production of low cost manufactures, and the potential for foundation, turbine and component export beckon for the Middle Kingdom. The potential US market alone could exceed $10 billion in the next decade, and indeed, Chinese steel is being used for foundations for the Greater Gabbard project off the UK.

China installed its first offshore wind project in 2007, a modest 1.5 MW facility placed by the China National Offshore Oil Corp (CNOOC) on one of its oil platforms. In April 2009, installation work began at the 102 MW Shanghai Donghai Bridge project in the East China Sea, the country's first commercial offshore wind farm. The project will be powered by thirty-four 3 MW Sinovel turbines installed on gravity-based foundations, with the turbines to be erected as a complete unit in a one-lift installation—similar to the Beatrice Demonstration project off Scotland. The project costs are expected to be around $340 million and final commissioning is expected in 2010.

Development in China is moving quickly and we expect the country to become a major player offshore within the next decade.

Table 1: Operational Offshore Wind Power Plants – June 2009

Project	Country	MW	Turbines	Online
Vindeby	Denmark	5	11	1991
Lely	Netherlands	2	4	1994
Tunø Knob	Denmark	5	10	1995
Irene Vorrink (Dronten)	Netherlands	17	28	1996
Gotland (Bockstigen)	Sweden	3	5	1998
Blyth Offshore	UK	4	2	2000
Middelgrunden	Denmark	40	20	2001
Utgrunden	Sweden	11	7	2001
Yttre Stengrund	Sweden	10	5	2001
Horns Rev	Denmark	160	80	2002
Frederikshavn phase 1	Denmark	3	1	2002
Frederikshavn phase 2	Denmark	8	3	2003
Nysted Havmollepark	Denmark	166	72	2003
Rønland	Denmark	17	8	2003
Samsø	Denmark	23	10	2003
North Hoyle	UK	60	30	2004
Arklow Bank phase 1	Ireland	25	7	2004
Ems Emden	Germany	5	1	2004

Hokkaido	Japan	1	2	2004
Scroby Sands	UK	60	30	2004
Kentish Flats	UK	90	30	2005
Barrow Offshore Wind	UK	90	30	2006
Breitling	Germany	3	1	2006
Egmond aan Zee	Netherlands	108	36	2006
Beatrice Demonstration	UK	10	2	2007
Burbo Offshore Wind Farm	UK	90	25	2007
Kemi Ajos phase I	Finland	9	3	2007
Lillgrund	Sweden	110	48	2007
Suizhong 36-1	China	2	1	2007
Inner Dowsing	UK	97	27	2008
Kemi Ajos phase II	Finland	15	5	2008
Princess Amalia (Q7)	Netherlands	120	60	2008
Lynn	UK	97	27	2008
Hooksiel Demonstrator	Germany	5	1	2008

The Role of Government

Development of the offshore wind industry at the national level is generally incremental, starting with one or just a few prototype turbines, migrating to pre-commercial scale farms typically of 10-60 MW, on to small commercial scale projects generally in 150 MW range, and finally arriving at full commercial scale projects of several hundred MW. The London Array, long-struggling but with improving prospects, could be the first project in the gigawatt range – the first 630 MW phase should be complete by 2013. This national learning curve typically requires five years or more, and the role of the government is both critical and changes over time. There is no better example than Great Britain.

Britain has awarded offshore wind projects in a rounds-based system. Britain's first licensing round took place in 2002 and its third round was launched in 2008. These rounds have seen a progressively more self-confident government involvement, with the government assuming a greater proportion of upfront expense, effort and risk over time. In the early stages of national development, most of the upfront commitment falls to the project developer, who must choose the site, perform resource measurement, environmental studies, address multiple stakeholder concerns (aviation, shipping and military issues, for example), secure permits and interconnect rights to the grid, and absorb related costs and investment of time. This creates a high barrier to entry as developers face multiple rounds of expense and risk over many years without certainty the project will ultimately succeed. For example, in the US, Cape Wind is generally regarded as an object of wonder in the industry—most observers are astounded that the company hung in for so many years.

In Britain, over time, the government and Crown Estate (who is responsible for coastal waters) has taken an increasingly greater role, zoning the offshore lands, performing meteorological assessments and environmental impact studies and requiring priority interconnect from utilities. This makes sense in many regards. Zoning is difficult to on a plot-by-plot basis, as it often reflects broader issues like shipping lanes, fishing grounds or migratory birds paths that are not easily managed outside a regional context. For example, fishermen may cede a portion of their grounds if compensated elsewhere, something which no individual developer can grant. Further, by absorbing the cost of the meteorological studies, the government can assume the risk of early investment without incurring a loss of time waiting for other studies and stakeholders issues to be resolved. Similarly, environmental issues are often best considered regionally, as migratory birds as best studied over a path rather over a specific site.

In many ways, the US is now grappling with issues Britain faced in Round 1. While the MMS has gained authority to lease the outer continental shelf for up to 25 years, most other costs and issues remain the domain of the developer. This includes the acquisition of a short term lease for and the costs associated with meteorological studies, as well as costs associated with environmental impact studies. This last point rankles the offshore wind community, as the MMS covers these same costs for the oil and gas industry. Under the Obama administration, offshore wind may expect, at a minimum, non-discriminatory treatment over time.

The United States is also peculiar in that offshore wind is, for practical purposes, run by the individual states and not on the federal level. Therefore, government support can vary enormously by jurisdiction. For example, the State of New Jersey provided grants to three developers to cover the cost of installing meteorological towers, thereby assuming significant upfront costs. Rhode Island, motivated to avoid the strife of Cape Wind in neighbouring Massachusetts, has embarked on an extensive effort to zone its entire coastal waters, including federal waters. Delaware has directed its Delmarva Power, the leading utility in Delaware, to sign a power purchase agreement with Blue Water Wind, an offshore wind developer. In sum, the development environment can vary materially from state to state. Some states with limited population or financial resources, for example Maine, would prefer that offshore wind be handled either federally or regionally. How this question will be resolved is unclear, but the answer will be decisive for the development of offshore wind in the United States.

Government Support

Subsidies are integral to offshore wind. The capital costs associated with an offshore wind project are at least twice those of onshore wind, and ongoing operations and maintenance costs are estimated to by 3-5 times that of land-based farms. Offshore wind is an expensive business, and increasingly so. Costs have risen from around £1.2m/MW on the first UK projects, through to over £2.5m/MW on projects under construction, with costs for projects under tender soaring to between £3-3.5m in some recent cases.

To make the numbers work, the government must help. In almost every case of successful development, the form of assistance has been a feed-in tariff. Feed-in tariffs, or 'market mechanisms' as they are rather euphemistically called, are payments for power generated at much higher than market rates and are usually guaranteed through the foreseeable project financing associated with a wind farm, generally 15-25 years. In an ideal case, these tariffs provide a predictable revenue stream to the project adequate to cover debt service, operations and maintenance, with enough left over to insure that the equity holders have an ongoing interest in the successful and professional management of the project.

Sometimes such tariffs are granted directly, as in Germany. Sometimes they are granted *de facto* through the use of renewable energy credits trading under one of many similar names, like renewable obligations, for example. Such tariffs are widely accepted in Europe but considered anathema in the United States, perhaps because they seem to lack sufficient commitment to competition. But that is, in the end, what financiers want. As one leading renewables banker stated, "We'll consider anything, but at the end of the day, we're pretty much looking for a feed-in tariff." Sometimes such tariffs are disguised as renewables credits. For example, this same banker noted that New Jersey's OREC's (Offshore Renewable Energy Credits), once one wades through the convoluted legal language, largely act as a feed-in tariff.

Generally, offshore credits are generally worth more than standard renewables credits, usually 50-100% more. For example, in April 2009 the UK Government announced that it was increasing its renewable energy credit (a 'ROC' in the UK) banding for offshore wind projects to 2 ROCs for every megawatt hour (MWh) of electricity produced. This applies to projects that reach financial closure within the budget year 2009/10. Thereafter the ROC will fall to 1.75 for projects clinched in following year before reverting to the previous level of 1.5 after 2011. This has already had the effect of pushing forward some projects such as the London Array which was struggling with high capital costs. There is some concern, however, that these measures will reduce investor confidence in the long-term due to uncertainty over potential future fluctuations to the mechanism.

Government support can come in other forms as well. In the UK (as elsewhere), the Renewables Obligation requires power suppliers to derive from renewables a specified proportion of the electricity they supply to their customers. This started at 3% in 2003, rising gradually to 10% by 2010, and targeting to 15% by 2015. The cost to consumers will be limited by a price cap and the obligation is guaranteed in law until 2027. Price caps in retail electricity are nothing new. Retail power prices feature among the most regulated—and politicized—prices in the world. Notwithstanding, price caps have the effect shifting the cost of subsidized power to the equity holders of utilities and have been linked to utility bankruptcies in the past. While caps may be expedient measures for securing political support for offshore wind, in the long term, they risk poisoning the well and creating management and investor resistance to utility-supported wind projects.

Of course, offshore wind is also financed through investment and production tax credits in the United States and other countries. The lustre of such schemes fades during recession, but they may be expected to play a role in the future as the economy recovers.

The Supply Chain

Like offshore oil and gas, offshore wind requires an extensive dockside supply chain, including blade manufacture, as well as foundation and cable fabrication, and port and vessel capabilities. Offshore wind farm components are often best manufactured quayside and, of course, require offshore installation using specialized vessels, crew and technicians. Ongoing operations and maintenance also require onshore support facilities and vessels. Dockside facilities are generally of sufficient scale to serve more than a single project, and indeed, serve as a continuing basis for a regional industry. Therefore, where the supply base is established can have long-lasting implications.

For example, even as Britain serves as the poster child for the development of offshore wind, so it serves as a negative example regarding the capture of the economic benefits of offshore wind. Up to 3/4th of the levelized costs of an offshore wind farm represent support from taxpayers or ratepayers in some form. For a gigawatt-scale project, such public support can literally be measured in the billions of dollars. Capturing a reasonable proportion of these benefits is a legitimate goal of government. Nevertheless, the nature of the industry in northern Europe has thwarted Britain's quest to do so. Our analysis suggests that Britain is capturing only 10% of the levelized cost its offshore projects, with the bulk of expenditure ending up in Germany and Denmark. Britain, as a practical matter, was late to the game.

In the United States, the offshore wind industry looks to be centered in the Northeast coastal states, broadly speaking from Washington, D.C. to Boston, Massachusetts, and possibly on to Maine. Only this region has the combination of major load centers, the income and willingness to commit substantial funding to renewables, a lack of other renewables and excellent shallow to mid-water offshore wind resources. However, this region has no material offshore supply chain. The offshore supply chain for the United States is concentrated almost exclusively around the oil and gas business in the Gulf of Mexico. Therefore, the Northeast's supply chain will have to be developed literally from scratch, and this process has begun. For example, Deepwater Wind management has stated that the company envisions using Quonset, Rhode Island to stage projects for New Jersey and New York along with Rhode Island, building Rhode Island an alternative-energy industry that will power the state for years. So the carve-up is underway. Within a year, the deals will have been struck and the benefits largely allocated.

Offshore wind faces many challenges, both in costs and logistics. But in Europe – and in particular, in Britain – the industry has taken hold and is consolidating its role in the UK's energy portfolio. The United States comes from far back, but anticipates exciting times ahead.

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Steven manages the New York office of Douglas-Westwood and covers the offshore wind industry for Douglas-Westwood in North America. For the past six years, Adam has been responsible for DWL's renewable energy work, completing many studies of the industry. Recent Douglas-Westwood offshore projects include: managing a due-diligence project for a €100m investment to establish a new wind turbine manufacturer, a major study on supply chain constraints and 2020 targets for the UK's Department of Business, Economics & Regulatory Reform. Adam is principal author of DWL's renewable energy publications, including *The World Offshore Wind Report* and *The World Wave & Tidal Energy Report*.