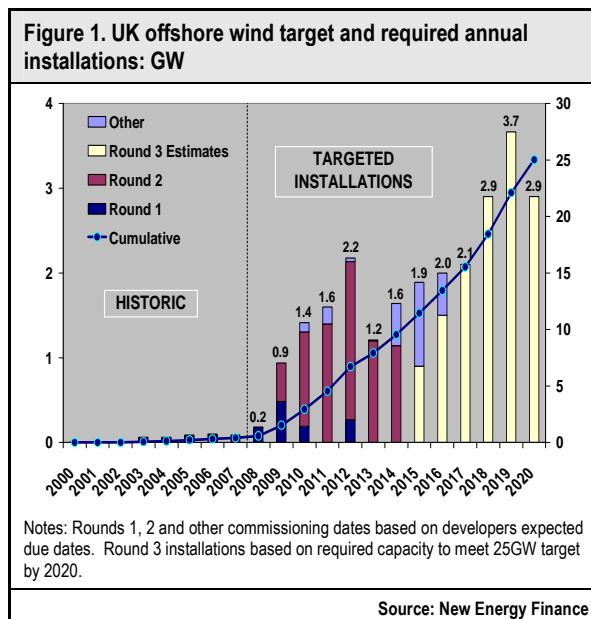


OFFSHORE WIND INSTALLATION SHIPS: GAMING THE MARKET

Specialised ships for the rapid and economic installation of large offshore wind turbines are scarce. Experienced installation companies have numerous vessels out to tender but the growth in the market offers opportunities for new entrants using established financing techniques. However with three year lead times for vessel construction establishing relationships with the major offshore development companies with access to wind turbines will be important to minimise short term risk to cash flows.

- The offshore wind market in Northern Europe is experiencing a renaissance with 558MW under construction in the UK alone and the UK and Germany targeting 63GW of capacity by 2020.
- There is tightness throughout the supply chain from turbine manufacturers to logistics. Competition for the necessary specialised installation ships is high. Centrica, the UK based power generator and utility, has options on one of the most advanced ships – the MV Resolution until 2016. There are currently only three specialist installation vessels, two owned by Danish company A2SEA and one by UK group Marine Projects International. Jersey-based Gaoth Offshore has put designs for a new purpose-built vessel out for tender and A2SEA and MPI are also looking at ordering further ships.
- Three factors mean that the existing fleet of installation ships will be inadequate for future installations – the size of next generation turbines, the water depths at the installation sites and the limitations on port facilities in key markets.
- Further specialised ships will be built in the next three years, a number backed by private equity. Investors are balancing the high cost of ship building (€80m-€140m), low access to ship building facilities (three year lead times) and the vagaries of near term demand and supply to analyse their returns.



Industry growth prospects

The offshore wind market in Northern Europe is experiencing a renaissance with 558MW under construction in the UK alone and the UK and Germany targeting 63GW of capacity to 2020. Mike Prowse, UK sales manager at A2SEA, the Danish logistics and installation company, which claims to have installed 75% of offshore wind turbines to date, said that work was stop-start until the publication of the UK's Energy White Paper in 2007. "Now demand has really taken off and the market is looking very strong from this year until 2011 and beyond," he adds.

The European Wind Energy Association (EWEA) estimates that between 20GW and 40 GW of offshore wind energy capacity will be operating in the European Union by 2020. One of the main drivers of demand has been the UK's approval of offshore as one of the main ways to meet its renewable targets as well as the desire in Germany to further diversify away from coal generation and support industry in areas of low economic growth in Northern Germany.

Near term demand for installation ships will be dictated by the actual availability of offshore wind turbines from the major suppliers, Vestas and Siemens, and new upcoming suppliers, REpower and Multibrid. This will be reviewed in a forthcoming Research Note.

A specialist task

Competition for the necessary specialised installation ships is high. UK based power generator and utility Centrica has options on one of the most advanced ships – the MV Resolution until 2016. The installation of wind turbines offshore is a specialist job requiring specific equipment. The vessels involved have to be big enough to transport 70m turbine towers, nacelles and 40m blades, they need jack-up capability so they can provide a level platform to work on and they need a crane to lift the components in place. Given the youth of the offshore wind industry, it is no surprise that there are few specialist vessels available.

Currently, there are two main options for offshore project developers wishing to get their turbines shipped. Denmark's A2SEA was the pioneer in the field and says it has installed more than 75% of existing offshore wind capacity. Founded in 2000 by Kurt Thomsen, it is based in Frederica, Denmark, with subsidiaries in the UK and Germany. Its first order in 2001, for Horns Rev has been followed by contracts at Nysted, Scroby Sands, Kentish Flats and Egmond aan Zee.

The company owns and operates two vessels, M/V Sea Energy and M/V Sea Power, originally container ships converted into self-elevating crane ships to cater for the offshore wind market. The vessels have four jacking legs and can operate in 27m and 14m respectively. The company has also purchased a crane barge, the Jumping Jack, from Mammoet Van Oord, which can work at depths of up to 35m. When the installation industry hit a quiet patch in 2006, Thomsen left the company to pursue other opportunities.

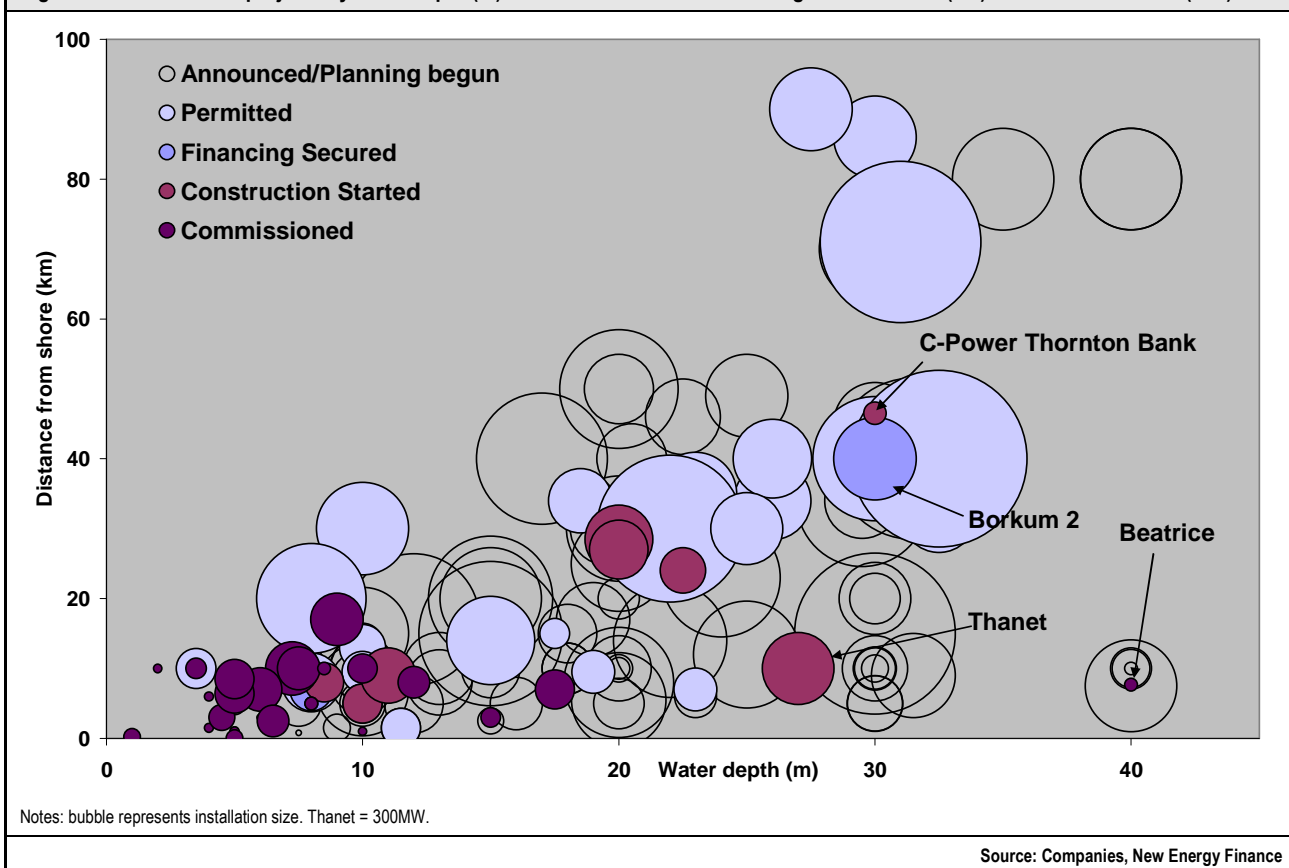
Centrica has secured the M/V Resolution, a Teesside-based ship operated by Marine Projects International with six legs and able to operate in depths of up to 35m. Centrica is renting it until the end of 2008, and now booking it until 2011, with one-year options until 2016. The company is using the vessel to install its 180MW Lynn and Inner Dowsing projects off the Lincolnshire coast. MPI is majority-owned by Dutch shipping group Vroon and it has ordered two further vessels to carry out wind farm maintenance, and these are due for delivery in 2008.

Capacity limitations

Three factors mean that the existing fleet of installation ships will be inadequate for large volume installations – the size of next generation turbines, the water depths at the installation sites and the limitations on port facilities in key markets.

The main task of a crane ship is safely to lift the complete nacelle and rotor unit on to the top of the wind turbine tower. There is a limit on what mass the existing fleet can lift and new ships with 300 tonne + lifting capacity will be required to install the next generation of wind turbines. Existing ships will be relegated to an operations and maintenance role, replacing key components such as gearboxes, generators. Current

Figure 2. Offshore wind projects by water depth (m) and distance to nearest shore/grid connection (km) and installation size (MW)



offshore turbine top head mass ranges from 100 tonnes to 295 tonnes (see Figure 3). The next generation of 4MW+ turbines will have top head mass of 300 tonnes and up.

Projects commissioned to date have been in water depths less than 20m and relatively close inshore (see Figure 2). Thanet at 27m and C-Power Thornton Bank at 30m depth are the front runners for a large number of projects which will require installation vessels with greater flexibility on depth. As mentioned above, A2SEA and Vroon's new ships will operate in water depths of up to 35m.

The distance to the projects in terms of grid connection will change less rapidly than the water depth. However limitations on port facilities, particularly on the UK's east coast, mean that installation ships are operating out of Dutch ports and therefore have a much greater distance to travel with a full load of turbines. New ships will not be simple jack-up barges but will be more advanced, larger scale, integrated installation and transport vessels.

Capacity expansion

Further specialised ships will be built in the next three years, a number backed by private equity investors. Investors are balancing the costs (€80m-€140m), low access to ship building facilities (three year lead times) and the vagaries of near term demand and supply, to analyse their returns.

Both MPI and A2SEA are looking to expand their capacity. The Danish company says its current vessels are getting a bit small in relation to the size of the turbines and it is "looking at construction possibilities", which are likely to be a mix of new and chartered capacity. In terms of new vessels, it is considering all its options, including China, S.Korea and the Baltic States. A new vessel would cost €90m-€140m depending on its structure, Prowse said, and would take about three years to build so it would not be in service until about 2011.

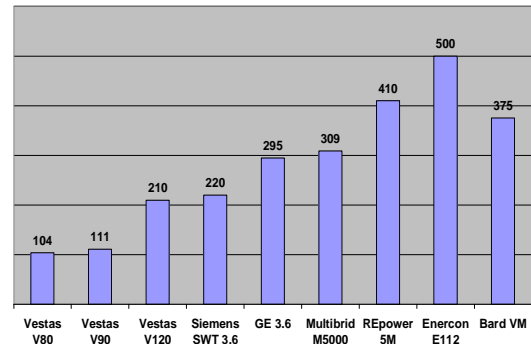
MPI, which is also reviewing its options for other vessels, concurs with A2SEA's view of the market – a new ship would take three years to build and cost about €100m. It says it is also looking at all options, including the Far East, China and Eastern Europe. It is also interested in buying some jack-up vessels for maintenance purposes – these would not have to be as big as the construction ships. The company says it will make an announcement some time in 2008.

The shortage of capacity also attracted the attention of investment bank Credit Suisse's Utility and Climate Change Fund, a low profile operation with about \$1bn available to invest. It saw a gap in the market for offshore wind installation and created a company to help fill that gap. Gaoh Offshore – named after the Iroquois native Americans' Master of the Winds – is based in Jersey and has called on the expertise of A2SEA founder Kurt Thomsen to design a vessel, which, according to reports, is entirely new and should be capable of installing in water 45m or even 55m deep. It should also be better suited to the bigger turbines the offshore industry is looking to use.

The company's chief executive, Graham Philip, is an 18-year veteran of the marine services sector who was CEO of Vroon (Viking) Offshore Services' UK operation, which operated a fleet of 32 emergency response and rescue/field support vessels in the North Sea before moving to Gaoh. Philip says the company has put the company's design out to tender and is awaiting responses from six yards around the world. It is also in discussions with potential long-term charter customers. "If it works, we would hope to build more," he says, but he stresses that this is a start-up company in an immature industry and that the requirements on any vessel are changing all the time.

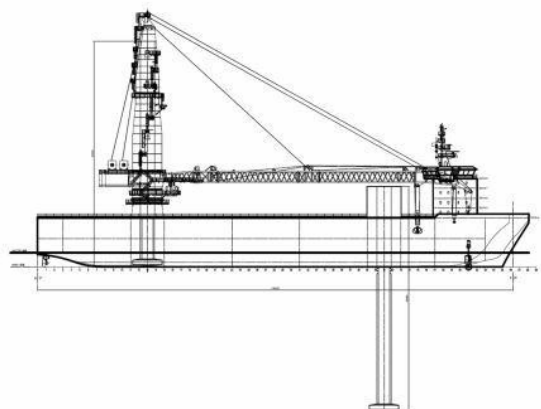
To build further ships, the company would need to be sure contracts were in place for at least two or three customers. In the long run, the company

Figure 3. Offshore wind turbine top head mass (nacelle + rotors): metric tonnes



Source: Companies, New Energy Finance

Figure 4. Designs for Gaoh's new offshore wind turbine installation ship



Source: Gaoh Offshore

Table 1. Designs for Gaoh's new offshore wind turbine installation ship

Length o.a.	140.6m
Length p.p	135m
Breadth	36.2m
Payload	4,500 metric tonnes (9x3.6MW turbines)
Speed	12 knots
Power (Diesel Electric)	14MW
Deck Load	10 tonnes/m ²
Jacking capability	1.5m H _s , 45m water depth
Dynamic Positioning	DP 2
Quarters	72/122 persons
Helideck	Sikorsky S61N
Crane	Liebherr MTC Offshore crane
Operation Criteria	Up to 16m per second wind speed
Lifting Capacity	1,600 metric tonnes at 35m radius, 72m above water surface 400 metric tonnes at 35m radius, minimum 100m above water surface

Source: Gaoh Offshore

would like to be able to provide a full range of marine contract services for the wind industry.

"Within about five years, you will be able to build a ship secure in the knowledge that you will be able to take 180 days here, 180 days there but we are not there at the moment. We are very conscious that we need to design a vessel that is what the wind industry needs but that also has the ability to work in other sectors such as oil and gas," Philip says.

In addition, German construction group Hochtief has ordered a new €30m jack-up barge from Hellenic Shipyards, a Greek company owned by German steel company ThyssenKrupp. A number of companies are also starting to appear that offer maintenance services, while ignoring the more technologically challenging installation market. In February 2008, for example, German group BARD ordered a special purpose vessel for the maintenance and provisioning of the offshore wind farms, and this will come into service in 2010. Meanwhile, MPI is set to take delivery soon of two maintenance vessels and North Wales-based Offshore Wind Power Marine Services offers "vessel and logistical support" to offshore installations. The company says it has seen such demand for its services that a further eight vessels will come into services by the end of 2008.

A number of other barges have also been pressed into service, according to shipping company Clarksons, including Excalibur, Annegret, Tijn, Vagant and Wind (jack-up barges), along with crane barges such as MEB-JBI and Roland.

The shipping market

Investing in this particular niche of the shipping market is complicated by the dynamics of the wider shipping sector. Shipyards around the world are working at or close to full capacity and there is a general shortage of ships as a result of booming demand from Asia and elsewhere. With shipyards in Asia almost at full capacity, facilities in Western and Eastern Europe have been picking up orders that they were previously unable to win because of the extra expense. Despite the fact that the number of ships has almost doubled in the last decade, freight rates are so high, according to Kamar Zaman of shipbrokers Drewry, that older vessels are being kept in service instead of being scrapped – this, combined with fears of a downturn, is holding back investment.

Financing ships

Shipping is a traditional asset-backed finance market where for more than 50 years the prime source of funds has been the commercial banks. RBS has been one of the biggest shipping banks but has pulled back from the market recently, according to ship brokers Drewry. Normally, a one-ship company was set up, which took out a mortgage against 60-80% of the ship's value. The company then had to come up with the balance from its own equity, says Martin Stopford of Clarksons, the shipping group.

Another traditional source of finance has been the German 'KG' market – KG partnerships are essentially German special purpose companies that raise equity from investors – shipping, particularly container ships, has been the second-biggest destination for funds from German high net worth investors after real estate and, according to Stopford, "they are looking for new types of assets to finance". A similar system is used in Norway, where they are called KS partnerships – after getting a bad reputation in the 1980s when a lot of money went into ships that "were not what they claimed to be", they are coming back into vogue. On Wall Street, 'special purpose acquisition corporations' serve the same purpose – these vehicles address the problem with public funds that "you have to tell people what you are investing in and by the time you have done that, the deal is dead," Stopford says. Nonetheless, there are a number of listed vehicles that have raised equity in the US, Singapore, Hong Kong and even using Islamic finance in Dubai.

Private equity is also a source of funds for the shipping world – Drewry mentions firms such as Close Brothers, Fortress, Altima, 3i and KKR as organisations that have invested in ships in the past.

One of the main problems with shipping at the moment is that there is no slack capacity to step in if there are problems of any kind, leading to many projects being delayed, with knock-on effects on subsequent projects. Constraints of all types – including availability of turbines, transformers, offshore cables and shipping – will all start to ease from 2011, says A2SEA's Prowse, and there is confidence in the industry that there is at least 10-15 years building work ahead in Northern Europe.

Appendix I: Offshore wind installation and service ships

Selected Companies Mentioned in this Report			
Ship name	Ownership	Type	Status
Sea Energy	A2SEA	Self-elevating installation vessel	
Sea Power	A2SEA	Self-elevating installation vessel	
Vakaru Laivu Klaipeda	(Bard Engineering)	Self-elevating installation vessel	Due 2009
MV Resolution	Vroon Offshore Services	Self-elevating installation vessel	
Sea Jack	A2SEA	Self-elevating installation barge	
Annegret	F+ Z Baugesellschaft mbH	Self-elevating installation barge	
Tijl, II, III	Hydro Soil Services	Self-elevating installation barge	
Trident Bibby One	Bibby Line	Self-elevating installation barge	
Vagant	Geo@Sea	Self-elevating installation barge	
Wind	Dansk Bjergning og Bugsering ApS	Self-elevating installation barge	
Zee Jack Major	Howard Marine	Self-elevating installation barge	
Eide Barge 5	Eide Marine Services AS	Lifting barges	
Enak	Bugsier	Lifting barges	
Pontra Maris	Stemat	Lifting barges	
Rambiz	Scaldis Salvage & Marine Contractor	Lifting barges	
Roland	Bugsier	Lifting barges	
Svanen	Ballast Nedam	Lifting barges	
Sancho Panza	Vroon Offshore Services	Turbine Maintenance	Due 2008
Don Quichote	Vroon Offshore Services	Turbine Maintenance	Due 2008

Source: Companies, New Energy Finance

Selected Companies Mentioned in this Report			
Company	Ownership	Home country	Relevant Sub-activities
A2SEA	Private	Denmark	Offshore wind turbine installation
Centrica	Public	UK	Energy Generation
Gaoh Offshore	Private	Jersey / Denmark	Offshore wind turbine installation
Marine Projects International	Private, owned by Vroon	UK / Netherlands	Offshore wind turbine installation
Credit Suisse	Public	Switzerland	Financial Services
Scaldis	Private	Belgium	Shipping
Marine Current Turbines	Private	UK	Tidal power generation
Hochtief	Public	Germany	Construction/shipping
Offshore Wind Power Marine Services	Private	UK	Offshore wind farm maintenance

Source: New Energy Finance

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