



The European offshore wind industry

Key trends and statistics 1st half 2016

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This report summarises construction and financing activity in European offshore wind farms from 1 January to 30 June 2016.

WindEurope regularly surveys the industry to determine the level of installations of foundations and turbines, and the subsequent despatch of first power to the grid. Data includes demonstration sites and factors in decommissioning when they occur, representing net installations per site and country unless otherwise stated.

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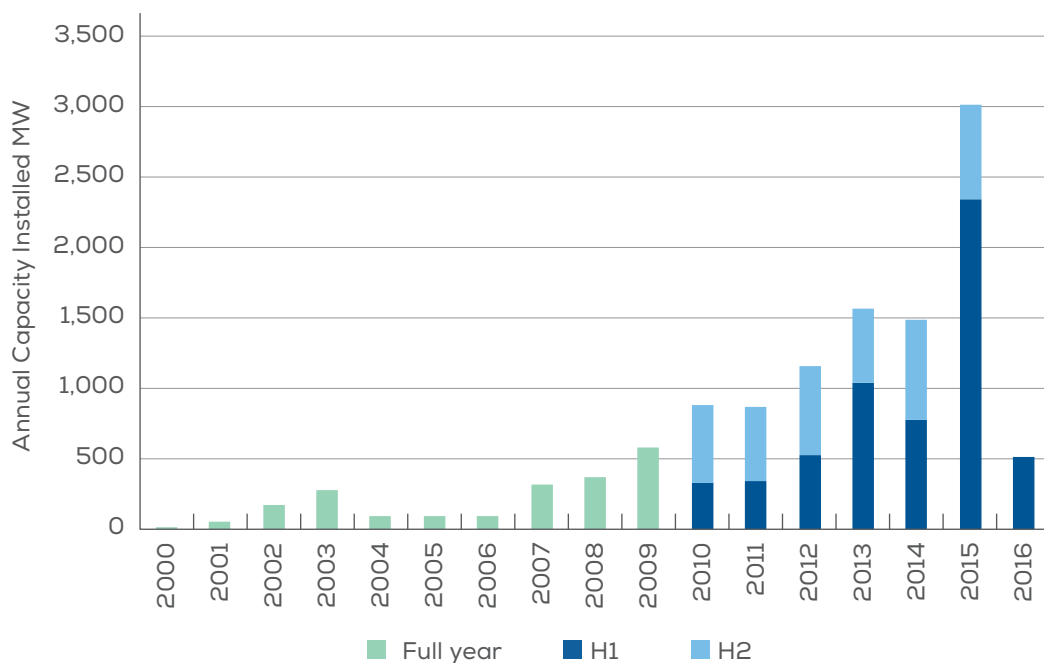
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EXECUTIVE SUMMARY

In the first six months of 2016, Europe fully grid connected 114 commercial offshore wind turbines with a combined capacity totalling 511 MW. Overall 13 commercial wind farms were under construction which once completed will have a total capacity of over 4.2 GW.

FIGURE 1

Annual installed offshore wind capacity in Europe (MW)



Source: WindEurope

New offshore capacity installations during the first half of 2016 were down 78% compared to the same period the previous year. The work carried out in European wind farms during the first six months of 2016 is detailed below:

- 114 wind turbines were fully grid connected, totalling 511 MW in 4 wind farms: Westermeerwind (NL), Gemini (NL), Gode Wind I (DE), Gode Wind II (DE).
- 182 turbines (44 units or 32% more than during the same period last year) were erected in four wind farms in the first half of the year: Westermeerwind (NL), Gemini (NL), Gode Wind I (DE), Gode Wind II (DE). Some have been grid-connected, some have not.
- Including installation activity from last year, 128 turbines, totalling 596 MW, are currently erected but awaiting grid connection.
- 177 foundations (28% more than the same period last year) were installed in nine wind farms: Nordsee One (DE), Nobelwind (BE), Nordergründe (DE), Dudgeon East (UK), Sandbank (DE), Veja Mate (DE), Burbo Bank Extension (UK), Race Bank (UK), Rampion (UK).
- Piling activity at Wikinger (DE) commenced in the first half of 2016, but as of 30 June no foundations were installed.
- The average size of wind turbines installed in the first half of 2016 is 4.8MW, or 15% larger than over the same period last year.
- Seven projects, worth €14bn, reached Final Investment Decision (FID) in the first half of 2016. This will finance 3.7 GW of new capacity, a doubling from the first half of 2015 (1.8 GW).

As of 30 June 2016, cumulatively, there are 3,344 offshore wind turbines with a combined capacity of 11,538 MW fully grid connected in European waters in 82 wind farms across 11 countries, including demonstration sites.

1. TURBINES GRID-CONNECTED

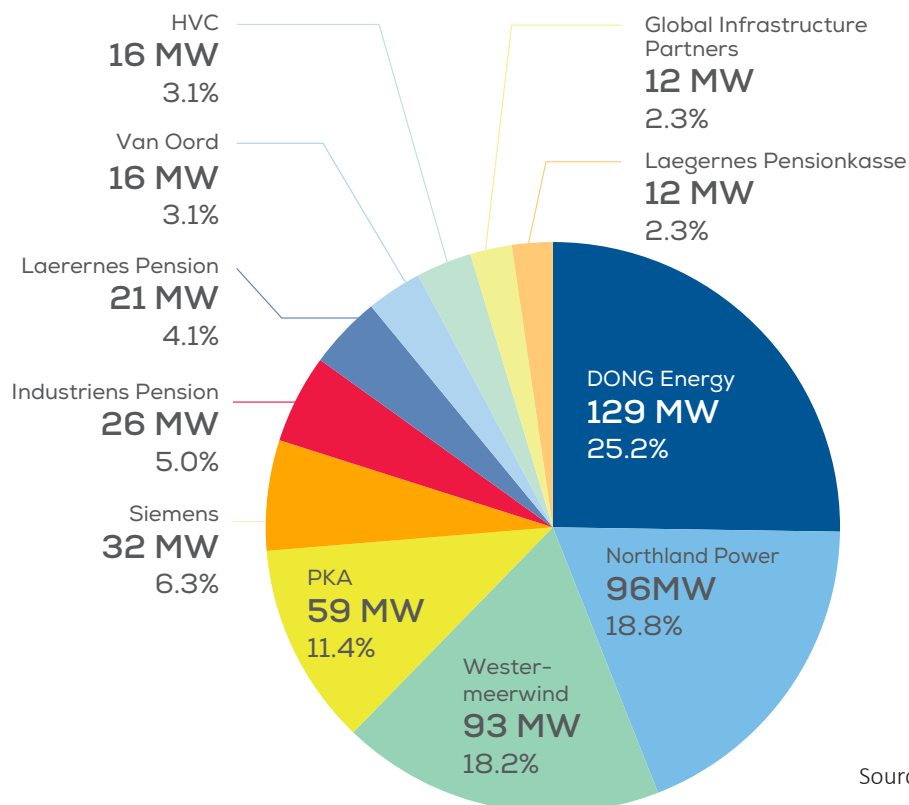
OWNERSHIP

Four commercial wind farms connected wind turbines to the grid totalling 511 MW. Figure 2 shows the share of connected MW per developer from 1 January to 30 June 2016 taking into account each company's share in the projects.

Multiple owners exist at the sites with grid connections. Power producers still account for the majority share, but infrastructure and pension funds account for 25.2% of the installed MW this year.

FIGURE 2

Offshore wind developers' share of new grid connected capacity between 1 January and 30 June 2016 (MW)



Source: WindEurope

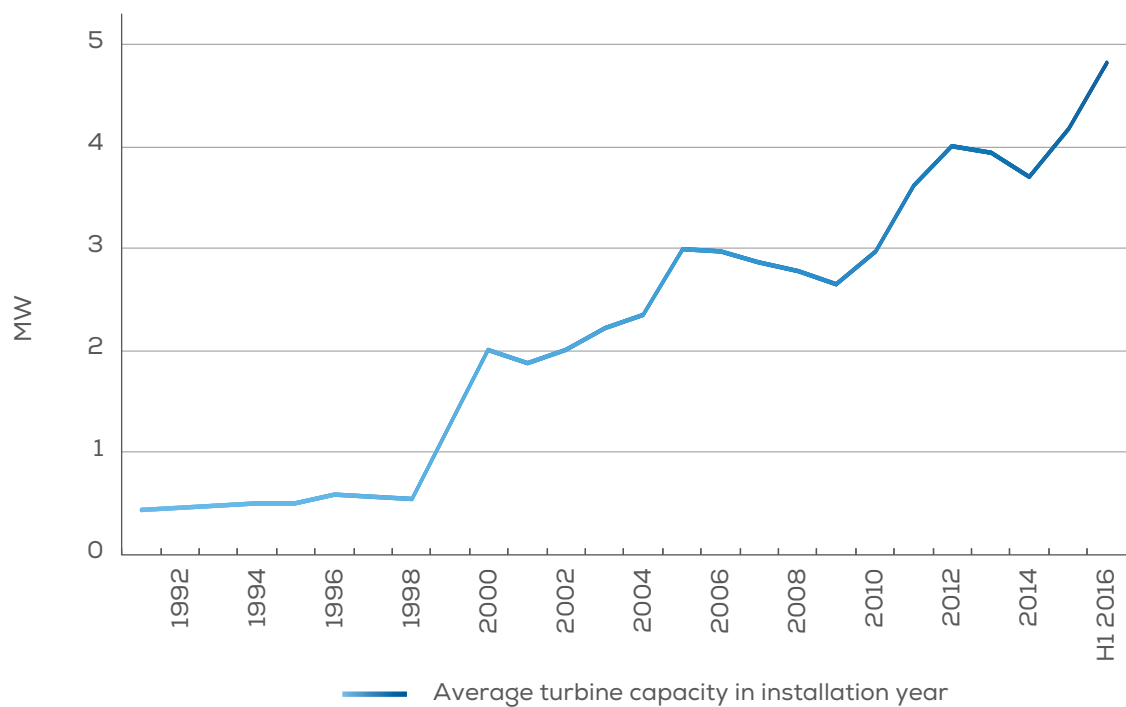
WIND TURBINES

All 114 turbines grid-connected in the first half of 2016 were provided by Siemens. They ranged in size between 3 MW and 6 MW.

The average wind turbine installed during the first six months of the year is 4.8 MW, representing a 15% increase over the same period last year. Only three out of the 13 sites under construction in 2016 will use 3MW class turbines, with two sites using 4 MW turbines, seven sites using 6 MW class turbines, and one site using the first 8 MW turbines.

FIGURE 3

Average rated capacity of turbines installed



Source: WindEurope

2.

CONSTRUCTION CARRIED OUT

SUMMARY

During the first six months of the year work was carried out on 13 offshore wind farms. Foundations and turbines were installed and/or grid connected in four countries: Belgium, Germany, the Netherlands and the United Kingdom.

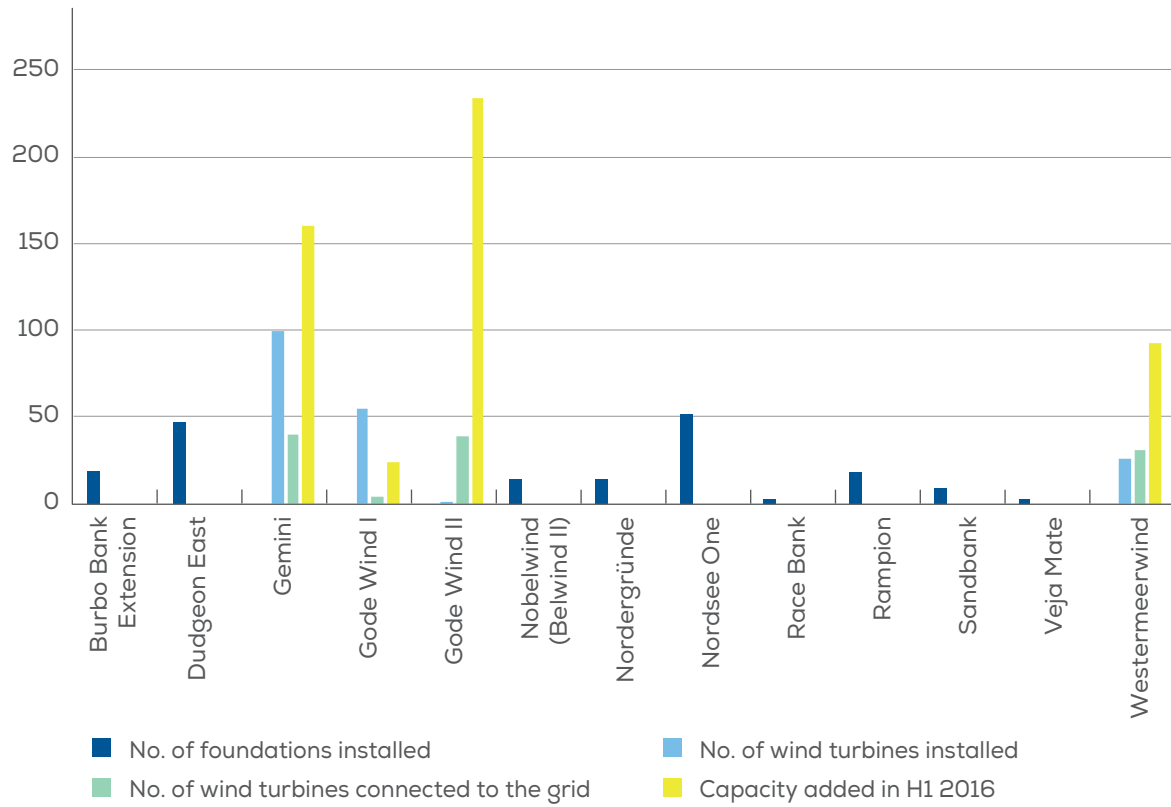
TABLE 1

Summary of work in offshore wind farms between 1 January and 30 June 2016

	BELGIUM	GERMANY	NETHERLANDS	UNITED KINGDOM	TOTAL
Number of farms	1	6	2	4	13
Number of foundations installed	14	77	0	86	177
Number of turbines erected	0	56	126	0	182
Number of turbines grid connected	0	43	71	0	114
MW fully connected to the grid	0 MW	258 MW	253 MW	0 MW	511 MW

FIGURE 4

Installation and grid connection of wind turbines in offshore wind farms between 1 January and 30 June 2016



Source: WindEurope

OFFSHORE WIND INSTALLATIONS

Seven out of 13 projects with construction activity are new starts in 2016, representing 2.9 GW of additional capacity upon their completion. As of 30 June, the status of projects with construction activity is as follows:

TABLE 2

Summary of work carried out at European offshore wind farms between 1 January and 30 June 2016

WIND FARM NAME	COUNTRY	STATUS
Westermeerwind	Netherlands	Fully grid-connected
Gemini	Netherlands	Partially grid-connected
Gode Wind I	Germany	Partially grid-connected
Gode Wind II	Germany	Partially grid-connected
Nordsee One	Germany	Foundations installed
Nobelwind (Belwind II)	Belgium	Foundations installed
Nordergründe	Germany	Foundations installed
Dudgeon East	United Kingdom	Foundations installed
Sandbank	Germany	Foundations installed
Veja Mate	Germany	Foundations installed
Burbo Bank Extension	United Kingdom	Foundations installed
Race Bank	United Kingdom	Foundations installed
Rampion	United Kingdom	Foundations installed

- Piling activity at Wikinger (DE) commenced in the first half of 2016, but as of 30 June no foundations were installed, so the project is not included in this report
- Gode Wind I and Gode Wind II have been separated out into two projects due to the different ownership structures of each site

3. NEW INVESTMENTS

FINANCING ACTIVITY

New investments in offshore wind in Europe continue to grow strongly during the first half of 2016. A total of seven projects across four countries reached Final Investment Decision (FID), for an estimated record-breaking investment value of around €14bn. This will finance 3.7 GW of new capacity, a doubling from the first half of 2015 (1.8 GW).

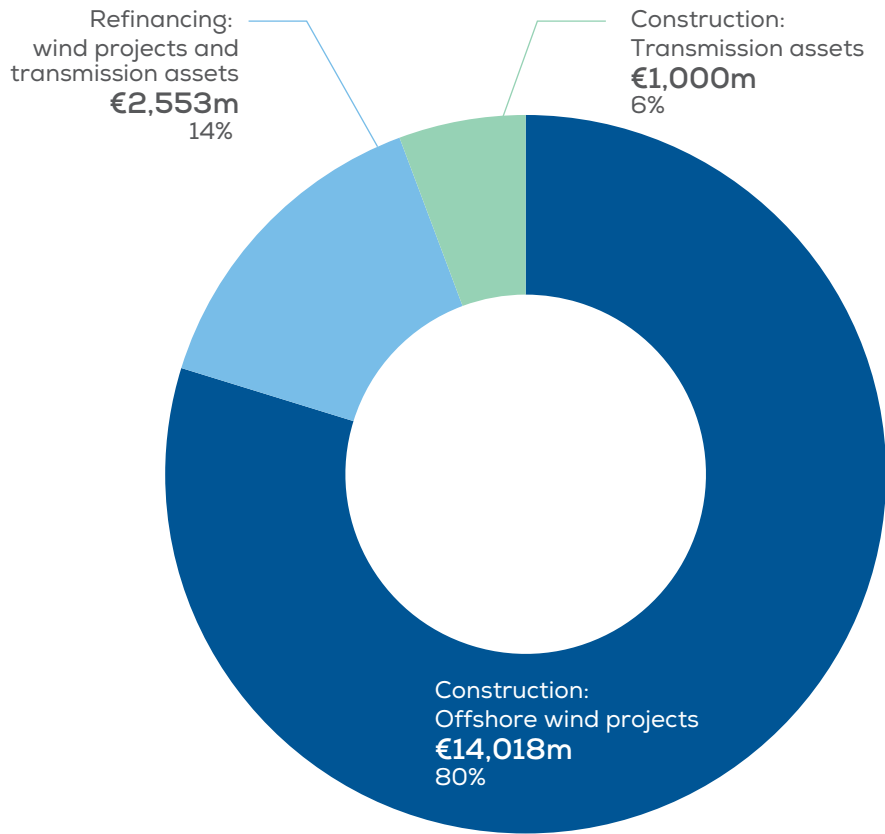
TABLE 3

Investments in offshore wind farms H1 2016

COUNTRY	TOTAL INVESTMENT REQUIREMENT (mEUR)	FINANCED NEW GROSS CAPACITY (MW)
Denmark	999	400
Finland	121	40
Germany	2,529	835
UK	10,369	2,502
Total	14,018	3,777

In addition to the investments in new wind farms, the first half of 2016 also saw €2.5bn in refinancing transactions and €1bn committed for the construction of transmission. The sector generated a total investment of €17.5bn.

FIGURE 5
Investments in the offshore wind sector in H1 2016 (mEUR)



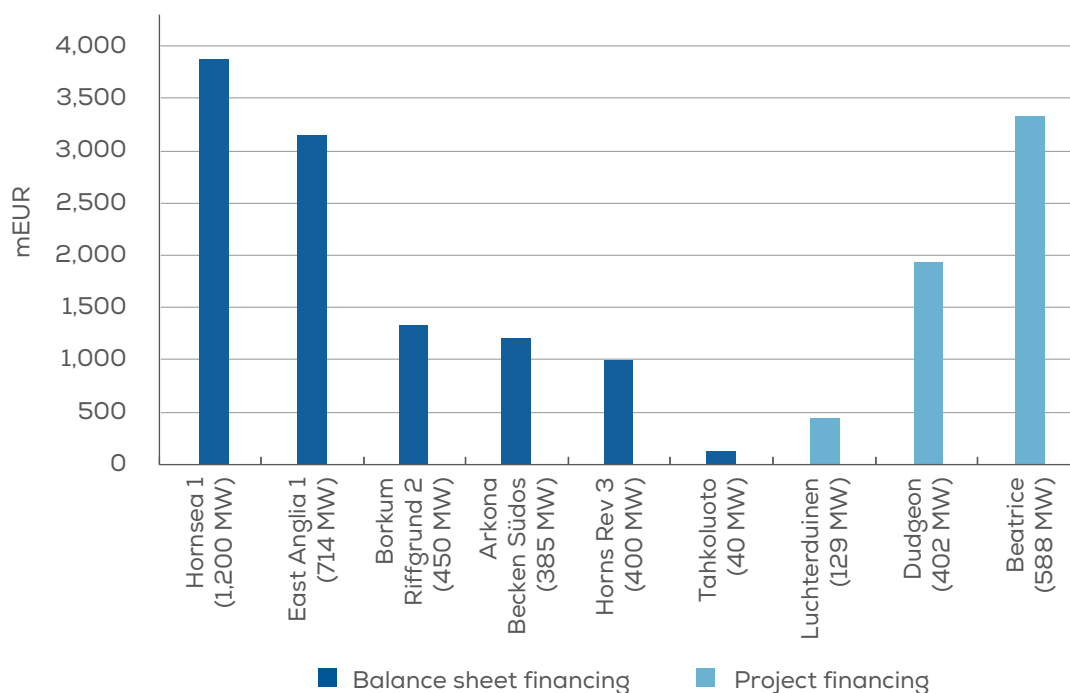
Source: WindEurope

DEBT FINANCE

Power producers continue to be substantial providers of equity capital. Very few power producers have so far made use of non-recourse finance structures, and this trend has continued throughout 2016. Consequently, the markets were heavily dominated by balance sheet financing.

FIGURE 6

Projects reaching FID in 2016 H1



Source: WindEurope

Project finance has remained an important tool given the scale of the offshore wind sector. This is the case in particular for independent power producers, new market entrants and refinancing transactions. Non-recourse debt stood at €4.7bn, with the successful closing of Beatrice (588 MW) offshore wind farm, and the refinancing of Luchterduinen (129 MW) and Dudgeon (402 MW) offshore wind farms.

Financial markets have supported the offshore wind sector through a variety of investors and financial structures. More commercial banks are entering the sector, with larger financing volumes. New lenders also include institutional investors, who have been attracted to the debt side in the recent years. While liquidity levels have been on the rise, debt-to-equity ratios have remained in the margins of 70:30, indicating no appetite for more aggressive structures.

Government-supported banks, export credit agencies and multilateral banks remain important, in particular for larger greenfield projects. Offshore wind projects have featured predominantly in the European Investment Bank (EIB) financing, backed also by the European Fund for Strategic Investments (EFSI). Notably in the first half of 2016, the EIB alone provided €674m for the financing of Beatrice (588 MW) offshore wind farm.

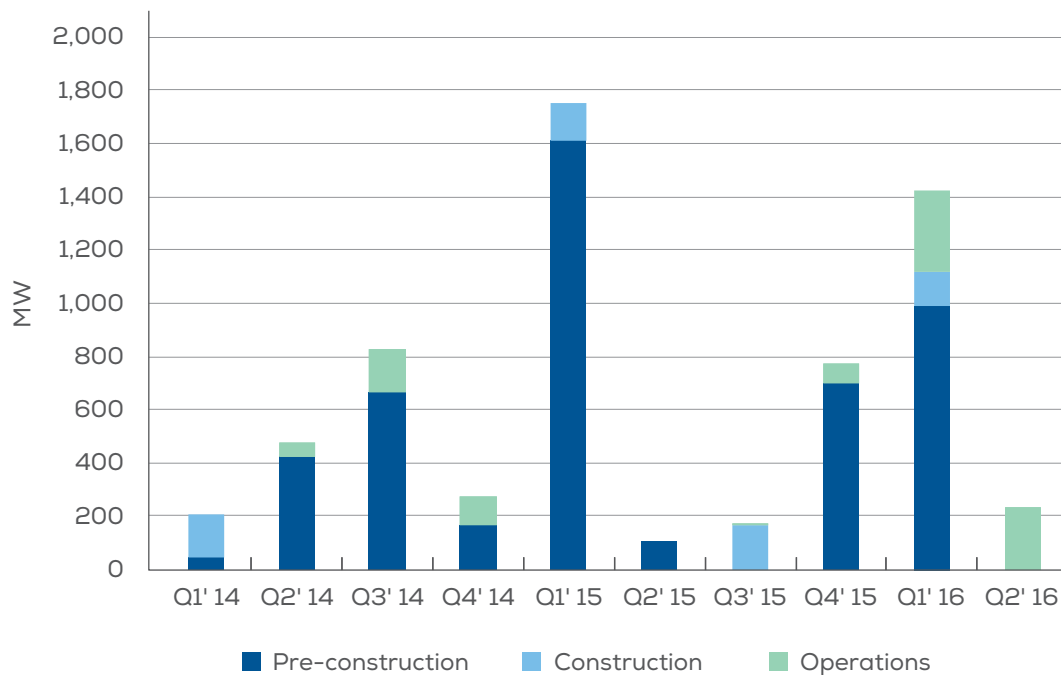
EQUITY FINANCE

Equity markets have remained active, with two main factors at play: the corporate asset disposal of power producers with a view to freeing up capital, and the need to refinance projects in operation. In total, 1.6 GW have been divested during the first half of 2016, the majority during pre-construction phase.

Transactions during this period have reflected a diversifying equity mix with both corporate, financial and in particular overseas investors. Notable deals include:

- China Three Gorges' acquisition of an 80% stake in Meerwind (288 MW) offshore wind farm
- SDIC Power of China's acquisition of Repsol's offshore wind business and consequently a 100% stake in Inch Cape (784 MW) offshore wind farm and a 25% stake in Beatrice (588 MW) offshore wind farm
- PKA and KIRKBI A/S jointly acquiring a 50% stake in Burbo Bank Extension (258 MW) wind farm

FIGURE 7
Merger and acquisition activity 2014 – 2016 (in MW)



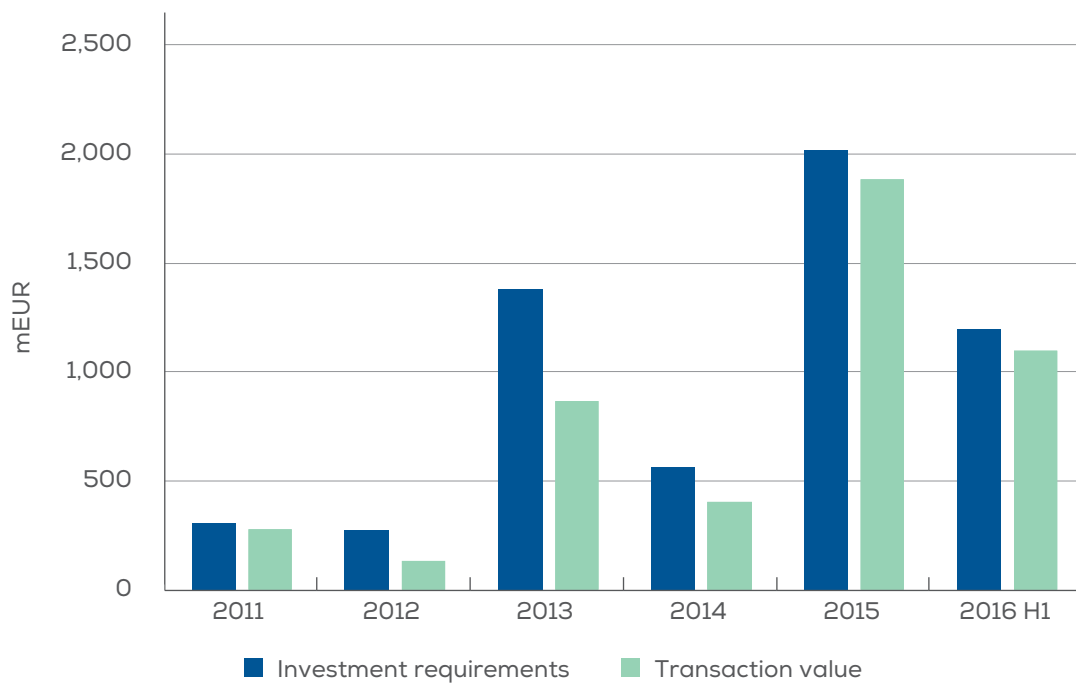
Source: WindEurope

TRANSMISSION ASSETS

Investments in transmission assets in the first half of 2016 stood at €1.2bn. In June 2016, TenneT issued its second consecutive €1bn green bond. The proceeds will be used to finance four offshore wind transmission projects in the German North Sea for a total capacity of 3.5 GW. Earlier this year, Westermost Rough transmission assets reached financial close in the UK.

FIGURE 8

Investments in transmission assets (mEUR)



Source: WindEurope

OUTLOOK FOR H2 2016 AND 2017

TABLE 4

Offshore wind project pipeline and investment requirement

PROJECT PIPELINE	COUNTRY	TOTAL INVESTMENT REQUIREMENT (mEUR)	CAPACITY (MW)
Rentel Offshore Wind Farm	Belgium	1,250	300
Norther Offshore Wind Farm	Belgium	1,300	370
Deutsche Bucht Offshore Wind Farm	Germany	1,162	252
EnBW Hohe See	Germany	1,500	492
Total		5,212	1,414

WindEurope expects €5.2bn and 1.4 GW in Final Investment Decisions (FIDs) by June 2017. This compares to €10bn and 2.2 GW for the same period last year. Transactions that are approaching financial close are Rentel (300 MW), Norther (370 MW), Deutsche Bucht (252 MW), EnBW Hohe See (492 MW).



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