HSBC Global Research

Offshore Wind

New Giants of the Sea by 2021

EQUITIES
INDUSTRIALS

Europe

- This report is an extract (with updates) of *Offshore Wind: New Giant of the Sea published on 21 February 2018*
- Market growth is supported by high tendering activity in 2018/19. Turbine suppliers are beginning to step up to the challenge of upscaling for the future
- We look at the supply chain repercussions of going 'ex-subsidy' and provide read-across to offshore oilfield services

Sean McLoughlin*
Analyst
HSBC Bank plc
sean.mcloughlin@hsbcib.com
+44 20 7991 3464

Tarek Soliman*, CFA
Analyst
HSBC Bank plc
tarek.soliman@hsbc.com
+44 20 3268 5528

Adam Dickens*
Analyst
HSBC Bank plc
adam.dickens@hsbcib.com
+44 20 7991 6798

** Employed by a non-US affiliate of HSBC Securities (USA) Inc, and is not registered/ qualified pursuant to FINRA regulations*

Better visibility on growth

Offshore wind in our view remains the most attractive part of the wind sector. We see policy visibility post 2025 in Europe and rising commitments in markets such as Taiwan and US as anchors for robust growth. In MW terms, offshore wind rises to 10% of global wind installations by 2019e and to 16% by 2025 from 4% in 2016. In USD terms, we forecast 10% market CAGR reaching USD48bn by 2025e. 13-14GW of tenders in 2018/19 should support near-term strength.

Going solo – the end of subsidies in sight

We are confident the challenges of upscaling offshore wind turbines to the 13-15MW scale implied in an ex-subsidy world are not insurmountable. On 01 March GE announced a USD400m investment plan to develop and deploy a next-generation 12MW offshore wind turbine by 2021, effectively firing the starting gun on the next-generation turbine race. This development not only drives better longer-term visibility for the industry, but arguably validates the ambition of leading developers prepared to bid aggressively in order to secure zero subsidy projects. Turbine competitors Siemens Gamesa (SGRE) and Vestas need to accelerate turbine upscaling plans to avoid losing market share to GE post 2020, in our view. Across the supply chain for offshore wind, we see participants adopting a vertical strategy as a way of offsetting pricing pressure as equipment and project sizes grow in scale.

The implications for oilfield services

We also look at the read-across for oilfield services (OFS). The growing offshore wind market offers a more diverse addressable market, and one not driven by oil prices, but its small relative size (we estimate USD10bn by 2025, approximately 20% of a USD50bn global market) and competitive dynamics (more capabilities going 'in-house') means we think don't think it will be a game changer for OFS.

Disclosures & Disclaimer

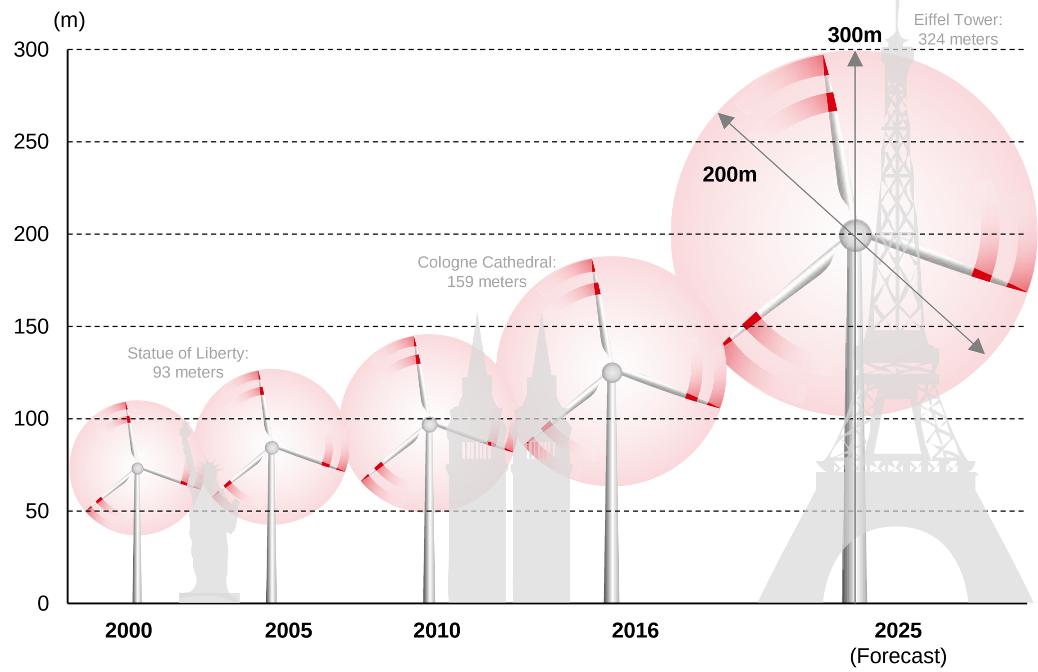
This report must be read with the disclosures and the analyst certifications in the Disclosure appendix, and with the Disclaimer, which forms part of it.

Issuer of report: HSBC Bank plc

View HSBC Global Research at:
https://www.research.hsbc.com

Super scaling for the future

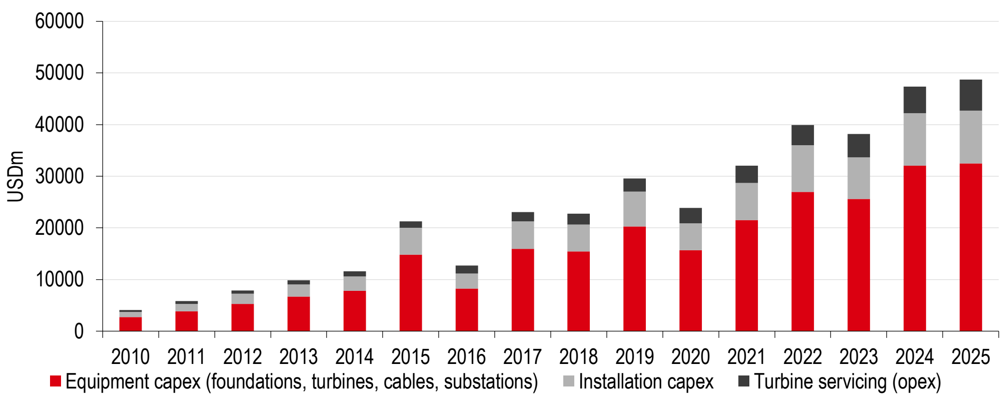
Super scaling: 13-15MW offshore wind turbines to drive the subsidy free era by 2025



	2000	2005	2010	2016	2025 (Forecast)
Power:	2.0 megawatts	2.3MW	3.6MW	5.0MW	13-15MW
Overall height:	100 meters	130m	142m	185m	300m
Rotor diameter:	76 meters	90m	120m	145m	200m and more

Source: German Offshore Wind Energy Foundation, GWEC, BNEF, HSBC estimates

Offshore wind market rising to USD48bn by 2025, 10% CAGR from 2017



Source: HSBC estimates

Sector drivers

- As the offshore wind industry embraces subsidy-free projects by 2025, the turbine upscaling challenge is next; significant but feasible
- Firm commitments in US, Taiwan, Korea to drive rapid international expansion and provide an extra-European growth boost post 2020
- High consolidation and high growth are offsets against supply chain pricing pressure; verticalisation strategy can protect OEM margins

Sector outlook

European demand outlook robust; Asia and US markets stepping up

European offshore wind volumes stabilising >5GW by 2022e, US and Taiwan driving ex-EU growth post 2020

We have greater confidence in the longer-term growth prospects for offshore wind as costs continue to fall. Currently we see annual European volumes stabilising above 5GW by 2022e with demand spread across 10 markets. In June 2017 Germany, Denmark and Netherlands issued a joint commitment to install 60GW in 2020-30, implying 6-10% CAGR in Europe alone to 2030.

China remains the largest market ex-Europe and we expect annual installations in China to rise above 3GW from 2023e. The US and Taiwan are increasing commitments to Offshore Wind and, until local supply chain builds up in either country, our expectation is that the first projects (post 2020) will be supplied from Europe. Overall we forecast the global market for offshore wind to reach USD48bn by 2025e, growing at a 10% CAGR from 2017.

Europe moving to zero subsidy

Zero subsidy bids in Germany and Netherlands, offer a first glimpse of the end game for offshore wind

Leading offshore wind developers Ørsted along with EnBW sent out a clear message to the offshore wind industry in April 2017 by winning the first German offshore wind tender with zero subsidy bids on 1.5GW of projects due for completion by 2025. By bidding for zero subsidy, these utilities will forfeit the stability and earnings visibility of a fixed price contract, until this point a core attraction for investment returns in wind and solar projects. By accepting to receive the market price, returns on zero subsidy projects are thus highly dependent on the power price. Historically, offshore wind projects (like other renewables) were all offered fixed price contracts. Exposure to market prices was thus seen as a bad thing as it makes profits more volatile. The offshore wind industry's rising confidence is a sign of maturity, as it now claims to be cheap enough by 2025 to no longer rely on fixed pricing.

A zero subsidy tender in the Netherlands for 700MW held in December 2017 underpins the idea that the April 2017 German tender was not a freak result, rather the first glimpse of offshore wind's end game: to be no longer reliant on subsidy support. An 05 February 2018 Bloomberg article quotes Uwe Knickrehm, managing director of the German offshore wind federation AGOW, saying that with "massive interest" in the second German offshore wind tender in April 2018, "it's a fair bet that some big players will follow the precedent" from 2017 and bid zero subsidy.

A clear mandate for the supply chain

We think this trend reflects the industry's growing confidence in huge cost savings through the supply chain and the scale up to the next generation of turbines by 2025. This ultimately underpins the longer-term attractiveness and competitiveness of offshore wind.

The supply chain now has a clear mandate: to develop 13-15MW turbines by 2025 and to drive down costs throughout the supply and installation process in order to drive LCOE firmly below EUR50/MWh. The rising pipeline in 2025 we believe is a clear incentive for the industry to drive progress.

A 13-15MW turbine – when and not if

A 13-15MW turbine would require 100+m blades, which we believe is technically feasible

In our conversations with offshore wind supply chain players we have noted a broad agreement that a 13-15MW turbine range based on 100+m blades will be developed as this is physically possible, so largely a matter of scale and capital. Vestas has launched a 9.5MW variant of its V164 turbine (based on 80m blades), currently the standalone most powerful turbine. We believe this is likely the last iteration of the V164 platform, which will require longer blades to drive higher power ratings.

Siemens Gamesa (SGRE) has launched a new 8MW turbine (the SG-8.0-167) based on 81.5m blades and has said it is working on a new blade design to take power rating potentially to 10MW and above. SGRE has integrated Adwen, a JV between Gamesa and Areva, into its offshore business. Adwen has in development an 8MW turbine based on an 88m blade, which is the longest blade produced. SGRE could adapt this longer blade (10% longer than the V164 blade, offering the potential for over 20% higher power) to its next generation turbine. Senvion is pressing ahead with a 10+MW turbine prototype by 2020 in partnership with EnBW.

Verticalisation is the new strategy – a headwind for installers?

More suppliers 'in-housing' installation to adapt to cost pressures could crowd out Oil Field Services players

The supply chain is likely to face cost pressures in meeting Ørsted and other developers' demands. We note a trend toward equipment providers driving more installation work in order to generate higher revenues. Siemens adopted a turnkey turbine + foundation + EPC 'wrap' for the 497MW Hohe See project. Prysmian is driving a new turnkey cable offering (export cable + inter-array cables + installation) in an attempt to leverage its market leadership in subsea cables.

This could prove in our view a headwind for installers and subsea technology providers as equipment manufacturers look to drive significant cost savings by controlling a greater proportion of the equipment installation. Moves by equipment suppliers into the installation space could further squeeze the incentives and crowd out the oilfield services players from entering meaningfully into the offshore wind installation market, which itself is only moderate in size versus oil & gas. We estimate an offshore wind installation market of around USD10bn by 2025, which is unlikely to prove material enough to offset the structurally smaller subsea/umbilicals market we expect to see over the medium term.

Foundations – monopiles continue to dominate for now

Floating foundations is still in R&D phase and not cost effective

Each offshore wind turbine is anchored to the seabed on fixed foundations. The firm favourite among foundation types, with an 87% share by units installed in 2017 is the monopile. This is a huge tubular steel structure up to 8m in diameter and up to 100m in length which is hammered vertically into the seabed to form the base on to which the turbine is subsequently mounted. We expect the monopile will continue to dominate to 2020e. Longer-term, new markets such as West coast US and Japan that require floating foundations may drive cost competitive floating structures. Floating foundations are proven structures in O&G and oil majors are more comfortable with the technology than even leading offshore wind developers such as Ørsted. Statoil has a number of floating demos and Aker Solutions on 07 February 2018 entered into a partnership with floating foundation specialist Principle Power.

We highlight that floating is not cost competitive and is still in the R&D phase (current cost target for floating is EUR120/MWh by 2025) but further progress on floating foundations may prove a longer-term threat for monopile suppliers such as Sif group.

Becoming cost competitive

- Technological advancements and declining prices driving robust outlook; we expect 13-14GW of tenders to be declared in 2018/19
- Offshore wind expanding rapidly beyond Europe as US, Taiwan, Korea make firm commitments
- Dawn of ex-subsidy era is within sight; the supply chain is confident of meeting the challenge of upscaling to 13-15MW turbines by 2025

Declining cost and competitive bidding drive robust global outlook

3.1GW commissioned in Europe in 2017 (+50% y-o-y) led by UK and Germany

2017 was yet again a remarkable year for offshore wind which witnessed falling prices and increased installations. In Europe 3.15GW of new capacity was commissioned in 2017 led by installations in UK and Germany implying y-o-y growth of ~50%. Cumulative installations of offshore wind reached 18.7GW by YE 2017 (of which 84% is in European waters). Assuming an average uptime (load factor) of 40%, we estimate offshore wind can generate enough energy to power 6m homes.

2017 was also the year which introduced zero-subsidy bids. 1.3GW of capacity received zero-subsidy bids in Germany in April 2017 followed by a 700MW zero-subsidy auction held in the Netherlands in December (winning bids expected in Q1 2018). The low prices are a testament to the improvement in technologies related to offshore wind and will certainly strengthen its long term outlook, but it also increases the pressure on supply chain participants to adapt quickly to the changing environment. Significant consolidation events such as the merger between Siemens WindPower and Gamesa, and Prysmian's acquisition of General Cable have been driven in part, we believe, with an eye on securing leadership and cost competitiveness in offshore wind.

European players can drive extra-European growth phase

Budding markets like Taiwan and US have increased their targets for offshore wind installations

To date the offshore wind industry had been concentrated in the North Sea and the North Atlantic. Countries outside Europe have also shown increasing interest in and commitment to offshore wind. Though China remains a leader in the APAC region with an installed capacity of ~ 2GW, other countries such as Taiwan and the US – despite significant geographic differences both with good conditions for offshore wind – have accelerated their timelines and increased their targets for offshore wind installations.

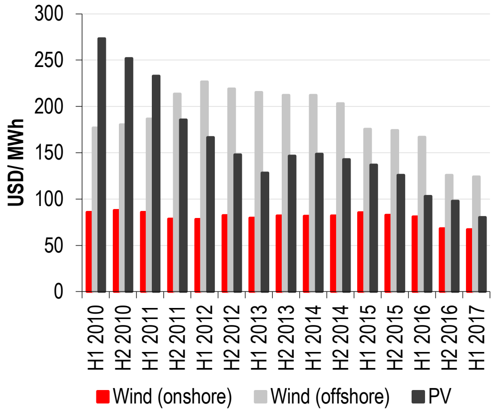
Offshore wind in markets outside Europe is still at the developing stages. A lot of technological improvements are still in the pipeline and the expertise of European players will be crucial in developing the technology around the globe. European supply chain players have expressed significant interest in developments in APAC and USA and we expect will lead the charge into new markets.

Moving towards a zero subsidy era

Lower prices are a positive for the industry in the long term but this has put pressure on supply chain participants to reduce costs

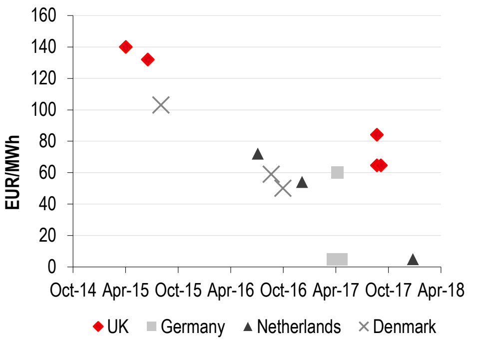
Auction prices have been on the fall across Europe and have now comfortably settled in the EUR50-85/MWh range. In April 2017, Ørsted and EnBW placed a bid of zero for 3 projects in the German auctions implying they will only be eligible for the wholesale electricity price without any subsidy. On similar lines, the Netherlands also held a subsidy free offshore wind auction for 700MW capacity, won by Vattenfall in March 2018. The rapid decline in offshore wind levelized cost of electricity (LCOE, defined as the cost to build and operate a power-generating asset over its lifetime divided by the total power output of the asset over that lifetime) is driven by increased competition among OEMs, larger projects and improvement in technology. Though we believe lower prices are a positive for the industry in the long term, rapid declines have put pressure on supply chain participants to reduce costs.

Offshore wind LCOE falling drastically



Source: BNEF

Offshore wind auction bids in the EUR50-85 MWh range; 'subsidy free' to receive pool price



Source: BNEF, Zero subsidy bid result in Netherlands expected to be announced in March 2018

The driving rationale behind the zero subsidy bids in Germany were expectations of higher wholesale power prices by 2024/25 which is the deadline for commissioning of these projects. Developers are taking the view that developments in technology would further decrease their costs and the prevalent wholesale power prices would be enough to cover their expenses and earn a decent return.

The 3GW capacity in the second CfD auction in UK held in September 2017 was awarded in the range of GBP 58-75/MWh, ~50% cheaper than the first round. The UK government has also allocated a budget of GBP557m for future CFD auction rounds focussed on 'less established technologies including offshore wind. The budget is expected to be utilized in the next 2 rounds of CFD auction to be held in 2019 and 2021. We have identified ~17GW of projects to come online between 2018-26. Prices in countries like Denmark, Netherlands and Germany are lower than UK due to government concessions in transmission costs and due to different auction rules.

France is expected to announce results of a 750MW tender in 2018, the pre-selected bidders for which was announced in May 2017. France had established a national offshore target of installing 0.5GW by 2018 and 3GW by 2023. Projects awarded in the first 2 rounds of tenders in 2012 and 2014 for 3GW of capacity with FiTs in excess of EUR200/MWh have been delayed due to legal issues and are now expected to be commissioned post 2020. The government is now aiming to simplify the permitting process for offshore wind projects to avoid unnecessary delays as seen in the first two tenders.

Results of the first 700MW subsidy free auction held in Netherlands is expected to be announced in March 2018. The second major offshore wind auction in 2018 will be conducted by Germany for a capacity of 1600MW in Q2 2018. Germany has set a national target of 15GW of offshore wind capacity by 2030 of which ~5GW has been commissioned by YE 2017.

13-14GW of upcoming offshore wind tenders in 2018/19

Country	Auction type	Expected date	Tendered volume (GW)	Notes
Netherlands	Capacity auction	Q1 2018	0.6-0.8	Zero subsidy auction
Germany	Transitional auction	Q2 2018	1.6	
France	Tender	Q2 2018	1.3	
Taiwan	Capacity auction	Q2 2018	2.0	
USA	Request for proposal	2018/19	0.8	New York
Taiwan	Selection for FiT	2018/19	3.5	
UK	CFD round 3	Q2 2019	3-4*	
Total			**12.8-14.0**	

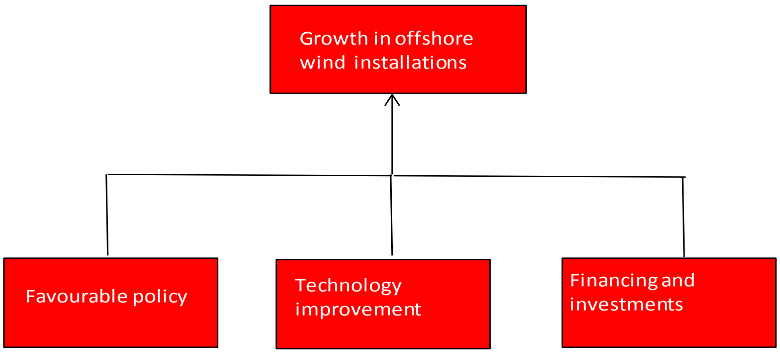
Source: BNEF, HSBC, *HSBCe

Sharp drops in LCOE of offshore to continue

Policy, technology and availability of financing should spur offshore wind to become cost competitive

We believe a mix of favourable policy, technology development and greater availability of financing should spur offshore wind to become fully cost competitive with conventional power generation over the next decade. Despite President Trump's decision to withdraw the US from the Paris Climate Change agreement (COP21), we do not believe that the outlook for offshore in the US has suffered a setback. This is partly because offshore projects in the US are decided by individual states and not centrally by the government, partly because offshore's reliance on energy policy-dictated subsidies is shrinking fast.

Key drivers in growth of offshore wind



Source: HSBC

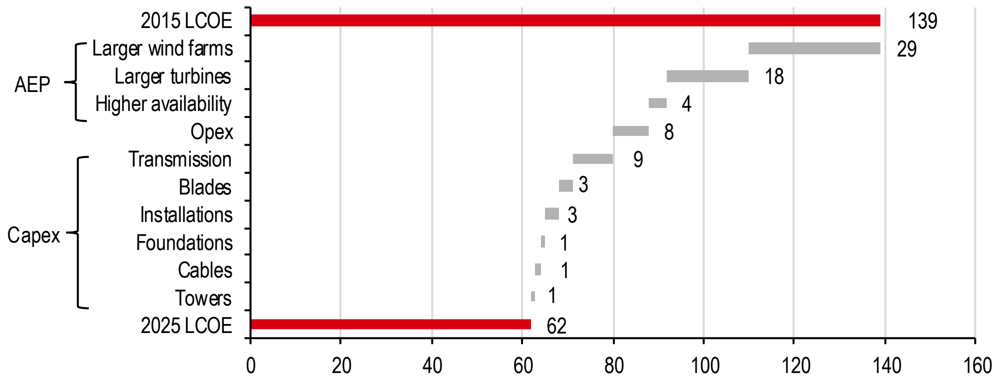
MAKE Consulting calculates the LCOE at EUR139/MWh in 2015. In H1 2016, it estimated a 44% decline in the average LCOE to EUR83/MWh by 2025 as the result of economies of scale, technology innovations and a maturation of the supply chain. MAKE's 2025 scenario assumes 10MW turbine ratings, a 550MW wind farm size located in water depths 50 km from shore.

Ørsted's expectation of 13-15MW turbines by the mid-20s are achievable given technical advances

It now appears likely, given the technical advances announced recently in monopole design, industry concentration (Siemens-Gamesa), the level of recent bids, and Ørsted's expectation of 13-15MW turbines by the mid-20s, that significantly sharper cost reductions are achievable. We estimate that an LCOE of EUR60-65/MWh is feasible by 2025 with a EUR74-79/MWh from 2015 split as follows:

- Energy **production efficiency**:
  - EUR28-30 larger wind farms (larger for 1GW+ units),
  - EUR17-20 larger turbines,
  - EUR3.5-4.0 higher availability,
- EUR7-9 opex for scheduled and unscheduled **maintenance**,
- EUR8-10 **transmission**,
- **Capex** reduction:
  - EUR2.5-3.0 capex on blades, EUR2.5-3.0 capex on installation, EUR3.0-3.5 split equally between capex on foundations, cables and towers.

Breakdown of cost reduction contributions on LCOE, 2015-2025e (EUR/MWh)



Source: MAKE (2015 LCOE), HSBC estimates; Note: AEP is annual energy production.

Demand outlook

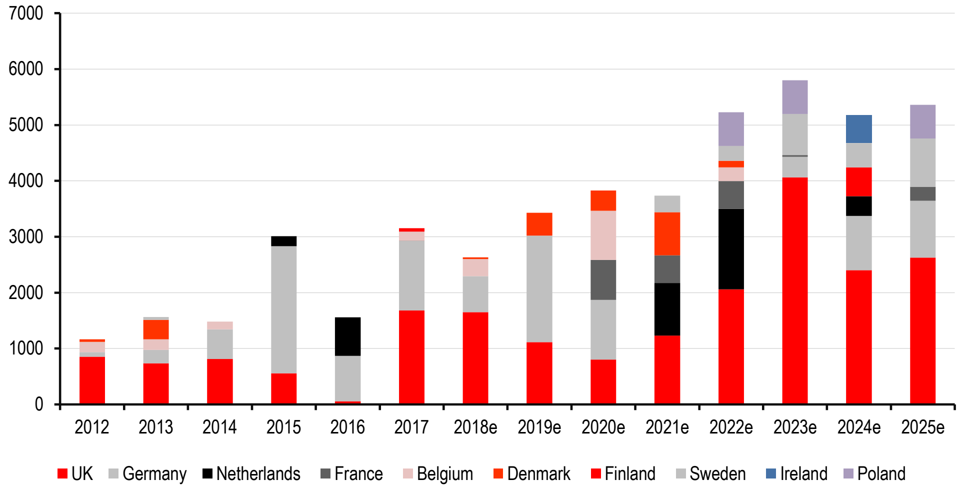
- Policy remains supportive, with 2030 targets driving better visibility
- US market will take off despite lack of federal support
- Growth outside Europe becoming more important post 2020

Improving visibility to 2025e in Europe

Europe installations 15.7GW by YE-2017, growing 3.6x by 2025e

Europe is the largest offshore market with cumulative installations reaching 15.7 GW by YE-2017, 84% of global offshore wind installations. Assuming an average uptime (load factor) of 40%, we estimate the European installed base of offshore wind can generate enough energy to power 5m homes. We have identified 77 projects adding up to 41GW of gross potential offshore wind installation pipeline in Europe alone (37GW of risk adjusted pipeline, giving all projects at the early planning stage a 50% chance of completion) to 2025, which equates to a 3.6x increase in the installed base.

Risk adjusted European offshore wind installations by country (MW)



Source: 4Coffshore, Bloomberg New Energy Finance, MAKE Consulting, HSBC estimates

We expect the pace of installations to accelerate to 2023, peaking in 2023 at 5.8GW

In the above chart we show annual wind installations in Europe since 2012 and our offshore wind pipeline to 2025, split by country. Annual wind installations in Europe averaged 2GW in 2012-17. We expect the pace of installations to accelerate to 2023, peaking in 2023 at 5.8GW. The installation peak in 2023 is tied to large installations in UK and installation of first wind farm of 600MW in Poland. Our installation forecasts naturally tail off after 2023 as visibility on the existing pipeline of announced projects in existing markets remains limited. We stress this simply is a visibility issue rather than an expected downturn in the market and expect new tenders in existing markets and as well as new markets (such as France and Poland) to over time reshape this curve. UK, Germany, Netherlands and Belgium have all committed support to 2025 and some already have 2030 targets in place.

European offshore wind installation targets

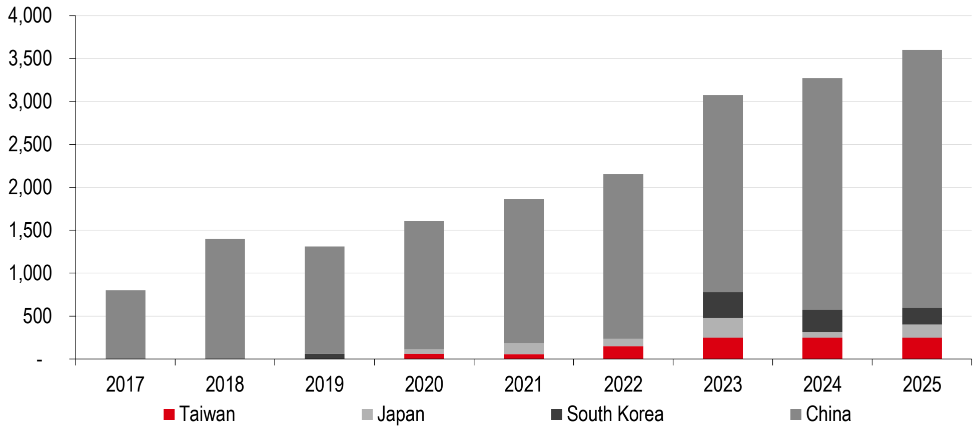
Country	2017 Capacity (GW)	Offshore wind targets	Support mechanism
UK	5.8	10 GW by 2020 and additional 10GW in 2020s	Contracts for difference(CfD)
Germany	5.3	6.5GW by 2020 and 15GW by 2030	Competitive tenders
Netherlands	1.1	4.45GW by 2023 and 11.5GW by 2030	Sustainable energy incentive scheme
France	0	0.5GW by 2018 and 3GW by 2023	Tender-based scheme
Belgium	0.7	3GW by 2023	Minimum price set by formula governed by LCOE

Source: Make Consulting

Offshore wind beyond Europe

APAC

Risk-adjusted APAC offshore wind installations by country (MW)



Source: 4Coffshore, Bloomberg New Energy Finance, MAKE Consulting, HSBC estimates

By YE 2017, APAC had ~2.3GW of cumulative installed offshore capacity and more than 95% of it lies in China. Offshore activity in the region has picked up pace over the past 2 years led by installations in China and supportive policy announcements in countries like Taiwan and South Korea. The offshore supply chain in the APAC region is still developing while local players are dominating in China, countries like Taiwan and Korea are being targeted by European OEMs and other supply chain participants like SIF Group.

APAC offshore wind targets

Country	Offshore wind targets
China	5GW by 2020
Japan	0.8GW by 2030
South Korea	10.6 GW by 2030
Taiwan	0.5GW by 2020 and proposed 5.5GW by 2025

Source: Make consulting

China is ranked number 3 in installed capacity globally with a strong pipeline

China

China currently has ~2GW of installed capacity out of which ~1.5GW was installed in 2016/17. It is ranked number 3 in terms of installed capacity globally and we have strong visibility on installations till 2021e due to large pipeline of secured and under-construction projects. Strong targets set by local government bodies and FiTs have been the primary drivers behind growth in the region. China has set a target of 5GW offshore in its thirteenth five year plan (2016-2020) wind by 2020 and FiTs are also expected to remain stable for at least a couple of years. 2.5-4MW turbines currently dominate the present installations and local players like Sewind are leading the market. European players have largely been unable to gain share in the Chinese market due to high barriers and strong bonding between the local OEMs and state utilities. SGRE is the only European OEM with sizeable presence in China due to its licensing deal with Sewind. For the next phase of installations, the local tier 1 OEMs are coming out with 5MW+ turbine variants which will be imperative to reduce LCOE and match reductions in tariffs post 2020.

Japan

Japan currently has 65MW of installed offshore wind capacity at YE 2017 and the national target for offshore wind is only 0.8GW by 2030. The primary reason for such a low target is the high LCOE of offshore wind, currently at EUR262/MWh. Developers have also shown concerns regarding low profitability and lack of clear regulations. Despite unclear policies and regulatory risks, Japan has a pipeline of 2GW, most of which are in early planning stages. Installations are expected to start post 2020 as government bodies provide a clear roadmap and simplify policies related to application and development of projects. The wind energy supply chain in Japan is mostly limited to local companies and foreign firms have largely stayed away from the market due to high preference for local firms and red tape bureaucracy.

Taiwan has ambitious targets for offshore wind development; 5.5GW of tenders in 2018

Taiwan

Taiwan currently has 647MW of installed onshore capacity while offshore wind development currently is at a very early stage but the Taiwanese government has set ambitious targets for offshore wind development. In late 2017, the government upgraded its 2025 offshore wind target to 5.5GW from 3 GW earlier which seems ambitious considering the lack of proper infrastructure to manage large installations. ~11GW of projects have already qualified to receive environmental permits. These projects will now compete for 5.5GW of offshore wind contracts, 3.5GW to be selected for the feed-in-tariff (FIT) and the rest to be awarded at an auction in May 2018.

European OEMs and utilities are taking significant interest in developments in Taiwan due to lack of local mature supply chain and supportive environmental conditions. European players in multiple parts of the supply chain have entered into agreements with local Taiwanese companies to explore present opportunities. SGRE is currently testing two turbines in Taiwan and Ørsted on 13 February 2018 received environmental impact assessment approvals for four projects in Taiwan, thereby securing exclusivity for 2.4GW of capacity. The next step is to secure grid capacity later in 2018, following which, subject to a final investment decision, investment could start on the first project in 2019.

Recent agreements in Taiwan by European companies

Company	Nature of agreement	Purpose
SGRE	Non binding MOU with Taiwan international ports	Development of potential manufacturing sites
Sif Group	Letter of intent with Century Wind Power	Examine opportunities for supplying foundations
Bladt	MOUs with CSBC and Century Wind Power	Fabricating jacket foundations and outfitting transitions pieces
GeoSea	Cooperation agreement with CSBC Corporation	Construction of offshore wind farms in Taiwan
Ørsted	New office in Taipei	Exploring opportunities in Taiwan and wider APAC region
	MoU with Century Wind Power	Developing substructure serial manufacturing works
	MoU with China Steel Corporation (CSC)	Manufacture and assemble underwater foundation substructures by 2020

Source: BNEF, Offshore wind Biz, Consult Make

Government aims to add around 53GW of renewable capacity by 2020

South Korea

The South Korean offshore market is also being driven by a strong push by the government to increase penetration of renewables in the power mix. A new renewable energy implementation plan by the government aims to add around 53GW of new renewable capacity by 2030 out of which 10.6GW is expected to be offshore wind. With only one demonstration project of 30MW with 3MW turbines, South Korea is much behind its peers in terms of technology. Local players will play a major role in developing competencies to ensure proper development.

USA

United States offshore wind plans

State	Offshore Wind Goals/Policies
New York	Long term plan to develop 2.4GW of capacity by 2030 via utility request for proposals (RFPs).
Massachusetts	Plans to build 1.6GW offshore wind by 2027 through utility RFPs.
New Jersey	The current goal is to develop 3.5GW of offshore wind capacity by 2030
Maryland	Outlined plans to subsidize offshore wind as part of state's renewable portfolio standard.

Source: BNEF, Bloomberg

We expect state-level incentives to drive demand in the US

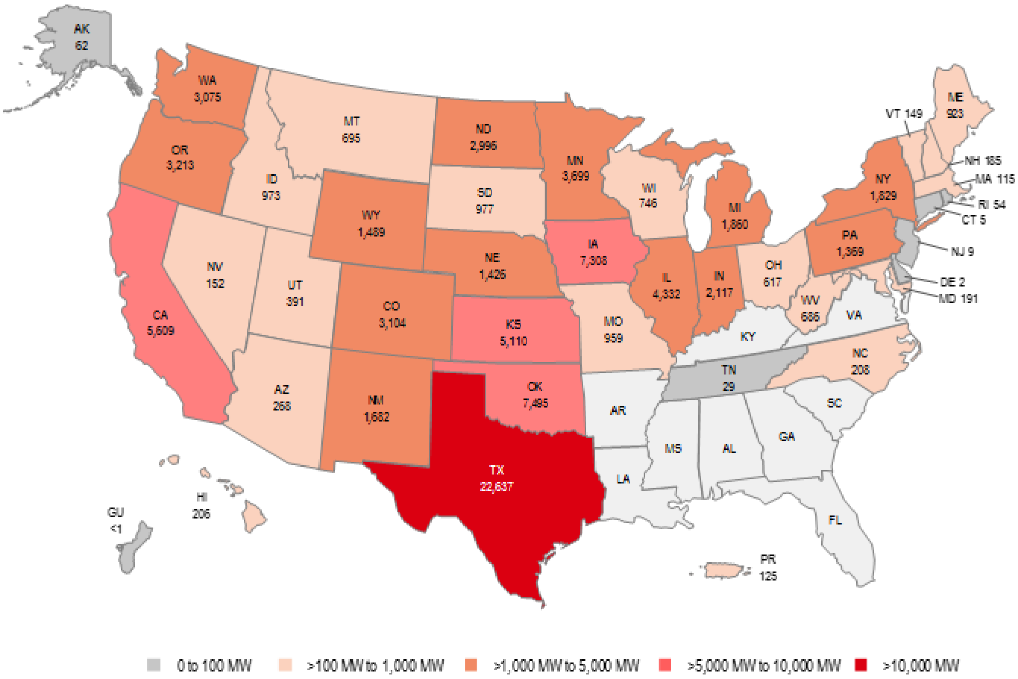
The US market will be concentrated in specific states due to the nature of the resource, so lack of federal support may be of limited impact. We expect state-level incentives to drive demand. Presently, only the states of New York, Massachusetts, Maryland and New Jersey have announced plans for developing offshore wind. Massachusetts currently requires utilities to sign long-term contracts 1600MW of offshore wind energy by 2027 and state utilities in December, 2017 invited request for proposals for 400-800MW of capacity. Bay State Wind, Deepwater Wind and Vineyard Wind have submitted bids and the next phase in the negotiation is set for April, 2018.The governor of New York has also announced firm plans to procure 800MW of offshore wind contracts in 2018 and 2019 as part of its long term plan to develop 2.4GW of capacity by 2030. The newly elected New Jersey Governor Phil Murphy has also accelerated state plans to develop offshore wind by announcing a goal of 3.5GW by 2030.

Offshore wind in US is currently at a very nascent stage, with little or no domestic manufacturing capabilities. Development will largely depend on imports from Europe or China in the medium term. European utilities and OEMs are also expressing great interest in Development in US for eg. MHI Vestas is testing its V164-9.5 turbine in US in an arrangement with Clemson University and as communicated in the recent capital markets day SGRE is also at advanced discussions with some utilities in the US. Cable OEM Nexans is investing in a US high voltage facility where it can participate in the US offshore market.

US offshore wind opportunity is greatest for northeast and west coast states

Source: US DOE

Low East Coast onshore wind volumes should drive favourable policy support for offshore wind



Note: installed onshore wind volumes by state in MW at YE 2017. Source: American Wind Energy Association

Other potential markets

Other countries like India & Australia are exploring the long term potential and feasibility of offshore wind

Countries like India and Australia are also exploring the long term potential and feasibility of offshore wind. The Indian power minister in December announced a 5GW offshore wind auction to be held in 2018 but the present focus is on conducting feasibility studies for the potential offshore zones at the coasts of Gujrat and Tamil Nadu. The survey work for a 200MW demonstration project at the cost of Gujrat is currently underway and we will get more clarity once the permits and plans for the same are in place. European OEMs with Indian presence and offshore wind competencies like SGRE, Vestas and Senvion would certainly benefit from an offshore boom in India. Australia is also conducting a feasibility study for a 2GW project near the windy Gippsland Cost and has also secured funding from a large green energy investment fund. Though the long term potential of markets like India and Australia seem solid, in the near-term they suffer from similar barriers like lack of planning process, policy support and proper supply chain.

Upscaling for 2025

- Cost competitiveness assumes a 26-58% power upgrade vs today's most powerful turbine by 2025
- Industry is confident of developing next generation turbines to enable truly low cost offshore wind power and GE has fired the starting gun
- GE is spending USD400m by 2021; peers need to increase spending

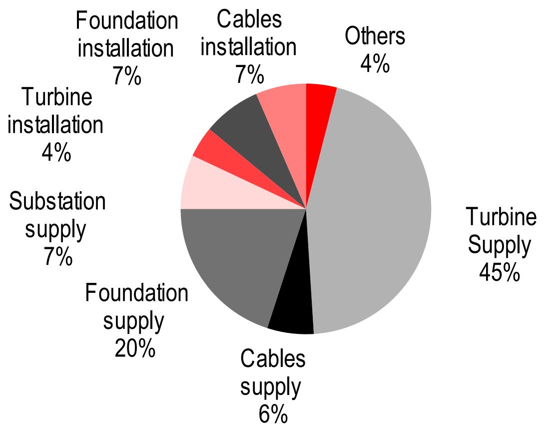
Technology advancements – bigger and better to reduce costs

Any sort of technology improvement relating to turbines or foundations can significantly decrease LCOE

Cost reductions are a key factor in driving offshore wind growth, together with the twin elements of favourable policy and financial conditions. Whilst the latter two elements seem to us to have remained largely in place, the pace and climate of cost reductions has accelerated to a remarkable degree. The industry is working to achieve cost reductions through the move to larger wind farms using larger turbines, greater standardisation of components and more developed supply chain infrastructure. Any sort of technology improvement relating to turbines or foundations can significantly decrease capex costs, and thus the cost of energy produced from an offshore wind farm. Based on average 2017 project data assumptions,

- The turbine makes up 45% of total project capex costs and the foundations make up 20%, whereas installation of both makes up a further 11%.
- Cable supply and installation (13%), substation supply (7%) and others (4%) make up the remainder of capex outlay in this example.

Breakdown of capital expenditure for offshore wind



Note: Using average 2017 project cost assumptions. Source Bloomberg New Energy Finance

Turbines account for half of offshore new-build costs; the industry's response to Ørsted: guarded yet constructive

A 13-15MW turbine needs 105-110m blades, a 20% extension on current best in class

Larger turbines drive better economics by decreasing the number of installations

Turbine OEMs have developed larger turbines to drive better economics as a lower number of installations has a positive impact on cost, despite requiring larger foundations and installation vessels. Larger turbines for developers are beneficial on the capex side (i.e. a lower number of turbines, foundations and inter array cables driving lower installation costs) and on the opex side. Ørsted highlights that the cost of servicing a turbine varies little with turbine size, therefore an 8MW turbine results in a 50% saving on opex compared to a 4MW turbine. This should lead to a significant saving over the turbine's 20+ year expected operated lifetime.

Overview of legacy and currently available offshore wind turbines by manufacturer

Turbine OEM		Turbine Model	
GE	GE4.1-113	GE 150-6.0	GE 220-12.0*
SGRE	SWT6.0-154	SWT7.0-154	SGRE 8.0 167
Vestas	V112-3.3	V164-8.0	V164-9.5
Senvion	6.2M-126	6.2M-152	10MW*

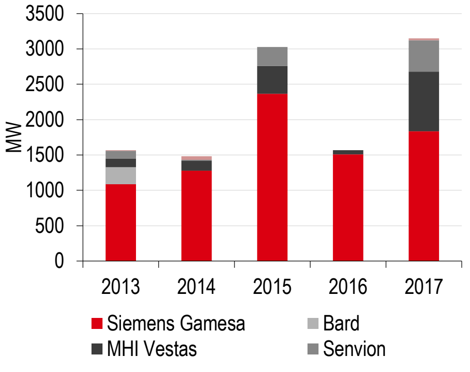
Source: company data, * in development phase

Turbine manufacturing sector: emergence of a leading triumvirate

Top three OEMs control two-thirds of global (ex-China) offshore wind market share

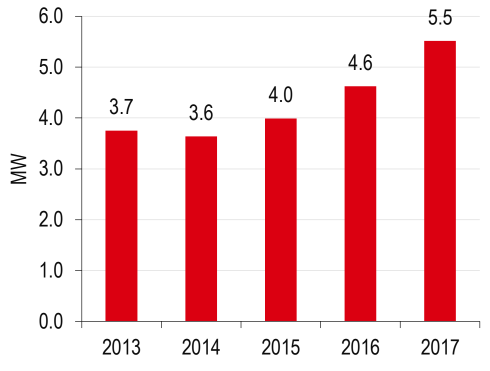
After the Gamesa-Siemens merger, a clearer Tier 1 / Tier 2 divide has emerged, in our view, with the top three suppliers controlling two-thirds of global (ex-China) market share (see charts below) in wind generation as a whole (onshore and offshore). Whilst smaller players have successfully developed strategies and products for individual markets or regions (e.g. Germany, Brazil, India), we believe that going forward scale will be an increasingly important determinant to remaining competitive globally across several markets in several continents. This may well lead to further consolidation in the supply chain.

European Offshore wind installations by OEM (MW)



Source: MAKE Consulting

Rising average turbine rating



Source: MAKE Consulting, HSBC

In justifying its Germany zero-subsidy winning bid, Ørsted 'throws down the gauntlet' to the OEMs

Ørsted has thrown down the gauntlet to the wind OEMs by predicting that 13-15MW turbines will be available for installation in 2024-25, and a key driver behind its zero subsidy bid for an offshore wind farm in Germany. On 01 March GE announced a USD400m investment plan to develop and deploy a next-generation 12MW offshore wind turbine by 2021, effectively firing the starting gun on the next-generation turbine race. The response from other wind OEMs has been guarded yet constructive.

- **Vestas:** launched the V164-9.5MW turbine in 2017, based on its geared V164 8MW design, still incorporating 80m-length blades but now including re-designed gearbox and upgraded cooling systems. Vestas is the preferred supplier with its 9.5MW machine for the 860MW Triton Knoll project in the UK, due for completion in 2022.
- **Siemens Gamesa:** launched the SG 8.0-167 DD in 2017, based on Siemens' gearless technology. We expect the machine to be market ready by 2020. The company has previously hinted at a 10MW turbine in development but has made no official statement.
- **Senvion**: announced it will have a 10MW+ prototype ready for 2019 and has partnered with EnBW and R&D institutes such as DTU, ECN and Fraunhofer IWES, among others, to jointly develop the turbine. According to the CEO, offshore wind will be subsidy-free in future.

Clues to the next generation from Denmark

Evidence of the next generation of turbines can be found in Denmark, where the prototypes of the current crop of 7-8MW turbines were tested. In March 2017 the Danish Government approved the expansion of the national wind turbine test centres in Østerild and Høvsøre, adding two test sites in each location. After expansion, the Østerild centre will provide test facilities for blades longer than 100 metres and will allow the testing of turbines up to 330m in height. By comparison, the world's longest blade is currently 88m, produced by LM Wind for Adwen's 8MW offshore prototype. SGRE has integrated Adwen, a JV between Gamesa and Areva, into its offshore business.

Understanding huge offshore wind turbines: a technical primer

The average annual power rating for turbines connected to the grid over a particular year has risen sharply after previously stabilising for several years:

- below 1MW in 1998,
- around 2MW in 2000-03
- around 3MW in 2005-10
- around 4MW in 2012-15
- around 5MW in 2016
- over 6MW in 2017e.

Ørsted's recently-opened Burbo Bank Extension offshore plant off Liverpool is the first to use 8MW turbines, provided by Vestas. At 195m from sea level to blade tip and 164m rotor diameter, each turbine (at 187m height) is taller than the 180m Gherkin building in London and has a swept area larger than the London Eye. It uses blades each of 80m length and 35t weight.

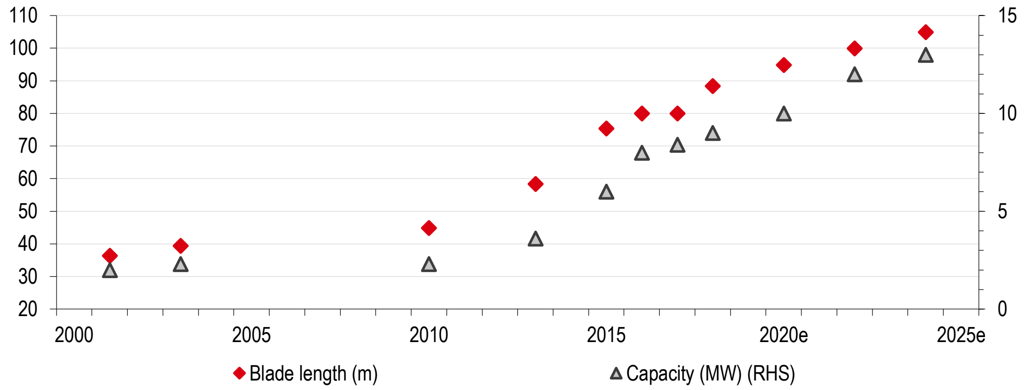
Extended blade length is key

The key development step has been in blade length, as this is one of the key metrics that governs the power output potential of a turbine. According to turbine manufacturer announcements quoted in Ørsted's offering circular, 26 May 2016, the diameter of wind turbine rotors is likely to reach 180m by 2020e, from 120m in 2011 and double the 90m of 2005. GE is targeting a 220m rotor diameter for its proposed 12MW turbine.

We look in detail at the current turbine class in order to assess how realistic is the rapid step up to 15MW.

- The power rating of a turbine is a function of average wind speed and the swept area, which in turn is a function of the length of the blade.
- A blade of length *r* will generate a swept area $A = \pi r^2$. A 10% increase in blade length will thus increase the swept area by over 20%.
- The formula for a turbine's available power rating is $P = (0.61)\ A\ v^3\ C_p$ or $= (1.92)\ r^2\ v^3\ C_p$, where *v* is the wind speed (power rating is even more sensitive to wind speed than to blade length) and C_p is the power coefficient.
- The theoretical maximum value for power efficiency of any design of wind turbine is 0.59 but in practice this varies between 0.35-0.45. The new Vestas 9.5MW turbine, however, extends this maximum value to 0.47, we estimate, as we discuss in the upcoming paragraphs. The power coefficient is a function of engineering requirements of a wind turbine - strength and durability in particular. The coefficient is turbine-specific and can be improved by optimising the design and performance of individual components (e.g. gearbox, bearings, generator, power electronics).

Rapid increase in turbine power ratings driven by longer blades



Source: Company data, HSBC estimates

How did Vestas upgrade the V164 from 6MW to 9.5MW?
Vestas launched the V164 in 2010 as a 6MW turbine and has since increased the power rating to 8MW (now installed at Burbo Bank extension in the UK), to 8.4MW (for Ørsted's Borkum Riffgrund 2 project) and up to 9.5MW, launched in 2017. Given that the blade length was frozen at 80m (hence the 164m diameter of the V164 swept area), the key variables are power coefficient and wind speed. We compare these in the sensitivity table below.

Optimisation gains: breaking the 0.45 efficiency barrier
Vestas' initial rating of 6MW may have simply been conservative as the company raised this to 7MW after initial testing. The 8MW range is achieved through a higher power coefficient, which would be driven by turbine improvements during the development phase. In our view the assumption of wind speeds has also increased, particularly for the 9.5MW upgrade. A 9.5MW rating is achievable at a coefficient of 0.45 (at the top end of the practical range) and an average wind speed of 11.8m/s. But we think that, with the upgrading of the gearbox and cooling system, the 9.5MW optimised turbine will achieve higher efficiency with a co-efficient of 0.47, we estimate. This remains some 20% below the theoretical maximum value for power efficiency of any wind turbine, mentioned above, of 0.59.

Improved product design and higher wind speeds driving Vestas V164 power rating increases

	average wind speed (m/s)								
Power coefficient, Cp	**10.0**	**10.3**	**10.5**	**10.8**	**11.0**	**11.3**	**11.5**	**11.8**	**12.0**
0.35	4.3	4.7	5.0	5.4	5.8	6.2	6.6	7.0	7.5
0.37	4.6	4.9	5.3	5.7	6.1	6.5	7.0	7.4	7.9
0.39	4.8	5.2	5.6	6.0	6.4	6.9	7.3	7.8	8.3
0.41	5.1	5.5	5.9	6.3	6.7	7.2	7.7	8.2	8.8
0.43	5.3	5.7	6.2	6.6	7.1	7.6	8.1	8.6	9.2
0.45	5.6	6.0	6.4	6.9	7.4	7.9	8.5	9.0	9.6
0.47	5.8	6.2	6.7	7.2	7.7	8.3	8.9	9.5	10.1

Note: bordered cells are denoted as: unshaded for initial power rating, plain grey shading denotes optimised power rating, striped grey shading denotes aggressive uprating potential. Source: HSBC estimates

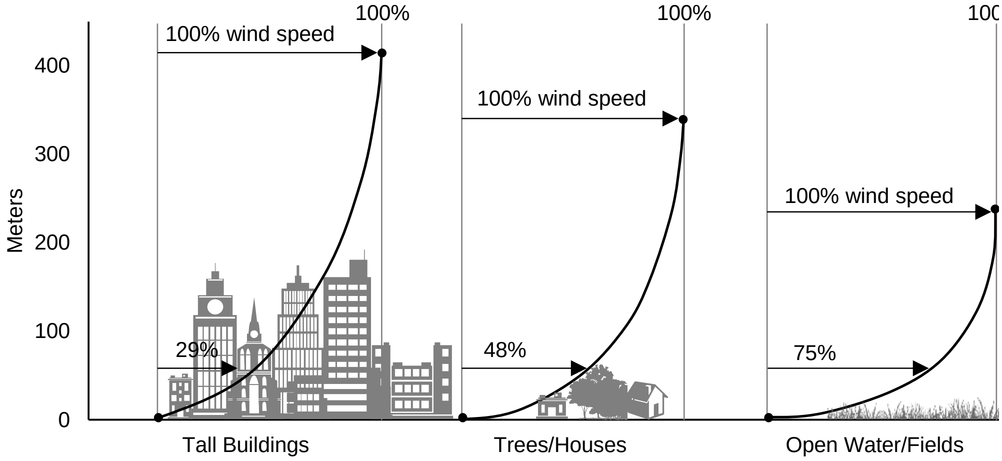
Based on a database of wind speeds published by offshore energy consultancy 4C Offshore, over 300 offshore wind sites have average wind speeds above 10m/s, of which 94 are above 11m/s. The highest recorded average wind speeds are 12.1m/s in China and 12.0m/s in Taiwan, and the highest in Europe is 11.9m/s (Scottish Continental Shelf near the Hebrides), as shown in the table below. This data corroborates the wind speed range in the above sensitivity table.

Highest off-shore wind speeds by country

Location	Country, area	Wind speed m/s
Taiwan Strait	China	12.1
Taiwan Strait	Taiwan	12.0
Scottish Continental Shelf (Hebrides)	UK N Sea	11.9
North Atlantic	UK N Atlantic	11.6
Stadthavet	Norway N Sea	11.3
Omaezaki Port	Japan	11.3
Skerd Rocks	Ireland	11.0
Irish Sea	UK Irish Sea	10.7
Borssele	Netherlands	10.2
Ringkobing	Denmark	10.2
Norther	Belgium	10.2
Dunkerque	France	10.2
Concordia, Enova	Germany N Sea	10.1
Punta de las Olas	Spain	10.1

Source: 4cOffshore.com

Taller offshore turbines can best harness the available wind resource to maximise power



Source: RSL Energy, HSBC estimates

How powerful can the next generation be?

We have conducted the same analysis on the Adwen AD-180 8MW turbine. Although now discontinued under SGRE, the relevance of this turbine prototype for the current analysis is that it boasts an 88.4m blade (currently the world's longest, but some way below the 107m blade that GE's 12MW turbine will be based on). Using the same wind speed and power coefficient input range, an initial (conservative) rating is 7.3MW. This could be uprated to 9.7MW and potentially as high as 11MW, based on an aggressive wind speed assumption.

Improved product design and higher wind speeds driving Gamesa AD180 power rating increases

	average wind speed (m/s)								
Power coefficient, Cp	10.0	10.3	10.5	10.8	11.0	11.3	11.5	11.8	12.0
0.35	5.3	5.7	6.1	6.6	7.0	7.5	8.0	8.6	9.1
0.37	5.6	6.0	6.5	6.9	7.4	8.0	8.5	9.1	9.7
0.39	5.9	6.3	6.8	7.3	7.8	8.4	9.0	9.6	10.2
0.41	6.2	6.7	7.2	7.7	8.2	8.8	9.4	10.0	10.7
0.43	6.5	7.0	7.5	8.1	8.6	9.2	9.9	10.5	11.2
0.45	6.8	7.3	7.9	8.4	9.0	9.7	10.3	11.0	11.7
0.47	7.1	7.7	8.2	8.8	9.4	10.1	10.8	11.5	12.2

Note: bordered cells are denoted as: unshaded for initial power rating, plain grey shading denotes optimised power rating, striped grey shading denotes aggressive uprating potential. Source: HSBC estimates

A 13-15MW turbine would need 105-110m blades, a 20% extension on current best in class

Using the same methodology, we look at the impact of longer blades on the initial and optimised power rating of future turbines as well as on the aggressive uprating potential. A 105m blade should be enough to hit the 13-15MW power rating range predicted by Ørsted result in an 11MW optimised turbine power rating whereas a 110m blade would be required for a 15MW optimised power rating. Under more aggressive assumptions, a 100m blade could result in a turbine with Ørsted's stated range.

GE's 12MW turbine, which is targeted to enter the market by 2021, is based a 107m blade, a significant technical challenge as over 20% longer than the Adwen blade. Provided GE is able to have the turbine ready for production by 2021 as planned, we see potential scope for GE to upgrade the power rating further based on our analysis.

Rising blade lengths are needed to drive the next-generation 10MW+ turbine class

Blade length (m)	% increase vs current best in class	Initial turbine power rating (MW)	Optimised turbine power rating (MW)	Aggressive uprating potential (MW)
90	2%	7.6	10.0	11.4
95	7%	8.4	11.2	12.7
100	13%	9.4	12.4	14.1
105	19%	10.3	13.6	15.5
110	24%	11.3	15.0	17.1

Note: red border indicated power rating within ØRSTED's assumed 13-15MW range. Source: HSBC estimates

GE shows the R&D drive that is needed

The boundaries of what is possible in wind continue to be extended. The speed of the increase in scale to the current best in class turbines has been rapid and successful. The first testing site for the 100m blade is permitted in Denmark so all that is missing is a push on R&D to accelerate development of the next generation of turbines. We expect Vestas (through its Vestas MHI JV), and Siemens to spend intensively to drive the next generation of turbines, in particular now that GE has fired the starting gun on the race to the next generation turbine. GE has said it plans to spend USD400m to develop and deploy its next-generation turbine by 2021. This provides an indication of the sums required by GE's peers to keep pace in the upscaling race.

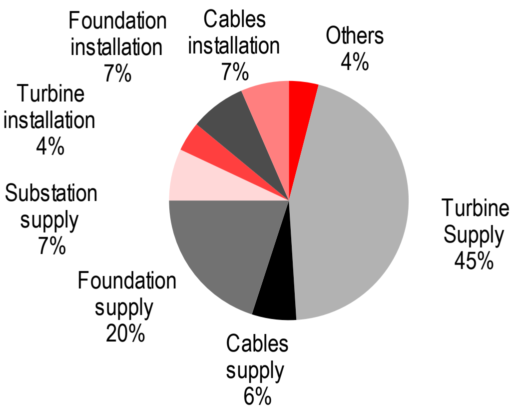
We believe that there is no physical reason why a 25MW turbine cannot eventually be built. Ørsted has dedicated teams that put ideas to encourage turbine suppliers such as Siemens and Vestas. For 20MW turbines, we believe that there is currently a height restriction on offshore wind farms of 330MW (implying a 150m blade), which could potentially be raised.

Supply chain adaptation

- Siemens Gamesa and Vestas are the leading offshore wind turbine suppliers by market share, followed by Senvion and GE
- Verticalisation is a compelling strategy for supply chain players to capture more value in each project
- Cable suppliers such as Prysmian and Nexans are driving more sales by providing offshore wind cables along with installation

Supply chain will need to adjust to new pricing

Breakdown of capital expenditure for offshore wind



Note: Using average 2017 project cost assumptions. Source Bloomberg New Energy Finance

Turbine suppliers are under pressure to reduce costs post the rapid decline in auction prices

Turbine suppliers

Turbine suppliers have come under great pressure to reduce cost post the rapid decline in auction prices in particular for onshore projects. The result has been widespread consolidation and restructuring among major suppliers.

Equipment suppliers have been focussing on developing larger turbines to drive better economics as a lower number of installations has a positive impact on cost, despite requiring larger foundations and installation vessels. Larger turbines for developers are beneficial on both the capex side (i.e. a lower number of turbines, foundations and inter array cables driving lower installation costs) and the opex side (i.e. lower maintenance costs per MW).

SGRE has been the leader in offshore wind turbines but MHI Vestas has rapidly gained market share

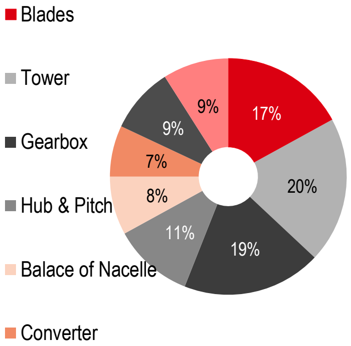
SGRE has historically been the market leader in offshore wind turbines but MHI Vestas has rapidly gained market share (27% market share in Europe in 2017) with its 8MW and 9.5MW turbines. MHI Vestas has a current backlog of 1.9GW of confirmed orders and 2.5GW of conditional / preferred supply agreements for the V164 turbine. This is directly in competition with SGRE's recently launched SG 8.0-167 turbine, which has already secured 3GW of firm orders.

Vestas and SGRE announced order pipeline

Date announced	Project name	Market	Owner	Exp installation year	Turbine	No. turbines	MW
Vestas							
Firm & unconditional orders							
	Walney Extension phase 1	UK	Ørsted	2017/18*	V164-8.0	40	330
	Horns Reef 3	Denmark	Vattenfall	2018*	V164-8.0	49	406
27-Sep-16	Aberdeen Bay	UK	Vattenfall	2018*	V164-8.4	11	92
15-Dec-16	Norther NV	Belgium	Norther NV	2019*	V164-8.4	44	370
	Borkum Riffgrund 2	Germany	Ørsted	2019*	V164-8.0	56	450
21-Aug-17	Deutsche Bucht	Germany	British Wind Energy	2019*	V164-8.0	31	252
Total						**231**	**1900**
Conditional orders							
30-Mar-17	Borssele III & IV	Netherlands	consortium	n.a.	n.a.		680**
Total							**680****
Preferred supplier							
18-Sep-17	Triton Knoll	UK	Consortium	2021*	V164-9.5	90	855
30-Oct-17	Moray East	UK	Consortium	2022*	V164-9.5	100	950
Total						**190**	**1805**
Total Vestas orders							**4385**
Siemens Gamesa							
30-Oct-15	Galloper	UK	RWE	2017/18	SWT-6.0-154	56	336
23-Dec-14	Wikinger	Germany	Iberdrola	2017/18	M5000-135	70	350
3-Jul-15	Race Bank	UK	Ørsted	2017/18	SWT-6.0-154	91	580
1-Jun-17	Albatros	Germany	EnBW	2018	SWT-7.0-154	16	112
21-Dec-16	Rentel	Belgium	Rentel NV	2018	SWT-7.0-154	42	309
25-Apr-16	Arkona	Germany	E.ON	2018	SWT-6.0-154	60	385
28-Oct-15	Walney Extension East	UK	Ørsted	2018	SWT-7.0-154	47	330
17-Feb-17	Hohe See	Germany	EnBW	2019	SWT-7.0-154	71	497
28-Nov-17	Vesterhav North	Denmark	Vattenfall	2020	SG 8.0-167	21	180
28-Nov-17	Vesterhav South	Denmark	Vattenfall	2020	SG 8.0-167	20	170
6-Jul-17	Borssele 1 and 2	Netherland	Ørsted	2020	8 MW	94	752
27-Apr-16	East Anglia ONE	UK	Iberdrola	2020	SWT-7.0-154	102	714
19-Sep-16	Dieppe-Le Tréport	France	GDF & EDPR	2021	D8	62	496
19-Sep-16	Yeu-Noirmoutier	France	GDF & EDPR	2021	D8	62	496
28-Nov-17	Kriegers Flak	Denmark	Vattenfall	2021	SG 8.0-167	72	600
14-Feb-17	Hornsea 2	UK	Ørsted	2022	SG 8.0-167	70	1386
Total Siemens Gamesa						**1059**	**7693**

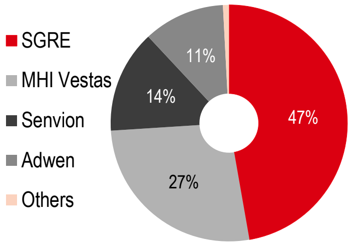
Source: Company press releases, *Publicly communicated by the owner, subject to change, **The megawatt output awarded to the project, subject to change upon reaching final investment decision

6MW offshore wind turbine capex distribution



Source: Make Consulting

2017 European turbine installations market share



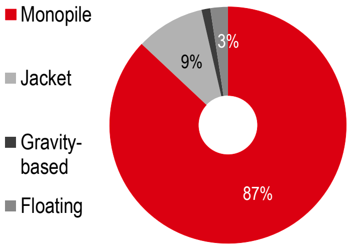
Source:: Wind Europe

Foundations

Monopile foundations are the most preferred type due to their lower cost and standard installation

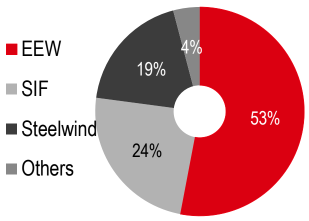
Foundations represent the single largest balance of plant cost, and the capital cost alone accounts for 15-20% of the total cost of the offshore wind farm. Monopile foundations are the most preferred type due to their lower cost and standard installation process. In 2017, 87% of installed foundations were monopiles. At water depths of 5-30m monopiles are routinely used as the cheapest option. Despite the benefits of using monopiles, jackets are growing in popularity especially for projects with greater than 40m depth as they are light weight and easier to install. We expect jacket foundations to have a high penetration in the US as the US sea bed is not too conducive for monopiles and existing US oil & gas players have more experience in working with jacket foundations.

2017 European foundations share by technology



Source: Make Consulting

2017 European foundations share by manufacturers



Source: Make Consulting

Sif Group and EEW remain the largest suppliers of foundations in Europe with more than 75% share of 2017. Following reductions in bid prices these companies are focusing on reducing cost of foundations by exploring different design methodologies which can reduce penetration depth of foundations and lower the amount of steel required, which is the main material used. Jacket manufactures are also trying to reduce complexities in design and production by implementing automation. Though jacket foundations are expected to gain share in the coming years, we believe monopiles will continue to dominate the market at least until 2020e.

Established European foundation players are now looking for new opportunities in the budding APAC and US markets. According to company press releases in 2017, both Sif group and Bladt have signed letters of intent and MOUs with local companies in Taiwan to explore the possibility of manufacturing foundations in the country.

Cables

We forecast a 25% demand CAGR to 2022e in Europe for cables in offshore wind farms

For cable manufacturers offshore wind involves high profitability subsea transmission activity, which has led the leading suppliers to actively target this end market.

The offshore cables industry is also going through a phase of large consolidations pressured by cost cutting. In early 2017 NKT completed its acquisition of ABB's cable business and in December 2017 Prysmian announced a USD3bn acquisition of General Cables. Scale has become crucial in the offshore cables market which are also under huge pressure to reduce cost and increase quality. The cable makers may also need to invest in developing new and larger cables for larger turbines.

We estimate a total cable volume of ~18200km installed by 2025 to connect the installed base of offshore wind by 2025e.

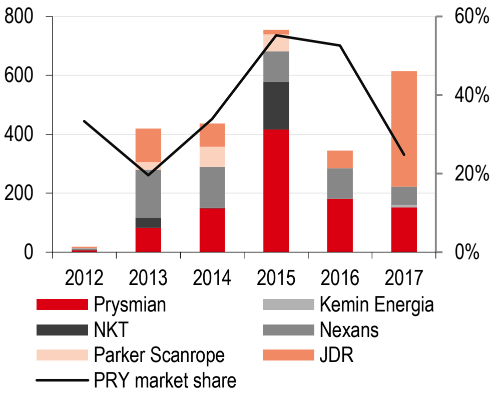
Offshore wind cables: 90-120% growth to 2025e vs installed base at YE 2017 in Europe

	Cumulative by YE 2017	2017-2025	pipeline to 2025 as % of installed base	Cumulative by YE-2025
Offshore wind GW installed	14.0	36.8	263%	50.9
# wind farms operational	75	86	115%	161
# turbines installed	3865	5374	139%	9239
Cables (km)				
Onshore cables	1657	1548	93%	3205
Export cables	2657	3047	115%	5704
Array cables	3905	5429	139%	9333
Total cables	8219	10024	122%	18242
units				
onshore cables (km / wind farm)	22.1	18.0		19.9
export cables (km / wind farm)	35.4	35.4		35.4
array cables (km / turbine)	1.0	1.0		1.0

Source: Note: Extra-European markets not considered. Source: Wind Europe, Bloomberg New Energy Finance, 4coffshore, HSBC estimates

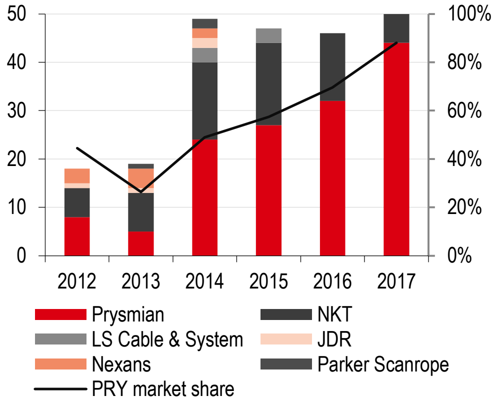
We see Prysmian cementing its position as the clear market leader in offshore wind cables through the acquisition of General Cables. General Cable's subsidiary, NSW, is a good fit as it has lots of exposure to offshore wind interarray cables, a segment where Prysmian has been losing share. It should help to drive Prysmian's objective to offer a one-stop shop, vertically integrated offshore wind offering. Prysmian believes NSW's German plant is underutilised. The acquisition could help Prysmian in increasing its market share in export and inter-array cables for offshore wind to 70% and 53% respectively from the present 52% and 9% cementing its leadership in offshore wind. However, we are concerned there may be anti-trust questions related to Prysmian's high market share in this segment. In 2017, we saw JDR cables (acquired by TFKable, (unlisted), in 2017) gain market share over Prysmian in the inter array cable market as it won the order for the 588MW Beatrice offshore wind farm in Scotland.

Inter-array cable for offshore wind – post acquisition of General Cable



Note: in # of installed units.
Source: WindPower Europe

Export cable for offshore wind – post acquisition of General Cable



Note: in # of installed units.
Source: WindPower Europe

Implications for offshore oilfield services (OFS)

- Offshore / subsea oil and gas players have technical expertise and asset bases compatible with offshore wind engineering, project management, installation and equipment supply
- The growing offshore wind market offers OFS players a diversified business opportunity not driven by oil prices
- However, competition is tough and the addressable offshore market in the medium term is relatively small

Power companies and 'Big Oil' have moved into offshore wind as a way to explore a more diverse set of business activities; is it time for oil's supply chain – the OFS players – to join? Our analysis of the offshore wind value chain sees an addressable market for OFS-type businesses worth around USD10bn by 2025. There are almost as many similarities between the value chains for offshore oil and gas and offshore wind as there are differences, and here we examine the potential for OFS companies to play a greater role in the offshore wind market given their expertise and track records in the wider offshore oil and gas space.

In this section we elaborate on the competitive dynamics of this emerging space for OFS. We continue to see a smaller addressable market for offshore / subsea OFS, with medium term order intake only some 60% of that of the previous cycle. Therefore offshore wind continues to be a potentially interesting additional business area for offshore OFS. But this is an area where customers are likely well aware of the current market for offshore oil and gas, and all that implies for the profitability of offshore wind-related work for suppliers. Also a number of players in the offshore wind value chain are going 'in-house', such as cable OEMs owning their own installation vessels, and utilities 'in-sourcing' maintenance services.

Activity in offshore wind is also crucially independent of the oil and gas business cycle, exposing OFS to a different risk profile to its core activities but one with a low correlation with the price of oil. In fact there is a reasonable history of selected offshore OFS players working in offshore wind installation over the years, although the experience of some of the Engineering & Construction (E&C) players has been less positive, with several contractors having to absorb unplanned project cost rises and other challenges.

What activities can OFS companies undertake in offshore wind?

Several aspects of OFS' activities have cross-over with offshore wind …

Due to the diverse / heterogeneous nature of OFS companies, the industry's embedded expertise and assets overlap with offshore wind comes across several segments including:

- Offshore engineering and project management
- Subsea equipment manufacturing

- Installation / heavy lifting of turbines, foundations and substations
- Cable laying
- Maintenance and inspection (including digital / predictive maintenance)
- Decommissioning

What can OFS companies offer to offshore wind?

Subsea OFS companies have a long track record of operating offshore

Several OFS companies can offer a range of aspects of offshore project design, installation and maintenance, including:

- Long and established track record in offshore / harsh-environment subsea engineering and project management
- Manufacturing capacity to compete in supply of substation platform or cable equipment
- A range of vessel capabilities to undertake various elements of offshore installation works and maintenance

Companies with existing offshore 'E&C' capabilities are able to offer engineering / project management experience and expertise. The construction of substation platforms, topsides or other offshore wind infrastructure also has a similarity with the projects undertaken by the E&C offshore divisions of OFS companies. Subsea equipment manufacturers of umbilicals (and risers) used in subsea oil and gas production can be used for cabling, as can installation techniques from subsea infrastructure.

Vessel requirements for offshore wind are mainly jack-up vessels for installing or assembling turbines and blades. Floating cranes / heavy lift vessels are required for the lifting and installing of heavier foundations, jackets and monopiles. For cable laying there are more specialised vessel requirements.

How good a 'fit' are the OFS assets for offshore wind?

Some oil and gas vessels are currently 'over-spec' …

With offshore wind hardware expected to change as the industry matures (monopiles, foundations and turbine / blades getting bigger) the installation vessel requirements are unlikely to remain static over time. Vessels originally constructed and designed for the oil and gas industry are more likely to currently be 'over-spec' than 'under-spec' for offshore wind; however, offshore wind's potential vessel requirements also extend to less technically demanding elements such as maintenance.

… but could be needed in the future as offshore wind infrastructure gets bigger

Offshore wind heavy lift work is in some aspects somewhat less technically challenging and more repetitive than that in offshore oil and gas, but with the aim of securing utilisation for otherwise idle vessel capacity, it is clearly an end market of interest. OFS assets are also likely to offer greater heavy lift capacity (up to 5,000t and above) than current or recently upgraded offshore wind installation vessels (more likely up to 3,000t); giving OFS a competitive edge in substation and foundation works due to the nature of the heavy lifting. This also means that vessels with greater lifting capacity owned by OFS companies have the ability to handle ever larger (and heavier) offshore wind turbines, foundations, jackets and monopiles in the future. For example Saipem's S7000 vessel has a lifting capacity of 14,000t, the third largest globally. This contrasts with some installation-orientated players who run the risk of having to invest in purpose built vessels without a clear view of whether they will be capable of installing heavier next generation turbines (e.g. in 2013 private company Seajacks announced it had commissioned the Scylla vessel to handle UK Round 3 turbines, which at the time was the largest offshore wind installation vessel).

We think OFS companies will look for opportunities that don't require additional investments

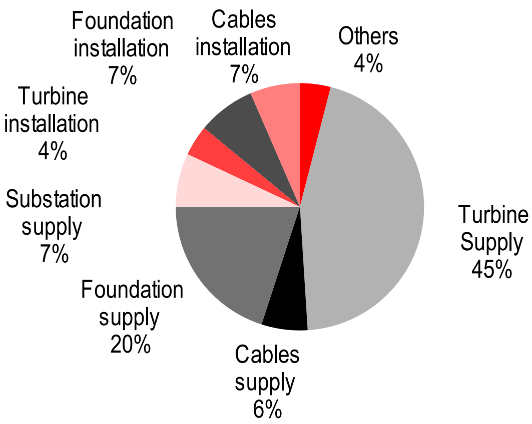
With the exception of current 'good fit' and / or underutilised vessels, it is unlikely that OFS names are going to commit significant funds to commissioning new vessels or assets as a way to make headway in the market unless they already have a presence (e.g. SUBC's Seaway Heavy Lifting).

What is in it for surf/subsea players and how big is the market opportunity?

A key motivation for OFS is to reduce current asset under-utilization

The primary motivation for the OFS subsea industry is to diversify and expand its activity base at a time when offshore / subsea oil and gas awards are in what could be a prolonged challenging phase. The extent to which the opportunities presented by offshore wind are taken by offshore / subsea players is dependent on the potential returns and the additional required capital commitments by the OFS players. Opportunities that are 'high value' or reduce under-utilisation but that need minimal new investment are likely to be the most favoured.

Breakdown of capital expenditure for offshore wind



Note: Using average 2017 project cost assumptions. Source Bloomberg New Energy Finance

The offshore wind market for OFS players is significantly smaller than oil and gas

Our estimates indicate that the offshore wind 'installation' market up for grabs for OFS companies could represent around a fifth of offshore wind capex by 2025, or approximately a total of USD10bn. This compares to a 90-company survey of oil and gas capex spend in 2017 of USD390bn; although this also includes onshore oil and gas.

We think installation and EPC contracts offer the best opportunities for OFS players

Within the 'installation' segment, we see OFS' greatest potential in foundation, turbines monopiles and substations. Here OFS players can offer subsea experience with seabed foundations, superior heavy lift vessels and engineering expertise. The current market dynamics for cable manufacturing and installation are challenging for meaningful entry as cable OEMs have been buying / building their own vessels, e.g. Prysmian – which has a particularly dominant market position. However, Q1 2018 saw an established OFS name, Subsea7 acquire a cable laying and maintenance business - Siem Offshore Contractors.

Strong position of incumbents could restrict market entry for some areas of offshore wind (e.g. cables)

OFS companies have the capability, and are already undertaking, projects on an EPCI or FEED basis and we think any shift away from traditional 'transport and install' engineering contracts to more complex EPC contracts may favour oil and gas E&C companies. Integrated offerings that include project design as well as manufacturing and installation are becoming more prominent in the OFS space of late.

In offshore wind engineering and construction, established oil and gas E&C players such as Saipem, Fluor, Wood, CB&I compete with the three major 'pure play' EPC contractors in offshore wind, Van Oord, Jan de Nul and DEME group. There is also competition from turbine OEMs; Siemens have offered a turbine, foundation and EPC 'wrap' in the past.

Why offshore wind *won't* change the face of subsea / offshore OFS

Relatively small market size and competition may delay significant market entry into offshore wind

The relatively small market size and existing competition may mean that a large move into offshore wind is not currently likely for OFS companies en masse. However, with the expected growth in the offshore wind industry there will continue to be opportunities for OFS companies to win contracts on a more selective basis and where they offer an advantage.

We pose some key questions in considering whether OFS companies' exposure to offshore wind will be peripheral or significant.

- Will OFS players half–heartedly enter the market as a way to better utilise assets in down cycle and subsequently withdraw as and when offshore oil and gas market activity returns?
- Will subsea installers be able to earn sufficiently attractive returns on their more complex (and potentially over-specified) vessels while carrying out offshore wind work (without the need for additional investment)?
- Will the business model for offshore wind match the subsea/SURF industry's current move towards integrated supply of engineering design, equipment and installation services?
- Will wind utility 'in house' supply chain companies encroach on the market?

Some OFS companies are positioning into the offshore wind sector

A data point worth considering in relation to the last of our questions posed is that GeoSea (part of the DEME group) bought the A2sea vessel company in Q3 17 from Siemens and Ørsted; evidence that some turbine players are stepping away from elements of the integrated supply chain model.

More recently, an OFS company move into offshore wind was Aker Solution's purchase of a 5% equity stake (rising to 10%) in floating wind power technology company Principle Power Inc. Aker Solutions talks of *"a major opportunity in offshore floating wind where demand is growing in the transition to a low-carbon future"* and highlighted the synergies with existing offshore technology and engineering solutions from the oil and gas industry.

More broadly, some OFS companies have moved further into the offshore wind space over the last few years, whilst other have withdrawn. For example, TechnipFMC, Europe's largest OFS name, closed its legacy 'Technip Offshore Wind' business in 2014. Meanwhile Subsea7 has made two acquisitions in the last 12 months to increase its exposure to offshore wind. Other traditional oil and gas service companies, such as Saipem, are exploring ways to reduce oil price volatility – one being offshore wind.

Disclosure appendix

Analyst Certification
The following analyst(s), economist(s), or strategist(s) who is(are) primarily responsible for this report, including any analyst(s) whose name(s) appear(s) as author of an individual section or sections of the report and any analyst(s) named as the covering analyst(s) of a subsidiary company in a sum-of-the-parts valuation certifies(y) that the opinion(s) on the subject security(ies) or issuer(s), any views or forecasts expressed in the section(s) of which such individual(s) is(are) named as author(s), and any other views or forecasts expressed herein, including any views expressed on the back page of the research report, accurately reflect their personal view(s) and that no part of their compensation was, is or will be directly or indirectly related to the specific recommendation(s) or views contained in this research report: Sean McLoughlin, Tarek Soliman, CFA and Adam Dickens

Important disclosures

Equities: Stock ratings and basis for financial analysis
HSBC and its affiliates, including the issuer of this report ("HSBC") believes an investor's decision to buy or sell a stock should depend on individual circumstances such as the investor's existing holdings, risk tolerance and other considerations and that investors utilise various disciplines and investment horizons when making investment decisions. Ratings should not be used or relied on in isolation as investment advice. Different securities firms use a variety of ratings terms as well as different rating systems to describe their recommendations and therefore investors should carefully read the definitions of the ratings used in each research report. Further, investors should carefully read the entire research report and not infer its contents from the rating because research reports contain more complete information concerning the analysts' views and the basis for the rating.

From 23rd March 2015 HSBC has assigned ratings on the following basis:
The target price is based on the analyst's assessment of the stock's actual current value, although we expect it to take six to 12 months for the market price to reflect this. When the target price is more than 20% above the current share price, the stock will be classified as a Buy; when it is between 5% and 20% above the current share price, the stock may be classified as a Buy or a Hold; when it is between 5% below and 5% above the current share price, the stock will be classified as a Hold; when it is between 5% and 20% below the current share price, the stock may be classified as a Hold or a Reduce; and when it is more than 20% below the current share price, the stock will be classified as a Reduce.

Our ratings are re-calibrated against these bands at the time of any 'material change' (initiation or resumption of coverage, change in target price or estimates).

Upside/Downside is the percentage difference between the target price and the share price.

Prior to this date, HSBC's rating structure was applied on the following basis:
For each stock we set a required rate of return calculated from the cost of equity for that stock's domestic or, as appropriate, regional market established by our strategy team. The target price for a stock represented the value the analyst expected the stock to reach over our performance horizon. The performance horizon was 12 months. For a stock to be classified as Overweight, the potential return, which equals the percentage difference between the current share price and the target price, including the forecast dividend yield when indicated, had to exceed the required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). For a stock to be classified as Underweight, the stock was expected to underperform its required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). Stocks between these bands were classified as Neutral.

*A stock was classified as volatile if its historical volatility had exceeded 40%, if the stock had been listed for less than 12 months (unless it was in an industry or sector where volatility is low) or if the analyst expected significant volatility. However, stocks which we did not consider volatile may in fact also have behaved in such a way. Historical volatility was defined as the past month's average of the daily 365-day moving average volatilities. In order to avoid misleadingly frequent changes in rating, however, volatility had to move 2.5 percentage points past the 40% benchmark in either direction for a stock's status to change.

Rating distribution for long-term investment opportunities

As of 03 April 2018, the distribution of all independent ratings published by HSBC is as follows:

Buy	48%	(27% of these provided with Investment Banking Services)
Hold	40%	(27% of these provided with Investment Banking Services)
Sell	12%	(16% of these provided with Investment Banking Services)

For the purposes of the distribution above the following mapping structure is used during the transition from the previous to current rating models: under our previous model, Overweight = Buy, Neutral = Hold and Underweight = Sell; under our current model Buy = Buy, Hold = Hold and Reduce = Sell. For rating definitions under both models, please see “Stock ratings and basis for financial analysis” above.

For the distribution of non-independent ratings published by HSBC, please see the disclosure page available at http://www.hsbcnet.com/gbm/financial-regulation/investment-recommendations-disclosures.

To view a list of all the independent fundamental ratings disseminated by HSBC during the preceding 12-month period, please use the following links to access the disclosure page:

Clients of Global Research and Global Banking and Markets: www.research.hsbc.com/A/Disclosures

Clients of HSBC Private Banking: www.research.privatebank.hsbc.com/Disclosures

HSBC and its affiliates will from time to time sell to and buy from customers the securities/instruments, both equity and debt (including derivatives) of companies covered in HSBC Research on a principal or agency basis.

Analysts, economists, and strategists are paid in part by reference to the profitability of HSBC which includes investment banking, sales & trading, and principal trading revenues.

Whether, or in what time frame, an update of this analysis will be published is not determined in advance.

Non-U.S. analysts may not be associated persons of HSBC Securities (USA) Inc, and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with the subject company, public appearances and trading securities held by the analysts.

Economic sanctions imposed by the EU and OFAC prohibit transacting or dealing in new debt or equity of Russian SSI entities. This report does not constitute advice in relation to any securities issued by Russian SSI entities on or after July 16 2014 and as such, this report should not be construed as an inducement to transact in any sanctioned securities.

For disclosures in respect of any company mentioned in this report, please see the most recently published report on that company available at www.hsbcnet.com/research. HSBC Private Banking clients should contact their Relationship Manager for queries regarding other research reports. In order to find out more about the proprietary models used to produce this report, please contact the authoring analyst.

Additional disclosures

1 This report is dated as at 04 April 2018.

2 All market data included in this report are dated as at close 28 March 2018, unless a different date and/or a specific time of day is indicated in the report.

3 HSBC has procedures in place to identify and manage any potential conflicts of interest that arise in connection with its Research business. HSBC's analysts and its other staff who are involved in the preparation and dissemination of Research operate and have a management reporting line independent of HSBC's Investment Banking business. Information Barrier procedures are in place between the Investment Banking, Principal Trading, and Research businesses to ensure that any confidential and/or price sensitive information is handled in an appropriate manner.

4 You are not permitted to use, for reference, any data in this document for the purpose of (i) determining the interest payable, or other sums due, under loan agreements or under other financial contracts or instruments, (ii) determining the price at which a financial instrument may be bought or sold or traded or redeemed, or the value of a financial instrument, and/or (iii) measuring the performance of a financial instrument.

Production & distribution disclosures

1. This report was produced and signed off by the author on 04 Apr 2018 12:17 GMT.
2. In order to see when this report was first disseminated please see the disclosure page available at https://www.research.hsbc.com/R/34/GBRFfmH

Disclaimer

Legal entities as at 30 November 2017
'UAE' HSBC Bank Middle East Limited, Dubai; 'HK' The Hongkong and Shanghai Banking Corporation Limited, Hong Kong; 'TW' HSBC Securities (Taiwan) Corporation Limited; 'CA' HSBC Securities (Canada) Inc.; HSBC Bank, Paris Branch; HSBC France; 'DE' HSBC Trinkaus & Burkhardt AG, Düsseldorf; 000 HSBC Bank (RR), Moscow; 'IN' HSBC Securities and Capital Markets (India) Private Limited, Mumbai; 'JP' HSBC Securities (Japan) Limited, Tokyo; 'EG' HSBC Securities Egypt SAE, Cairo; 'CN' HSBC Investment Bank Asia Limited, Beijing Representative Office; The Hongkong and Shanghai Banking Corporation Limited, Singapore Branch; The Hongkong and Shanghai Banking Corporation Limited, Seoul Securities Branch; The Hongkong and Shanghai Banking Corporation Limited, Seoul Branch; HSBC Securities (South Africa) (Pty) Ltd, Johannesburg; HSBC Bank plc, London, Madrid, Milan, Stockholm, Tel Aviv; 'US' HSBC Securities (USA) Inc, New York; HSBC Yatirim Menkul Degerler AS, Istanbul; HSBC México, SA, Institución de Banca Múltiple, Grupo Financiero HSBC; HSBC Bank Australia Limited; HSBC Bank Argentina SA; HSBC Saudi Arabia Limited; The Hongkong and Shanghai Banking Corporation Limited, New Zealand Branch incorporated in Hong Kong SAR; The Hongkong and Shanghai Banking Corporation Limited, Bangkok Branch; PT Bank HSBC Indonesia; HSBC Qianhai Securities Limited

Issuer of report
HSBC Bank plc
8 Canada Square
London, E14 5HQ, United Kingdom
Telephone: +44 20 7991 8888
Fax: +44 20 7992 4880
Website: www.research.hsbc.com

In the UK this document has been issued and approved by HSBC Bank plc ("HSBC") for the information of its Clients (as defined in the Rules of FCA) and those of its affiliates only. It is not intended for Retail Clients in the UK. If this research is received by a customer of an affiliate of HSBC, its provision to the recipient is subject to the terms of business in place between the recipient and such affiliate.

HSBC Securities (USA) Inc. accepts responsibility for the content of this research report prepared by its non-US foreign affiliate. All U.S. persons receiving and/or accessing this report and wishing to effect transactions in any security discussed herein should do so with HSBC Securities (USA) Inc. in the United States and not with its non-US foreign affiliate, the issuer of this report.

In Singapore, this publication is distributed by The Hongkong and Shanghai Banking Corporation Limited, Singapore Branch for the general information of institutional investors or other persons specified in Sections 274 and 304 of the Securities and Futures Act (Chapter 289) ("SFA") and accredited investors and other persons in accordance with the conditions specified in Sections 275 and 305 of the SFA. This publication is not a prospectus as defined in the SFA. It may not be further distributed in whole or in part for any purpose. The Hongkong and Shanghai Banking Corporation Limited Singapore Branch is regulated by the Monetary Authority of Singapore. Recipients in Singapore should contact a "Hongkong and Shanghai Banking Corporation Limited, Singapore Branch" representative in respect of any matters arising from, or in connection with this report.

In Australia, this publication has been distributed by The Hongkong and Shanghai Banking Corporation Limited (ABN 65 117 925 970, AFSL 301737) for the general information of its "wholesale" customers (as defined in the Corporations Act 2001). Where distributed to retail customers, this research is distributed by HSBC Bank Australia Limited (ABN 48 006 434 162, AFSL No. 232595). These respective entities make no representations that the products or services mentioned in this document are available to persons in Australia or are necessarily suitable for any particular person or appropriate in accordance with local law. No consideration has been given to the particular investment objectives, financial situation or particular needs of any recipient.

This publication has been distributed in Japan by HSBC Securities (Japan) Limited. It may not be further distributed, in whole or in part, for any purpose. In Hong Kong, this document has been distributed by The Hongkong and Shanghai Banking Corporation Limited in the conduct of its Hong Kong regulated business for the information of its institutional and professional customers; it is not intended for and should not be distributed to retail customers in Hong Kong. The Hongkong and Shanghai Banking Corporation Limited makes no representations that the products or services mentioned in this document are available to persons in Hong Kong or are necessarily suitable for any particular person or appropriate in accordance with local law. All inquiries by such recipients must be directed to The Hongkong and Shanghai Banking Corporation Limited. In Korea, this publication is distributed by The Hongkong and Shanghai Banking Corporation Limited, Seoul Securities Branch ("HBAP SLS") for the general information of professional investors specified in Article 9 of the Financial Investment Services and Capital Markets Act ("FSCMA"). This publication is not a prospectus as defined in the FSCMA. It may not be further distributed in whole or in part for any purpose. HBAP SLS is regulated by the Financial Services Commission and the Financial Supervisory Service of Korea. This publication is distributed in New Zealand by The Hongkong and Shanghai Banking Corporation Limited, New Zealand Branch incorporated in Hong Kong SAR. This document is not and should not be construed as an offer to sell or the solicitation of an offer to purchase or subscribe for any investment. HSBC has based this document on information obtained from sources it believes to be reliable but which it has not independently verified; HSBC makes no guarantee, representation or warranty and accepts no responsibility or liability as to its accuracy or completeness. The opinions contained within the report are based upon publicly available information at the time of publication and are subject to change without notice. From time to time research analysts conduct site visits of covered issuers. HSBC policies prohibit research analysts from accepting payment or reimbursement for travel expenses from the issuer for such visits. Nothing herein excludes or restricts any duty or liability to a customer which HSBC has under the Financial Services and Markets Act 2000 or under the Rules of FCA and PRA. A recipient who chooses to deal with any person who is not a representative of HSBC in the UK will not enjoy the protections afforded by the UK regulatory regime. Past performance is not necessarily a guide to future performance. The value of any investment or income may go down as well as up and you may not get back the full amount invested. Where an investment is denominated in a currency other than the local currency of the recipient of the research report, changes in the exchange rates may have an adverse effect on the value, price or income of that investment. In case of investments for which there is no recognised market it may be difficult for investors to sell their investments or to obtain reliable information about its value or the extent of the risk to which it is exposed.

In Canada, this document has been distributed by HSBC Securities (Canada) Inc. (member IIROC), and/or its affiliates. The information contained herein is under no circumstances to be construed as investment advice in any province or territory of Canada and is not tailored to the needs of the recipient. No securities commission or similar regulatory authority in Canada has reviewed or in any way passed judgment upon these materials, the information contained herein or the merits of the securities described herein, and any representation to the contrary is an offense.

HSBC Bank plc is registered in England No 14259, is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority and is a member of the London Stock Exchange. (070905)

If you are an HSBC Private Banking ("PB") customer with approval for receipt of relevant research publications by an applicable HSBC legal entity, you are eligible to receive this publication. To be eligible to receive such publications, you must have agreed to the applicable HSBC entity's terms and conditions ("KRC Terms") for access to the KRC, and the terms and conditions of any other internet banking service offered by that HSBC entity through which you will access research publications using the KRC. Distribution of this publication is the sole responsibility of the HSBC entity with whom you have agreed the KRC Terms.

If you do not meet the aforementioned eligibility requirements please disregard this publication and, if you are a customer of PB, please notify your Relationship Manager. Receipt of research publications is strictly subject to the KRC Terms, which can be found at https://research.privatebank.hsbc.com/ – we draw your attention also to the provisions contained in the Important Notes section therein.

[1090276]

Global Industrials Research Team

Industrials

Analyst
Michael Hagmann +44 20 7991 2405
michael.hagmann@hsbcib.com

Analyst
Scott Cagehin +44 20 7992 1444
scott.cagehin@hsbc.com

Head of Research, Korea
Brian Cho +822 3706 8750
briancho@kr.hsbc.com

Analyst
Paul Choi +822 3706 8758
paulchoi@kr.hsbc.com

Analyst
Anderson Chow +852 2996 6669
andersonchow@hsbc.com.hk

Analyst
Puneet Gulati +91 22 2268 1235
puneetgulati@hsbc.co.in

Analyst
Yeon Lee +822 3706 8778
yeonlee@kr.hsbc.com

Analyst
Helen Fang +852 2996 6942
helen.c.fang@hsbc.com.hk

Analyst
Sean McLoughlin +44 20 7991 3464
sean.mcloughlin@hsbcib.com

Analyst
Edward Perry +44 20 7991 8415
edward.perry@hsbc.com

Analyst
Shrinidhi Karlekar +91 22 6164 0689
shrinidhi.karlekar@hsbc.co.in

Analyst
Nick Webster +27 11 676 4537
nick.webster@za.hsbc.com

Analyst
Jörg-André Finke, CFA +49 211 910 3722
joerg-andre.finke@hsbc.de

Analyst
Somesh Agarwal +65 6658 0616
somesh.kumar.agarwal@hsbc.com.sg

Analyst
Richard Schramm +49 211 910 2837
richard.schramm@hsbc.de

Analyst
Philip Saliba +49 211 910 2672
philip.saliba@hsbc.de

Associate
Tracy Li +852-2996 6751
tracy.s.w.li@hsbc.com.hk

Autos

Analyst
Horst Schneider +49 211 910 3285
horst.schneider@hsbc.de

Analyst
Yogesh Aggarwal +91 22 2268 1246
yogeshaggarwal@hsbc.co.in

Analyst
Henning Cosman +44 207 991 0369
henning.cosman@hsbc.com

Analyst
Vivek Gedda +91 22 6164 0693
vivekgedda@hsbc.co.in

Analyst
Vikas Ahuja +91 22 3396 0690
vikasahuja@hsbc.co.in

Analyst
Tarun Bhatnagar +65 6658 0614
tarunbhatnagar@hsbc.com.sg

Analyst
John Chung +8862 6631 2868
john.chung@hsbc.com.tw

Transportation

Analyst
Andrew Lobbenberg +44 20 7991 6816
andrew.lobbenberg@hsbcib.com

Analyst
Edward Stanford +44 20 7992 4207
edward.stanford@hsbc.com

Analyst
Parash Jain +852 2996 6717
parashjain@hsbc.com.hk

Analyst
Achal Kumar +91 80 4555 2751
achalkumar@hsbc.co.in

Analyst
Wei Sim +852 2996 6602
weisim@hsbc.com.hk

Analyst
Joe Thomas +44 20 7992 3618
joe.thomas@hsbcib.com

Analyst
Alexandre Falcao +1 212 525 4449
alexandre.p.falcao@us.hsbc.com

Analyst
Augusto A Ensiki +1 212 525 4915
augusto.a.ensiki@us.hsbc.com

Analyst
Mauricio Arellano +52 55 5721 3863
mauricio.arellano@hsbc.com.mx

Analyst
Ricardo N Rezende, CFA +44 203 268 3325
ricardo.n.rezende@hsbc.com

Analyst
Teresa Yan +852 2914 9934
teresa.x.yan@hsbc.com.hk

Construction & Engineering

Analyst
Tarun Bhatnagar +65 6658 0614
tarunbhatnagar@hsbc.com.sg

Head of French Research
Pierre Bosset +33 1 56 52 43 10
pierre.bosset@hsbc.com

Analyst
Jonathan Brandt, CFA +1 212 525 4499
jonathan.l.brandt@us.hsbc.com

Analyst
Yevgeniy Shelkovskiy +1 212 525 3035
yevgeniy.x.shelkovskiy@us.hsbc.com

Analyst
Eduardo Altamirano +1 212 525 8333
eduardo.x.altamirano@us.hsbc.com

Analyst, LatAm Cement and Constructions, Real Estate
Javier Santiago +52 55 5721 2397
javier.santiago@hsbc.com.mx

Analyst
Coleman Clyde +1 212 525 2441
coleman.l.clyde@us.hsbc.com

Global Equity Head of Building Materials
John Fraser-Andrews +44 20 7991 6732
john.fraser-andrews@hsbcib.com

Analyst
Lesley Liu +852 2822 4524
lesleylliu@hsbc.com.hk

Analyst
Nicholas Paton, CFA +971 4 423 6923
nicholas.paton@hsbc.com

Analyst
Emily Li +852 2996 6599
emily.c.li@hsbc.com.hk

Analyst
Howard Lau, CFA +852 2996 6625
howard.h.b.lau@hsbc.com.hk

Specialist Sales

Rod Turnbull +44 20 7991 5363
rod.turnbull@hsbcib.com

Oliver Magis +49 21 1910 4402
oliver.magis@hsbc.de

Billal Ismail +44 20 7991 5362
billal.ismail@hsbcib.com

Jean Gael Tabet +44 20 7991 5342
jeangael.tabet@hsbcib.com