## Group performance

### Highlights

<table>
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</thead>
<tbody>
<tr>
<td><strong>FINANCIAL HIGHLIGHTS</strong></td>
<td></td>
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<tr>
<td><strong>INCOME STATEMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue</td>
<td>12,147</td>
<td>10,134</td>
<td>9,953</td>
<td>10,237</td>
<td>8,423</td>
</tr>
<tr>
<td>Gross profit</td>
<td>1,761</td>
<td>1,631</td>
<td>1,963</td>
<td>2,126</td>
<td>1,505</td>
</tr>
<tr>
<td>Operating profit before amortisation, depreciation and impairment losses (EBITDA) before special items</td>
<td>1,550</td>
<td>1,394</td>
<td>1,651</td>
<td>1,826</td>
<td>1,212</td>
</tr>
<tr>
<td>Operating profit [EBIT] before special items</td>
<td>1,004</td>
<td>959</td>
<td>1,230</td>
<td>1,421</td>
<td>860</td>
</tr>
<tr>
<td>Operating profit before amortisation, depreciation and impairment losses (EBITDA)</td>
<td>1,550</td>
<td>1,379</td>
<td>1,651</td>
<td>1,826</td>
<td>1,258</td>
</tr>
<tr>
<td>Operating profit [EBIT]</td>
<td>1,004</td>
<td>921</td>
<td>1,230</td>
<td>1,421</td>
<td>906</td>
</tr>
<tr>
<td>Operating profit [EBIT] before special items adjusted for tax</td>
<td>773</td>
<td>719</td>
<td>923</td>
<td>1,066</td>
<td>636</td>
</tr>
<tr>
<td>Net financial items</td>
<td>(98)</td>
<td>(51)</td>
<td>2</td>
<td>(33)</td>
<td>(15)</td>
</tr>
<tr>
<td>Profit before tax</td>
<td>909</td>
<td>910</td>
<td>1,192</td>
<td>1,287</td>
<td>925</td>
</tr>
<tr>
<td>Profit for the year</td>
<td>700</td>
<td>683</td>
<td>894</td>
<td>965</td>
<td>685</td>
</tr>
<tr>
<td><strong>BALANCE SHEET</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance sheet total</td>
<td>14,331</td>
<td>11,899</td>
<td>10,871</td>
<td>9,931</td>
<td>8,587</td>
</tr>
<tr>
<td>Equity</td>
<td>3,345</td>
<td>3,104</td>
<td>3,112</td>
<td>3,190</td>
<td>2,899</td>
</tr>
<tr>
<td>Investments in property, plant and equipment</td>
<td>451</td>
<td>312</td>
<td>268</td>
<td>304</td>
<td>220</td>
</tr>
<tr>
<td>Net working capital</td>
<td>(1,583)</td>
<td>(2,040)</td>
<td>(1,984)</td>
<td>(1,941)</td>
<td>(1,383)</td>
</tr>
<tr>
<td>Capital employed</td>
<td>4,165</td>
<td>3,602</td>
<td>3,609</td>
<td>3,686</td>
<td>3,394</td>
</tr>
<tr>
<td>Interest-bearing position (net), at the end of the period</td>
<td>2,452</td>
<td>3,046</td>
<td>3,359</td>
<td>3,255</td>
<td>2,270</td>
</tr>
<tr>
<td>Interest-bearing debt, at the end of the period</td>
<td>(98)</td>
<td>(51)</td>
<td>2</td>
<td>(33)</td>
<td>(15)</td>
</tr>
<tr>
<td><strong>CASH FLOW STATEMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash flow from operating activities</td>
<td>823</td>
<td>1,021</td>
<td>1,625</td>
<td>2,181</td>
<td>1,472</td>
</tr>
<tr>
<td>Cash flow from investing activities before acquisitions of subsidiaries and financial investments</td>
<td>(729)</td>
<td>(603)</td>
<td>(407)</td>
<td>(617)</td>
<td>(425)</td>
</tr>
<tr>
<td>Free cash flow before acquisitions of subsidiaries and financial investments</td>
<td>94</td>
<td>418</td>
<td>1,218</td>
<td>1,564</td>
<td>1,047</td>
</tr>
<tr>
<td>Free cash flow</td>
<td>332</td>
<td>(69)</td>
<td>1,218</td>
<td>1,364</td>
<td>1,047</td>
</tr>
<tr>
<td><strong>FINANCIAL RATIOS</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Financial ratios</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross margin (%)</td>
<td>14.5</td>
<td>16.1</td>
<td>19.7</td>
<td>20.8</td>
<td>17.9</td>
</tr>
<tr>
<td>EBITDA margin (%) before special items</td>
<td>12.8</td>
<td>13.8</td>
<td>16.6</td>
<td>17.8</td>
<td>14.4</td>
</tr>
<tr>
<td>EBIT margin (%) before special items</td>
<td>8.3</td>
<td>9.5</td>
<td>12.4</td>
<td>13.9</td>
<td>10.2</td>
</tr>
<tr>
<td>EBITDA margin (%)</td>
<td>12.8</td>
<td>13.6</td>
<td>16.6</td>
<td>17.8</td>
<td>14.9</td>
</tr>
<tr>
<td>EBIT margin (%)</td>
<td>8.3</td>
<td>9.1</td>
<td>12.4</td>
<td>13.9</td>
<td>10.8</td>
</tr>
<tr>
<td>Return of capital employed (ROCE) (%)</td>
<td>19.7</td>
<td>20.4</td>
<td>25.1</td>
<td>30.8</td>
<td>20.3</td>
</tr>
<tr>
<td>Net interest-bearing debt/EBITDA before special items</td>
<td>(1.6)</td>
<td>(2.2)</td>
<td>(2.0)</td>
<td>(1.8)</td>
<td>(1.9)</td>
</tr>
<tr>
<td>Solvency ratio (%)</td>
<td>23.3</td>
<td>26.1</td>
<td>28.6</td>
<td>32.1</td>
<td>33.8</td>
</tr>
<tr>
<td>Return on equity (%)</td>
<td>22.1</td>
<td>22.6</td>
<td>28.1</td>
<td>32.6</td>
<td>26.2</td>
</tr>
<tr>
<td><strong>SHARE RATIOS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earnings per share (EUR)</td>
<td>3.6</td>
<td>3.4</td>
<td>4.2</td>
<td>4.4</td>
<td>3.1</td>
</tr>
<tr>
<td>Book value per share (EUR)</td>
<td>16.8</td>
<td>15.1</td>
<td>14.4</td>
<td>14.4</td>
<td>12.9</td>
</tr>
<tr>
<td>P/E ratio</td>
<td>25.4</td>
<td>19.3</td>
<td>13.6</td>
<td>14.0</td>
<td>21.2</td>
</tr>
<tr>
<td>Dividend per share (EUR)</td>
<td>1.06</td>
<td>1.00</td>
<td>1.24</td>
<td>1.31</td>
<td>0.91</td>
</tr>
<tr>
<td>Payout ratio (%)</td>
<td>30.0</td>
<td>30.0</td>
<td>29.9</td>
<td>30.0</td>
<td>29.9</td>
</tr>
<tr>
<td>Share price at the end of the period (EUR)</td>
<td>901</td>
<td>659</td>
<td>576</td>
<td>617</td>
<td>648</td>
</tr>
<tr>
<td>Number of shares at the end of the period</td>
<td>198,901,963</td>
<td>205,696,003</td>
<td>215,496,947</td>
<td>221,544,727</td>
<td>224,074,513</td>
</tr>
</tbody>
</table>

### Notes

1. The ratios have been calculated in accordance with the guidelines from “Finansforeningen” [The Danish Finance Society] [Recommendations and Financial ratios].
2. Based on proposed dividend.
Group business areas

Vestas

Consolidated

Vestas’ consolidated numbers comprise Vestas Wind Systems A/S and the subsidiaries over which Vestas exercises control. Vestas covers the two business areas: Power solutions and Service. MHI Vestas Offshore Wind A/S is accounted for using the equity method.

In a rapidly changing market, Vestas achieved an increase in order intake compared to 2018, with a record-high 17,877 MW. This also resulted in an order backlog of 20,974 MW. Activity levels remained at a high level with 12,618 MW produced and shipped and 12,884 MW delivered to the customers.

Vestas’ reputation as a trusted service partner for customers was confirmed by 2019’s order intake. At the end of 2019, Vestas had service agreements in the order backlog with expected future contractual revenue of EUR 17.8bn, an increase of EUR 3.5bn compared to 2018. At the end of the year, Vestas had a total of 96 GW under service across 69 countries.

Accounted for as a joint venture in Vestas, MHI Vestas Offshore Wind A/S generated a net profit of EUR 6m. The solid order backlog, provides a good foundation for the future activity level, and positions the joint venture well to capture the opportunities of an expected increase in offshore wind power installations.

Key highlights 2019

Revenue
EUR 10,276m

EBIT before special items
EUR 742m

Order backlog
EUR 16.0bn

Key highlights 2019

Revenue
EUR 1,871m

EBIT before special items
EUR 482m

Order backlog
EUR 17.8bn

Key highlights 2019*

Revenue
EUR 1,435m

Net profit
EUR 6m

Order backlog
2,870 MW

* The information reflects the amounts presented in the financial statements of MHI Vestas Offshore Wind A/S (and not Vestas’ share of those amounts) for the period 1 January - 31 December 2019.
Income statement
Result for the year
Revenue
Revenue in 2019 amounted to EUR 12,147m, an increase of 20 percent compared to 2018, and hence Vestas closed the year with a revenue in the high end of the guidance range of EUR 11.0bn-12.25bn. Compared to 2018, revenue included a positive impact of approx. EUR 200m from foreign exchange rates effects.

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>12,147</td>
<td>44%</td>
</tr>
<tr>
<td>2018</td>
<td>8,423</td>
<td></td>
</tr>
</tbody>
</table>

In just four years, Vestas has managed to increase revenue by 44 percent – from EUR 8,423m in 2015 to EUR 12,147m in 2019.

The regions Europe, Middle East, and Africa (EMEA) and Americas accounted for 43 percent and 45 percent of the revenue, respectively, which is roughly the same distribution as seen the previous years.

Gross profit
Gross profit in 2019 amounted to EUR 1,761m, corresponding to a gross margin of 14.5 percent, a 1.6 percentage point decrease relative to 2018. The gross margin decrease was driven by lower average project margins in the Power solutions segment, which primarily reflected increased costs for tariffs and transport, overall tightness in the supply chain as well as some higher ramp-up costs and warranty provisions related to introduction of new products. This was partly offset by improved Service profitability as well as a reversal of write-downs on inventory of EUR 1.2bn related to the sale of 80 percent shares in subsidiaries that own three wind power plants in Romania.

Research and development costs
Research and development costs recognised in the income statement amounted to EUR 268m, compared to EUR 229m in 2018. The total research and development expenditure prior to capitalisation and amortisation increased by 14 percent to EUR 372m in 2019 (2018: EUR 325m), due to development activities as part of bringing new technology to the market including introduction of new product variants and service solution offerings.

Distribution costs
Distribution costs amounted to EUR 222m in 2019 (2018: EUR 189m). The increase was mainly due to additional depreciation in the supply chain area for transport equipment driven by new blade types and high activity.

Administration costs
Administration costs amounted to EUR 267m (2018: EUR 254m) and constituted 2.2 percent of revenue in 2019, a decline of 0.3 percentage points compared to 2018.

Depreciation, amortisation, and impairment
Overall depreciation, amortisation, and impairment amounted to EUR 546m before special items in 2019 (2018: EUR 435m). The increase was primarily a result of recent years’ higher capitalisation of costs related to the development and introduction of new technologies and product variants, including transport equipment.

Operating profit (EBIT)
EBIT before special items amounted to EUR 1,004m in 2019 (2018: EUR 959m), equivalent to an EBIT margin of 8.3 percent before special items, which is within the guidance range of 8-9 percent. The 1.2 percentage point decrease in EBIT margin before special items compared to 2018 was mainly driven by the lower gross profit margin as well as higher capacity costs.

Income from investments in joint ventures
Income from investments in joint ventures amounted to a profit of EUR 3m in 2019 (2018: EUR 40m). The profit in 2019 derives mainly from Vestas’ share of the result in MHI Vestas Offshore Wind on a standalone basis.

Net financial items
Financial items for 2019 amounted to negative EUR 98m (2018: EUR 51m) and comprised interests, fees, and currency related items. The negative deviation year on year was mainly driven by adverse developments in various currencies, particularly in the emerging markets.

Income tax
Income tax amounted to EUR 209m, equivalent to an effective tax rate of 23 percent (2018: 25 percent). The change in effective tax rate was due to the non-taxable gain from reversal of write-downs on inventory of EUR 120m in third quarter of 2019.
Profit for the year
Profit for the year amounted to EUR 700m in 2019 (2018: EUR 683m). The increase compared to the year before was mainly a result of higher revenue and a lower effective tax rate.

As the targets for bonus payout were achieved in 2019, a global bonus of EUR 107m will be distributed (cash effect 2020). There was no bonus payout for 2018.

Profitability ratios
Earnings per share amounted to EUR 3.57 in 2019, an increase of EUR 0.16 compared to 2018, mainly driven by a higher net profit, supplemented by share buy-backs executed in the fourth quarter.

Return on capital employed (ROCE) was 19.7 percent in 2019, a decline compared to 2018 by 20.4 percent in 2018. The negative development can be attributed to an increase in total equity.

Return on equity was 22.1 percent in 2019 (2018: 22.6), a decrease of 0.5 percentage points, which can also be attributed to a higher equity balance relative to increased earnings.

Warranty provisions
Warranty provisions in 2019 amounted to EUR 291m, equivalent to a warranty ratio of 2.4 percent of revenue in the year which was 0.8 percentage points above the ratio in 2018. The increased warranty provisions are a consequence of a steep delivery ramp-up and the acceleration of new product introductions, which require additional rework and repairs on new blade variants.

Working capital and cash flow
Net working capital
Net working capital amounted to a net liability of EUR 1.6bn as at 31 December 2019, which was EUR 0.4bn below net liability at the end of 2018. During 2019, the level was negatively impacted by build-up of inventory for deliveries in 2020 and increased trade receivables as a result of record-high revenue in the fourth quarter of 2019. These effects were partly offset by higher down- and milestone payments from customers and trade payables towards suppliers.

Cash flow from operating activities
Cash flow from operating activities was EUR 823m in 2019, which is a decrease of 19 percent compared to last year. The decrease was mainly driven by the mentioned negative development in net working capital during 2019, particularly with a very high release of net working capital in the fourth quarter of 2018, not fully matched in 2019.

Cash flow from investing activities
Cash flow from investing activities amounted to net outflow of EUR 729m, compared to the guidance of approx. EUR 800m. This is excluding the acquisition of SoWiTec Group GmbH (SoWiTec), any investments in marketable securities, and short-term financial investments. The EUR 126m increase in the net investment level compared to 2018 was driven by investments in technology-related development as well as investments in blade moulds, transport equipment and tools to cater for high activity and introduction of new technology and product offerings.

Free cash flow
The free cash flow, excluding the acquisition of SoWiTec, any investments in marketable securities, and short-term financial investments, amounted to positive EUR 94m (2018: EUR 418m).

Acquisitions
SoWiTec
In the third quarter of 2019, Vestas acquired 25.1 percent of the share capital of SoWiTec to support Vestas’ co-development strategy and to improve hybrid offerings. Vestas has the option to acquire 100 percent of the share capital and consequently, SoWiTec has been fully consolidated in Vestas’ consolidated financial statements.

Capital structure and financing items
Equity and solvency ratio
As at 31 December 2019, total equity amounted to EUR 3,345m, an increase from the year before of EUR 3,104m, which can be attributed to a positive net result.

As at 31 December 2019, the solvency ratio was 23.3 percent, which is a decline of 2.8 percentage points from the end of 2018, mainly as a result of higher total assets driven by build-up of inventory and trade receivables. To a lesser degree, the solvency ratio was impacted by changes to accounting policies as per 1 January 2019. These changes include capitalisation of operating lease contracts as per implementation of IFRS 16, and implementation of IFRIC 23, clarifying the accounting practice for uncertain tax positions. Combined, the impact from these changes was a decrease in equity of EUR 43m and an increase in total assets of EUR 255m, corresponding to a negative impact of 0.9 percentage points to the solvency ratio as at 1 January 2019.

To adjust Vestas’ capital structure and to meet the obligations arising from share-based incentive programmes to employees, in 2019, Vestas repurchased 2,302,859 shares, corresponding to EUR 201m, under a share buy-back programme executed during the months of November and December.

The strength of the balance sheet, combined with the results achieved in 2019, has led the Board of Directors to recommend a dividend of DKK 7.93 (EUR 1.06) per share equivalent to 30.0 percent of the net result for the year after tax.

Net interest-bearing position and cash position
As at 31 December 2019, Vestas’ net interest-bearing position was positive of EUR 2,452m, a decline of EUR 594m compared to 2018. This development was primarily a result of distributing cash to shareholders through dividend and share buy-back programme in excess of the free cash flow generated in the year, and as well a reflection of lease liabilities in financial debt of EUR 198m from the implementation of IFRS 16 Leases as per 1 January 2019.

Cash and cash equivalents amounted to EUR 2,888m as at 31 December 2019 (2018: EUR 2,918m).

The ratio net interest-bearing debt/EBITDA was (1.6) as at 31 December 2019 (2018: (2.2)). This adverse development was driven by the decline in net interest-bearing position supplemented by higher operating profit (EBITDA). The ratio remains well below the capital structure target of a net interest-bearing debt/EBITDA ratio below 1 x.
### Revenue
<table>
<thead>
<tr>
<th>Americas</th>
<th>EUR 4,626m</th>
<th>Europe, Middle East, and Africa</th>
<th>EUR 4,397m</th>
<th>Asia Pacific</th>
<th>EUR 1,253m</th>
</tr>
</thead>
</table>

### Order intake – firm and unconditional orders
<table>
<thead>
<tr>
<th>Americas</th>
<th>10,269 MW</th>
<th>Europe, Middle East, and Africa</th>
<th>6,001 MW</th>
<th>Asia Pacific</th>
<th>1,607 MW</th>
</tr>
</thead>
</table>

### Deliveries
<table>
<thead>
<tr>
<th>Americas</th>
<th>5,839 MW</th>
<th>Europe, Middle East, and Africa</th>
<th>5,319 MW</th>
<th>Asia Pacific</th>
<th>1,726 MW</th>
</tr>
</thead>
</table>

### Order backlog – firm and unconditional orders
<table>
<thead>
<tr>
<th>Americas</th>
<th>10,593 MW</th>
<th>Europe, Middle East, and Africa</th>
<th>7,891 MW</th>
<th>Asia Pacific</th>
<th>2,490 MW</th>
</tr>
</thead>
</table>

### Installed wind turbines in
<table>
<thead>
<tr>
<th>Americas</th>
<th>9 countries</th>
<th>Europe, Middle East, and Africa</th>
<th>25 countries</th>
<th>Asia Pacific</th>
<th>8 countries</th>
</tr>
</thead>
</table>
Financial performance
Result for the period
In 2019, revenue from Power solutions, Vestas’ onshore wind energy segment, amounted to EUR 10,276m (2018: EUR 8,465m). This was primarily driven by high activity levels in Americas, and particularly in the USA.

EBIT before special items from Power solutions amounted to EUR 742m, a 1.6 percentage point decrease compared to 2018. Consequently, the EBIT margin before special items was 7.2 percent (2018: 8.9 percent). This decline was primarily driven by increased costs related to tariffs and transport, general tightness in the supply chain, as well as ramp-up costs and warranty provisions related to introduction of new products. This was partly offset by reversal of write-downs on inventory of EUR 1.20bn related to the sale of 80 percent shares in subsidiaries that own three wind power plants in Romania.

Order intake
In 2019, onshore wind turbine order intake amounted to a record 17,877 MW, a 26 percent increase from 2018. The trend with increasing order intake thereby continues, underpinning the strong demand for wind power and Vestas’ wind power solutions globally. The order intake in 2019 corresponded to EUR 13.8bn (2018: EUR 10.6bn) and resulted in an average selling price of EUR 0.77m per MW.

Europe, Middle East, and Africa accounted for 34 percent of the order intake, and the region continues to be important for Vestas, with countries such as Finland, France, and Germany as largest contributors. In the region, the order intake was driven by 21 countries highlighting the highly diversified demand.

Americas represented more than 50 percent of the order intake, with the USA and Brazil as the most important markets. Thereby, the region continues its trend of increasing annual order intake for the fourth year in a row.

The Asia Pacific region accounted for 9 percent of the total firm and unconditional orders with Australia as the largest single contributor.

Order backlog
At the end of the year, the wind turbine order backlog amounted to 20,974 MW, equalling EUR 16.0bn. This resulted in an average price per MW in the order backlog of EUR 0.76. Compared to last year, the order backlog in MW increased by 34 percent from the strong order intake in 2019.

Onshore deliveries in 2019 - to more than 40 countries

<table>
<thead>
<tr>
<th>Region</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas</td>
<td></td>
<td>+17%*</td>
</tr>
<tr>
<td>Europe, Middle East, and Africa</td>
<td></td>
<td>+29%*</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td></td>
<td>+0.2%*</td>
</tr>
</tbody>
</table>

* Compared to 2018.
Global trends in the onshore wind power market
The global market for wind energy is facing strong demand and the volume of annual installed onshore wind power capacity is expected to have increased to 60 GW in 2019 (2018: 46 GW). This represents an increase of 35 percent compared to 2018 and is expected to be supported by all major regions. The region Europe, Middle East, and Africa was driven by increased installation levels in Scandinavia and Spain, while Latin America was primarily represented by Mexico and Argentina. Installations in Asia Pacific were primarily driven by Australia and China. In the USA, projects previously qualified for the full Production Tax Credit (PTC) create strong activity levels in the country.

By the end of 2019, the window to qualify new projects for the PTC was extended. This allows customers to qualify projects for 60 percent of the original PTC value until the end of 2020 and is expected to create a solid demand for installations until the end of 2024.1

Competitiveness of wind power continues to improve
With the broad introduction of auctions across most markets globally, renewable energy, and especially wind power, has established itself as the cheapest source in many markets when it comes to generating electricity. In fact, wind power and solar PV have now developed to be the most competitive sources of electricity generation in more than two-thirds of the world.2

As for wind power specifically, in 2014, the list of countries having wind power as the most competitive source of electricity included only Uruguay, Denmark, and Germany. In 2019, it includes important electricity markets such as the USA, India, China, Brazil, and many more.3

This development serves as the largest driver for a healthy demand situation in the wind power industry and at the same time forms the basis for a strong outlook in the future.

Developments in Power solutions during the year
During the year, Vestas has seen the market for onshore wind energy maturing even further. As wind power becomes more competitive, new customers such as corporates and financial institutions are entering the market; technology has been further developed with the introduction of a new modular platform, and Vestas’ global manufacturing and supply chain has been made more lean and scalable to cater for higher demand.

The market for wind power solutions continues to develop
In the Power solutions segment, Vestas leverages its legacy and current position as the global leader in onshore wind power measured on scale, market reach, innovation, and global footprint to serve customers’ needs globally. This position is used to expand the reach of wind energy and develop, sell, and deliver superior onshore wind power plant solutions. These solutions ensure enhanced performance for both owners of wind power plants and operators of broader electricity systems.

Increasing market complexity
As the competitiveness of wind power improves, Vestas’ customers are also getting more advanced. Multiple avenues to secure off-take of electricity are entering the stage, such as fixed Power Purchase Agreements (PPAs) in auctions, dealing directly with corporations as end customers, or simply supplying produced electricity into the grid at merchant terms – or even a combination of all three. This increased complexity reemphasises the importance of optimising the wind power solution at each and every site, and Vestas’ experience and technology lead becomes ever more important to constantly maximise the value of customers’ investments.

As an example, Vestas saw a number of projects in 2019 with customers relying fully on the merchant terms of the electricity market. This includes wind power projects in Denmark, the UK, Italy, Finland, and Australia, and showcases wind power as commercially viable without any direct support, utilising Vestas’ industry-leading technology and ability to maximise site-specific output.

In addition, customers are securing PPAs directly with corporates as a supplement to purchase agreements secured through large-scale tenders and auctions. In 2019, it is expected that close to 20 GW of all onshore wind power projects have been with a corporate company as the off-taker of electricity; and with corporations committing to a larger share of renewable energy in their operations, this proves an interesting opportunity for the wind power industry.4 As examples, Vestas secured orders from large corporations in Brazil, Mexico, and Finland; the latter wind park supplying clean and reliable energy directly to the operations of Google.

Repowering
Favourable wind sites and improved economics of onshore wind energy present an attractive opportunity for Vestas and its customers once the installed wind turbine reaches the end of its lifecycle. The market for repowering is expected to provide the wind power industry with more stability, but is still in an early stage, and is mainly centred around Europe and the USA.

The volume from repowering projects outside Europe and the USA is likely to increase beyond 2020. Interestingly, repowering orders are projected to come as an addition to new wind power installations as the need for new electricity generation capacity grows and will support a continuous high level of activity in more mature markets.5

Expanding commercial capabilities through development
The maturing of wind energy is also unlocking growth opportunities in new markets and customer segments for Vestas. To grasp these opportunities and increase the capability to partner with customers, in 2019, Vestas acquired a minority stake in SoWiTeC Group GmbH, a leading sustainable energy developer with a broad portfolio of renewable projects. This acquisition strengthens Vestas’ co-development portfolio and improves the offerings to customers in strategic markets such as Latin America, Asia, and other markets where Vestas’ extensive experience can make projects materialise through local knowledge.

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Further, in 2019, Vestas took over RES America Developments Inc. (RES)'s share in Roaring Fork Wind, LLC, a co-development joint venture between Vestas' wholly owned subsidiary Steelhead Americas, and RES. Vestas took over RES' stake as well as a development pipeline of 1.4 GW.

Vestas continues to work with key partners on the development of solutions such as co-development that address a wind park's full value chain to maximise return on investment and profitability. By doing so, Vestas provides solutions for its customers and creates new revenue opportunities.

**Manufacturing and supply chain capabilities**

Increasing annual global installations of wind turbines and a continuously strong demand is raising the importance of a lean and scalable manufacturing and supply chain setup. In addition, complexities in terms of trade tariffs between various countries result in additional transportation needs, as suboptimal sourcing opportunities suddenly become the most feasible option. Within this context, the unmatched globality of Vestas' manufacturing and supply chain footprint is of utmost importance. For more information regarding the impact and mitigation of trade barriers, see Risk management, page 053.

**Ramping up for higher activity levels and new products**

While managing additional supply chain complexities, during 2019, Vestas ramped up its manufacturing and supply chain for a higher activity level. The capacity of produced and shipped wind turbines consequently increased to 13 GW (2018: 11 GW). The largest part of the produced and shipped wind turbines comprised the upgraded variant of the 4 MW platform, the V136-4.2 MW™ turbine, and highlights the requirement of a fast ramp-up of new turbines.

Toward the end of the year, preparations for the production of the V150-4.2 MW™ turbine began in order to deliver on the strong order intake received during the year. For further information on risks associated with higher volumes and faster product cycles, see Risk management, page 053.

**Optimising the global manufacturing and supply chain footprint**

During 2019, Vestas continued the optimisation of its manufacturing footprint to support the increase of volumes and new products in regions and countries that offer strong growth, see the illustration on page 020.

Vestas expanded its own capacity in several parts of the world. In India, Vestas will establish a new nacelle and hub assembly factory in Chennai in the state of Tamil Nadu, as announced in July 2019. The new factory, which is expected to be operational by the end of 2020, will combine Vestas’ two existing facilities in the state of Tamil Nadu, creating an expanded, optimised, and scalable production hub with four times as many local manufacturing jobs in the state.

To be locally present in markets with high activity levels, Vestas has started production of its V150-4.2MW™ turbine in Brazil, in the state of Ceará, where the production of 2 MW nacelles is also located. In June 2019, Vestas signed a Memorandum of Understanding in Russia regarding localisation of equipment for the Russian sustainable energy market, including supply chain optimisation and local manufacturing of wind turbine components.

**Ambition for procurement and future partners to the value chain**

Vestas is not only investing in its own size and manufacturing capabilities, but as well in the scale of the full value chain.

Through partnerships with suppliers on blade manufacturing, Vestas is able to execute a higher activity level while at the same time complying with local content requirements.

In 2019, approx. 40 percent of the blade production was outsourced, this to three different suppliers across five different markets. This adds to the flexibility and cost effectiveness of Vestas' manufacturing footprint in all regions and further supports local content in important markets. In Brazil, Vestas works closely together with wind turbine blade manufacturer Aeris Energy to support local manufacturing, and...
through an extensive partnership, TPI Composites, Inc. is manufacturing Vestas blades in important markets like Mexico, Turkey, India, and China. Further, Vestas has expanded its collaboration with Shanghai Aeolon Wind Energy Technology Development Co., Ltd. to produce V136 blades while ramping up production of V150 blades in China towards 2020.

Going forward, Vestas aims to continue close partnerships with external suppliers to secure efficiency and flexibility of its full manufacturing and supply chain.

A leap in new technology
Vestas has been at the frontier of wind energy for 40 years, introducing market-leading wind energy solutions that have driven down the cost of energy and taken wind energy from niche to mainstream. In January 2019, Vestas introduced the EnVentus™ wind turbine platform, which represents another significant step forward in the continuous efforts to lower the levelised cost of energy and accelerate the global transition to a more sustainable energy mix.

As Vestas’ first onshore platform introduction since 2011, EnVentus™ combines proven technology and system designs from Vestas’ 2 MW and 4 MW platforms, and the 9 MW offshore platform with advanced modularity, building a foundation that reliably and efficiently lowers the cost of energy. Modularity is a fundamental change in how products are developed, sourced, manufactured, serviced, and upgraded, and all based on a new structural architecture providing multiple increasing benefits to Vestas and its customers and shareholders for many years to come.

Similar to all other OEMs in the wind power industry, Vestas’ conventional approach to product development offered limited synergies between products. Any design change to a turbine variant caused corresponding design changes in other parts of the turbine, as well as changes to processes, standards, tools, training, and servicing – all of which increased required costs and time. With increased market complexity and consequently shorter product lifecycles, this represents an unsustainable balance between cost of development and value creation.

In a rapidly developing market where each stage of a product lifecycle – from product design, procurement and manufacturing, transportation, and installation to operations, service and power plant upgrades – in general becomes shorter, the development of new and more efficient solutions results in an unsustainable balance. To keep up with the pace of innovation, while maintaining the same high level of robustness required by the wind energy market, Vestas embarked on the journey of introducing full modularity in all stages of the product lifecycle.

A modular architecture breaks down wind turbines into individual modules, with each module delivering a specific function such as wind capture or electrical conversion, and each contributing to the ultimate purpose of a wind turbine. Each module is based on a defined technology concept, design rules, value chain processes and standard interfaces to connect with adjacent modules. Going forward, product development will therefore take place at module level to meet customer needs while complying with the defined architecture. Mainly within blades and nacelles, this modularisation will reduce the number of unique components across the variety of the EnVentus™ platform as 60 percent of components are identical regardless of the combination of modules. On the current product portfolio comprising the 2 MW and 4 MW platform, there are only 20 percent of components that are identical across the different turbine variants. To maximise the value creation from this modularisation, towers will increasingly become site-specific, though still leverage the modularised interface and internals needed to generate multiple variants.

While it is Vestas’ unmatched scale, global presence, and industry-leading database that make this modular setup possible in the first place, it allows Vestas to continuously lead industry innovation going forward. Examining modularity through the lens of the product lifecycle, benefits emerging from the increased synergies across products include: Acceleration of time to market, maintaining quality of new products, simplified process from order to installation, maintaining power curve certainty, and maintaining service and upgrade reliability.
Global footprint

<table>
<thead>
<tr>
<th>Service</th>
<th>1-999 MW</th>
<th>1,000-4,999 MW</th>
<th>5,000 MW and above</th>
<th>Countries in which Vestas has service contracts</th>
</tr>
</thead>
</table>

### Americas
- **Revenue**: EUR 633m
- **Share of the region's total revenue**: 12%
- **Under service**: 37,223 MW
- **Expected contractual revenue of order backlog**: EUR 6,660m
- **Provides service in**: 18 countries

### Europe, Middle East, and Africa
- **Revenue**: EUR 1,045m
- **Share of the region's total revenue**: 19%
- **Under service**: 48,425 MW
- **Expected contractual revenue of order backlog**: EUR 9,447m
- **Provides service in**: 40 countries

### Asia Pacific
- **Revenue**: EUR 193m
- **Share of the region's total revenue**: 13%
- **Under service**: 10,663 MW
- **Expected contractual revenue of order backlog**: EUR 1,657m
- **Provides service in**: 11 countries
Financial performance

Result for the period
In 2019, the onshore Service business generated revenue of EUR 1,871 m, which equals a year-on-year growth rate of 1.2 percent (1.1 percent excluding impacts from currency translation). The revenue in the Service business continues to be positively impacted by an increasing fleet of installed wind turbines.

Profitability in the Service business continues to be strong, and in 2019, the EBIT margin increased to 25.8 percent (2018: 25.2 percent). This development was primarily driven by reliable performance of wind turbines under service contracts as well as efficient cost management and Vestas’ industry-leading global scale.

Revenue and EBIT margin before special items

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue (mEUR)</th>
<th>EBIT margin before special items (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>1,200</td>
<td>20</td>
</tr>
<tr>
<td>2016</td>
<td>1,500</td>
<td>22</td>
</tr>
<tr>
<td>2017</td>
<td>1,800</td>
<td>24</td>
</tr>
<tr>
<td>2018</td>
<td>1,780</td>
<td>26</td>
</tr>
<tr>
<td>2019</td>
<td>1,800</td>
<td>25.8</td>
</tr>
</tbody>
</table>

Continuous growth

64 percent revenue growth since 2015 with an EBIT margin leap of 8 percentage points.

Order backlog
At the end of 2019, Vestas had onshore service agreements in the order backlog with an expected future contractual revenue of EUR 17.8bn, which is an increase of EUR 3.5bn compared to 2018. This provides the service business with strong visibility and the ability to continue the reduction of the cost of maintenance for wind turbines.

Global trends in the onshore wind power service market
A strong growth in onshore wind power installations continues to fuel the growth in the global wind power service market. In 2019, the cumulative installed capacity is expected to have grown 11 percent to 600 GW.1)

This growth offers both promising opportunities and challenges as the market becomes more mature but at the same time requires greater stability and predictability for wind power as an energy source as it penetrates a larger part of the overall energy mix. Within this context, service of wind turbines plays a crucial role and scale will continue to be critical for service providers. To constantly provide customers with the right value proposition as the focus on life cycle cost of wind power increases, Vestas continues to improve its service capabilities.

Digital transformation
As the digital transformation continues, having the right digital platform has never been more important in order to deliver predictable and cost-efficient solutions, both of which are of high value for customers and grid operators.

With the increasing amount of renewable energy in the system, grid operators must address the challenge of balancing supply and demand from intermittent energy generation. One way of meeting this challenge is to use advanced forecasting tools to provide predictability in renewable energy generation in order to keep the grid stable. Secondly, having the right digital platform is ever important in order to deliver more efficient service and maintenance operations and increased energy production that matches the off-take in the grid.

Developments in Service during the year
The global service business combines advanced digital capabilities with unique operational and technical insights. In its Service division, Vestas is investing in a future, increasingly digitised operating model, which will transform the way the workforce operates individually and as a team. This will make Vestas’ commercial and operational activities even more globally aligned, efficient, and transparent. The simplified processes, automated tools, and improved planning will increase workforce efficiency in the field as well as improve both employee and customer satisfaction. The end-to-end scope of the programme and global implementation footprint means that Vestas will benefit from its scale along the full service value chain and realise benefits across the value chain. The programme is an important step when it comes to cost-out opportunities as well as enhancing its customer offerings in the Service business.

Vestas offers its customers a range of service solutions covering all areas of the wind power service business: maintenance partnering, parts & repair offerings, fleet optimisation solutions, and digital solutions to help customers optimise the output of wind power projects.

Vestas’ four-leg service portfolio
The four-leg service portfolio contributes to increasing performance and lowering the cost of energy for customers’ wind power plants and positioning Vestas as the one-stop shop for lifetime plant maintenance. Vestas works closely with its customers to tailor service packages to meet site-specific wind power plant requirements. Responding to Vestas customers’ evolving demands, Vestas offers a new generation of flexible fleet optimisation capabilities such as advanced plant and data management, diagnostics, and forecasting.

Vestas wind power service concepts

Vestas provides a number of tailored Active Output Management® packages. Whatever the needs related to a specific onshore project, there will be one to suit the customer.

### AOM 1000
- **Maximum flexibility**
  - The customer gains access to all of Vestas’ capabilities, available on a time and material basis.

### AOM 2000
- **Reduced risk**
  - Sustained turbine performance through regular preventative maintenance, with all components available on a time and material basis, and a selection of optional add-ons.

### AOM 3000
- **Shared risk**
  - A complete package with a flat fee, and main components on a time and material basis. The customer’s risk profile is shared with Vestas. Once the initial contract has expired, AOM 3000 enables replacement with a model for greater risk sharing.

### AOM 4000
- **Maximized uptime**
  - Everything a turbine requires, including main components and materials. This option includes a time-based availability guarantee of up to 97 percent uptime. The customer can also use the new Vestas Performance Manager software, ensuring complete transparency at all times.

### AOM 5000
- **Move wind from hour to power**
  - AOM’s all-inclusive, comprehensive energy-based option. Energy-based availability guarantee maximizes output by carrying out service and maintenance only during low-wind periods. Guarantee based on 97 percent energy-based availability, moving the availability measure from hour to power. The customer can also use Vestas’ Performance Manager software, ensuring complete transparency at all times.

## Maintenance partnering

The maintenance partnering based on the Active Output Management® (AOM) service concept remains the core of Vestas’ portfolio. With ample opportunities to further increase efficiency in the service of onshore wind turbines, the concept of full-scope service offerings remains critical in order for the customers to realise the lowest possible cost of onshore wind energy.

### AOM 2000-5000* signed with new wind turbine orders

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOM 2000</td>
<td>0.0</td>
<td>0.7</td>
</tr>
<tr>
<td>AOM 3000</td>
<td>7.0</td>
<td>6.9</td>
</tr>
<tr>
<td>AOM 4000</td>
<td>27.2</td>
<td>32.8</td>
</tr>
<tr>
<td>AOM 5000</td>
<td>65.8</td>
<td>59.6</td>
</tr>
</tbody>
</table>

* AOM 1000 not included as it conceptually registers as pay-as-you-go services on demand.

For yet another year, demand remained high for service contracts with a comprehensive scope. Further, Vestas has observed an extended duration both when signing new contracts and within the service order backlog. In fact, in 2019, the average length of full-scope contracts signed was 18 years, while the average duration of the backlog was unchanged from the year before at eight years.

This development is a result of Vestas’ continued capabilities to guarantee a certain performance of its wind turbines during their lifetime and is to a large extent driven by strong analytical skills utilising a vast repository of data.

### Parts & repair

Vestas offers an extensive range of parts & repair services for Vestas and multibrand turbine platforms. The Parts Services provide access to over 60,000 items available through customer service, via Vestas’ online eCommerce platform, or through one of the Active Material Management programmes. The Repair Services provide customers with a fleetwide one-stop shop for value added services that range from advanced inspections and asset management programmes, to uptower and downtower repair and exchange of major components and blades.

### Fleet optimisation

As wind technology matures, turbines already in operation can be upgraded to yield more energy and thereby improve an existing wind power plant’s output, thus improving the customers’ business case. Improvements of the production efficiency of a wind power plant can be carried out through site-specific optimisation of operational parameters, implementation of intelligent software algorithms, and enhanced aerodynamic add-ons.

As an example, in 2019, Vestas upgraded various wind farms in Australia consisting of V90-3.0 MW® and V117-3.3 MW® turbines. This fleet optimisation deal included controller upgrades for better operational use of data, enabling of power modes, extended cut-out wind speeds as well as...
as aerodynamic upgrades. Altogether, this improved the power curve and boosted annual energy production from the turbines by approx. 3 percent.

Digital solutions
With the acquisition of Utopus Insights, Inc. in 2018, Vestas embarked on a digital journey to orchestrate the future of energy as the global energy sector is transforming. Together with Utopus Insights, Vestas offers customers a suite of best-in-class analytics applications across energy sources that support the digitalisation of renewable energy assets and energy systems as well as addresses well-known challenges such as predictive maintenance, forecasting, and power plant optimisation.

A key milestone in this journey was the introduction of Scipher, an advanced energy analytics platform. This data platform enables a broad range of digital solutions by harvesting, deciphering and processing complex, vast amounts of data. Scipher thereby secures high standards in the accuracy of production forecasting, output optimisation and orchestration of energy portfolios in a cost-effective manner, which again leads to grid stability. Vestas and Utopus Insights offer customers digital solutions that provide a visualisation of performance insights (Scipher.Vx), hyper-local weather forecasts to predict energy generation (Scipher.Fx), and advanced predictive maintenance, enabled through artificial intelligence (Scipher.Rx).

During 2019, Vestas announced Australia to be the first country to leverage the wind energy forecasting offerings of the Scipher.Fx product. In collaboration with the Australian Renewable Energy Agency, the solution will improve upon the Australian Wind Energy Forecasting System’s five-minute forecast and improve weather forecasting precision from 16 km² to 1 km². The Scipher.Fx products will be deployed and piloted at several Australian wind farms consisting of Vestas wind turbines and follows the introduction of the Scipher.Vx products already introduced to the market in 2018.

Multibrand service solutions
Vestas’ journey of increasing its multibrand capabilities continues. The maintenance packages can be put together to specifically support long-term service and provide the customer with crucial lifetime extensions for old or legacy turbine technologies.

Including all the major turbine brands, Vestas has multibrand service deals across more than 347 sites in 20 countries. Leveraging scale and efficiencies from Vestas turbines under service, Vestas is able to raise the performance on most sites for a variety of different turbine models.

During 2019, Vestas has signed several multibrand contracts across all major regions including the USA, and several markets in Europe and Asia Pacific. Further, Vestas made its multibrand market entry in Denmark.

Scipher
Scalable, secure, and flexible energy analytics platform for data ingestion and curation.

To maximise value, digital solutions are developed to leverage a customer’s progress on their analytics evolution divided into three broad categories:

- **Scipher.Vx** Visualization
  - Intuitive, interactive, and customisable energy asset data visualisation and performance monitoring

- **Scipher.Rx** Maintenance
  - State-of-the-art predictive analytics that enables proactive asset maintenance

- **Scipher.Fx** Forecasting
  - Hyperlocal renewable energy forecasting powered by advanced energy-specialised weather forecasting

Approx. 85 percent of a Vestas wind turbine is recyclable – by 2040 this will be 100%
Global footprint

- **Japan**
  - Tokyo

- **Netherlands**
  - Vlissingen
  - Eiberg
  - Linn
  - Nakskov
  - Aarhus

- **Germany**
  - Hamburg

- **UK**
  - Isle of Wight
  - Flawley
  - London

- **USA**
  - Boston

- **Taiwan**
  - Taipei

Pre-assembly facility
Nacelle assembly and post manufacturing facility
Blades manufacturing facility
Paint and logistics facility
Office

Global

- **Revenue**
  - EUR 1,435m

- **Order intake**
  - 48 MW

- **Order backlog**
  - 2,870 MW

- **Order backlog – conditional orders and preferred supplier agreements**
  - 3,786 MW

- **Total installations**
  - 1,004 MW
Financial performance

MHI Vestas Offshore Wind A/S (MHI Vestas Offshore Wind) was founded in 2014 as a 50:50 joint venture between Mitsubishi Heavy Industries, Ltd. and Vestas Wind Systems A/S.

MHI Vestas Offshore Wind expects to double its revenue over a four-year period from a base of its completed financial year 2017/18, while continuously improving profitability. In addition, the ambition is to build a leading offshore service business from the growing installed base.

Result for the period

Compared to 2018, the joint venture’s revenue in 2019 increased by 29 percent to EUR 1.4bn. The revenue in 2019 was driven by deliveries to the projects Horns Reef 3 wind park in Denmark, Norther in Belgium, and Deutsche Bucht in Germany. Revenue from the project Norther was fully recognised in the second quarter of 2019 and the Horns Reef 3 wind park was fully recognised in the fourth quarter of 2019.

Net profit in the joint venture amounted to EUR 6m (2018: EUR 26m). Year on year, the EBIT performance was improving, but this was more than offset by additional non-operational costs related to a delayed project and adjustment of the tax position.

Order intake

MHI Vestas Offshore Wind signed a firm order in April 2019 with Spanish developer and construction company Cobra Group, part of the ACS Group, to provide five V164-9.5 MW™ turbines for the Kincardine floating offshore wind project, 48 MW. Furthermore, MHI Vestas Offshore Wind has during 2019 been selected preferred supplier to several offshore wind parks.

Order backlog

As at 31 December 2019, the wind turbine order backlog amounted to 2,870 MW (2018: 3,838 MW).

Accounting

The joint venture is accounted for using the equity method, and Vestas’ share of MHI Vestas Offshore Wind’s overall net result for the year is recognised in the income statement as “Income from investments in joint ventures and associates”. For Vestas, the investment amounted to 2,870 MW (2018: 3,838 MW).

As at 31 December 2019, the wind turbine order backlog amounted to 2,870 MW (2018: 3,838 MW).

Revenue and net profit

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue (mEUR)</th>
<th>Net profit (mEUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>0</td>
<td>(150)</td>
</tr>
<tr>
<td>2016</td>
<td>250</td>
<td>(100)</td>
</tr>
<tr>
<td>2017</td>
<td>750</td>
<td>0</td>
</tr>
<tr>
<td>2018</td>
<td>1,250</td>
<td>50</td>
</tr>
<tr>
<td>2019</td>
<td>1,500</td>
<td>-</td>
</tr>
</tbody>
</table>

Scaling up

While net profit has remained positive, the joint venture has increased its revenue significantly since 2016.

Global trends in the offshore wind power market

The global installed base of offshore wind energy is expected to have increased to 29 GW by the end of 2019, compared to 22 GW the year before.1) This represents an increase of 30 percent. Over the next four years, the annual installation growth is expected to average 10-15 percent.2)

Unlike the onshore wind power market, production of offshore wind turbines is centred around few but large manufacturers which makes the growth outlook for the industry even more compelling. Both the capital and the project cycle are also longer in the offshore wind power market which lead to a longer horizon when investing to be competitive and serve customer needs in the future.

Traditional markets are increasing their commitment to the offshore wind power industry to reach ambitious climate targets, and new markets, buoyed by the affordability, scale, and proximity to load centres, expects offshore wind power deployment to play a crucial role in the markets’ clean energy transition.

Developments in the joint venture during the year

Continued strong offerings in established markets

In September 2019, the UK announced the results of the latest Contracts for Difference (CfD) Allocation Round 3. The Dogger Bank, Sofia, Seagreen, and Forthwind (demo) projects will deliver 5.4 GW of installations to the UK’s energy mix between 2022 and 2025. The clearing price for the auction was GBP 41.6 per MWh for 2024/25 projects and GBP 39.6 per MWh for 2023/24 projects.3)

Soon after the CfD auction, MHI Vestas OffshoreWind announced a preferred supplier agreement with Seagreen Wind Energy Limited for up to 114 units.

In Germany, a conditional agreement was signed with Parkwind for the supply of 27 wind turbines to Arcadis Ost 1 in the Baltic Sea. The

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project will be the first to feature the V174-9.5 MW™ turbine. The joint venture also signed a preferred supplier agreement for the Baltic Eagle project (476 MW) in German waters in the Baltic Sea. The project will consist of 52 units of the V174-9.5 MW™ turbine, becoming the first V174 project.

MHI Vestas Offshore Wind was one of the first companies in the world to have their wind turbine on floating foundations and the joint venture is continuing to be a leader of this pioneering technology. In April 2019, the joint venture signed a contract for the world’s largest floating offshore wind park. The Kincardine Offshore Wind Park, located 15 km southeast of Aberdeen Bay in Scotland, will consist of five units of the V164-9.5 MW™ wind turbine. The company also signed two preferred supplier agreements for floating offshore wind power projects in France: the Croix & Belle-Île project (V164-9.5 MW™) and the Éoliennes Flottantes du golfe du Lion project (V164-10.0 MW™).

Expansion to new markets
Early market engagement in Taiwan, Japan, and the USA have provided the basis for MHI Vestas Offshore Wind’s expansion in to new markets. By 2030, USA is expected to have installed close to 20 GW, Japan close to 10 GW, and Taiwan more than 10 GW of offshore wind power.4)

New markets are still building the framework for developers and OEMs alike, with local content requirements, price and permitting among the topics being addressed over the past year. MHI Vestas Offshore Wind is working closely with authorities to demonstrate the economic value and job creation that offshore wind brings to a new market.

MHI Vestas Offshore Wind has three preferred supplier agreements this far in Taiwan:
- Project: Zone 27
  Customer: Copenhagen Infrastructure Partners
  Size: 100 MW (2021) and 452 MW (2023)
- Project: Xi Dao
  Customer: Copenhagen Infrastructure Partners
  Size: 48 MW (2024)
- Project: Zone 29
  Customer: Group China Steel Corporation
  Size: 300 MW (2024)

In November 2019, MHI Vestas Offshore Wind announced that it had secured a preferred supplier agreement for the Hibikinada Offshore Wind Farm in Japan totalling 220 MW, marking its entrance to an exciting future market with the V174-9.5 MW™ wind turbine.

Operational excellence
The first offshore installation of the V164 wind turbine was at Burbo Bank Extension in 2016. Since then, 270 V164 turbines have been installed offshore. The 200th V164 was installed at the Norther project in Belgium in February 2019, just nine months after the 100th turbine was installed at Borkum Riffgrund II in Germany. The increased speed of installation not only reflects the increasing volume in the market, it also echoes the maturity of MHI Vestas Offshore Wind processes and project capabilities after years of experience in delivering offshore wind projects.

As evidence to this operational progress, the V164 offshore wind turbine can now be installed and commissioned in half the time it took only three years ago and in the same time it took to install and commission the much smaller 3 MW turbines 10 years ago.

Projects fully or partially installed during 2019 include:
- Norther (370 MW), Belgium
- WindFloat Atlantic (25 MW), Portugal
- Deutsche Bucht (269 MW), Germany
- Northwester 2 (224 MW), Belgium

Building a service organisation
MHI Vestas Wind Offshore has increased its focus on generating more value from its service business. During 2019, the company established a new service sales organisation with the sole purpose of working closer with customers to create a service portfolio that meets an ever-increasing variety of business needs. Consequently, MHI Vestas Offshore Wind now has more than 1.3 years average duration on service contracts on the offshore wind power projects, excl. 1 GW of launch projects.

By building a balanced contract portfolio, the company aims to increase the number of long-term service contracts, create a modular portfolio of service products, deliver more value through after-sales upgrades and ensure that turbines remain part of the MHI Vestas Offshore Wind service fleet.

Technology
The company continues to increase the performance of the V164 platform with the introduction in 2019 of a 174 meter rotor and increased nominal power up to 10 MW.

Since its inception, the V164 platform has become a reliable workhorse for the offshore wind power industry and remains the most powerful commercially installed wind turbine on the market.

Development of MW rating in installations

<table>
<thead>
<tr>
<th>Year</th>
<th>MW Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>7.0</td>
</tr>
<tr>
<td>2017</td>
<td>7.5</td>
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<td>8.0</td>
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<td>2019</td>
<td>9.0</td>
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<tr>
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Manufacturing
The offshore wind power industry is seeing an increasing demand for the generation of in-market economic value in emerging markets and core markets, with many governments expecting to see rising job numbers with the increasing volume targets. MHI Vestas Offshore Wind is looking to expand its supply chain on a regional basis.

Today, the company’s manufacturing footprint consists of:
- A nacelle assembly facility at the Port of Lindø, Denmark,
- two blades manufacturing facilities at the Isle of Wight in the UK and in Nakskov, Denmark, respectively, and
- a pre-assembly facility at the Port of Esbjerg, Denmark.

During 2019, the company announced a series of Memorandums of Understanding for the manufacturing of various components in Taiwan, and an intention to increase its manufacturing presence in Scotland. These investment announcements are contingent on specific volume requirements being met in each region.

Safety
MHI Vestas Offshore Wind highly values its employees. Therefore, health and safety are consistently given highest priority to provide and maintain a safe and secure workplace for all employees.

MHI Vestas Offshore Wind is committed to:

- continuous improvement in occupational health and safety and
- giving employees the training and information they need to manage risks in their own work areas.

The continued company growth in the financial year 2018/19 combined with a steadily increasing activity level, is making an increased focus on safety paramount in all areas of the MHI Vestas Offshore Wind organisation. Consequently, additional efforts are put into preparing risk assessments for design, work instructions, and processes in the entire value chain.

Having faced a steady increasing activity level throughout the financial year 2018/19, MHI Vestas Offshore Wind has managed to keep the rate of lost time injuries at 0.89 against a target of 1.5 per one million working hours.

To further improve the safety performance and drive down the injury rate, MHI Vestas Offshore Wind will continue to dedicate high attention to the human factor. In addition to the Safety Awareness training programme and Safety Dialogue continuity, the Health, Safety and Environment department will on an ongoing basis launch several local and area targeted campaigns throughout the entire organisation to anchor the MHI Vestas Offshore Wind safety message and awareness in all areas of the business.