

Half Year

Report

2017

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# THE GLOBAL MARKET FOR OFFSHORE WIND ENERGY



WIRTSCHAFTSFORUM  
OFFSHORE  
HELGOLAND

# Contents

» *The global offshore wind industry is facing its next step towards maturity.* «

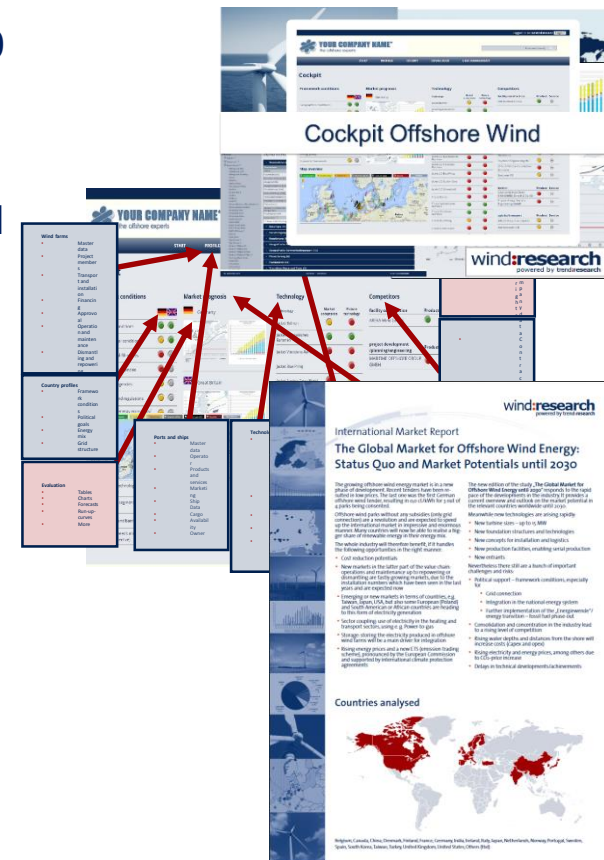
1. Introduction/Methodology
2. Framework conditions Offshore Wind Energy
3. Status Quo Offshore Wind Energy – 1st half of 2017
4. Trends and developments Offshore Wind Energy
5. Outlook and conclusion

# 1. Introduction/Methodology

## Methodology and sources

» The following studies and database provide the basis for this presentation. «

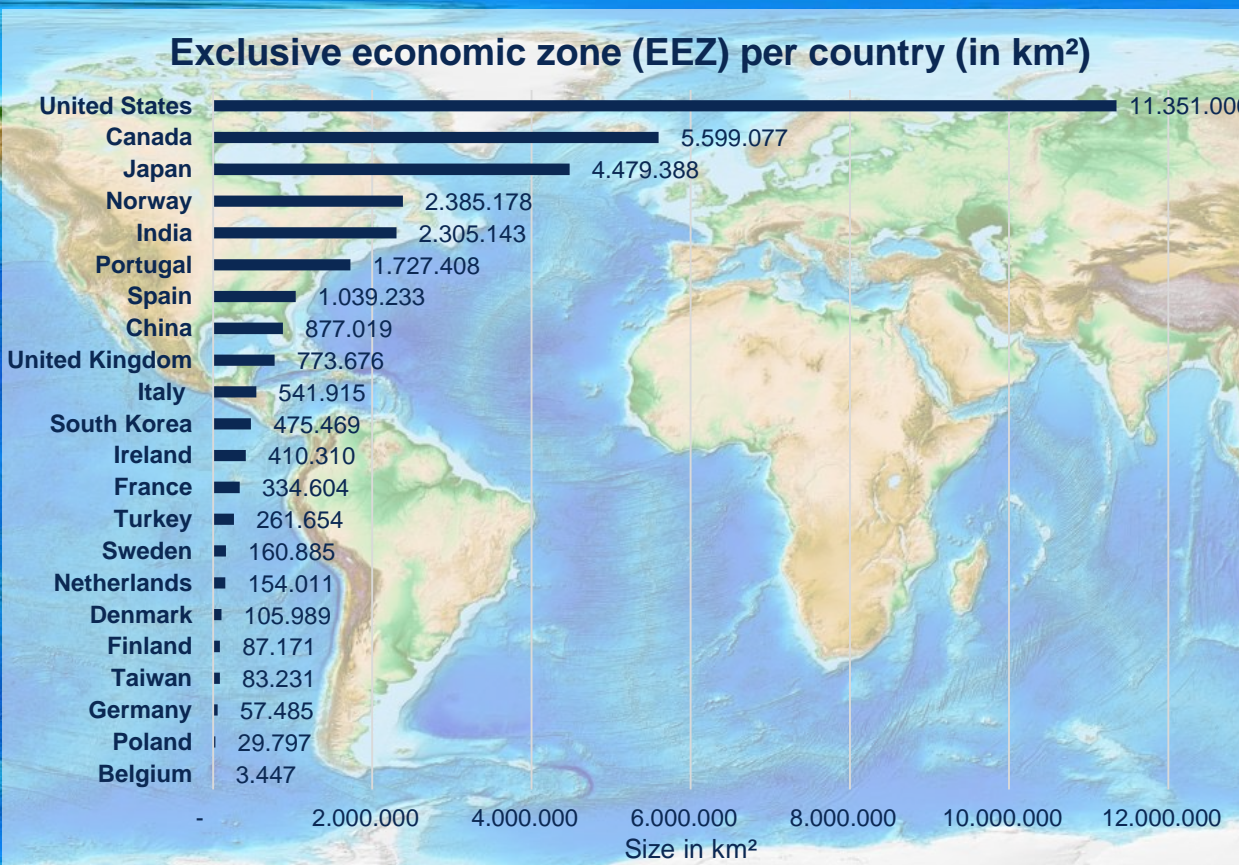
- Cockpit offshore wind: approx. 900 wind farms worldwide, over 350 criteria per farm, 32 country and 1.600 company profiles
- Various own studies, e.g.:
  - The Global Market for Offshore Wind Energy: Status Quo and Market Potentials until 2030
  - The market for operation & maintenance in the offshore wind industry until 2030
  - Cost reduction potentials for the offshore wind energy in Germany
  - The market for founding structures in offshore wind energy in Europe until 2030 (2nd ed.)
- Background: wind:research/trend:research
  - since 1997 in the energy sector
  - over 650 studies
  - more than 1.000 references, over 90 % market coverage.



## 2. Framework conditions

### 2.1 Geographical framework

» With a total area of approximately 11.4 million km<sup>2</sup>, the USA has the largest EEZ. «



Source: NOAA National Centers for Environmental Information (NCEI), 2017

## 2. Framework conditions

### 2.2 Political/legal framework

» *The political and legal framework is still the main driver for renewables. German production from offshore wind doubled in the 1st half of 2017.* «



**In December 2016 the European Commission released a new renewable energy directive.**

EU countries have agreed on a new 2030 framework for climate and energy, including EU-wide targets and policy objectives for the period between 2020 and 2030

**Targets for 2030**

**40 %** cut in greenhouse gas emissions compared to 1990 levels

At least a **27 %** share of renewable energy consumption

At least **27 %** energy savings compared with the business-as-usual scenario

**Policies for 2030: The European Commission has proposed**

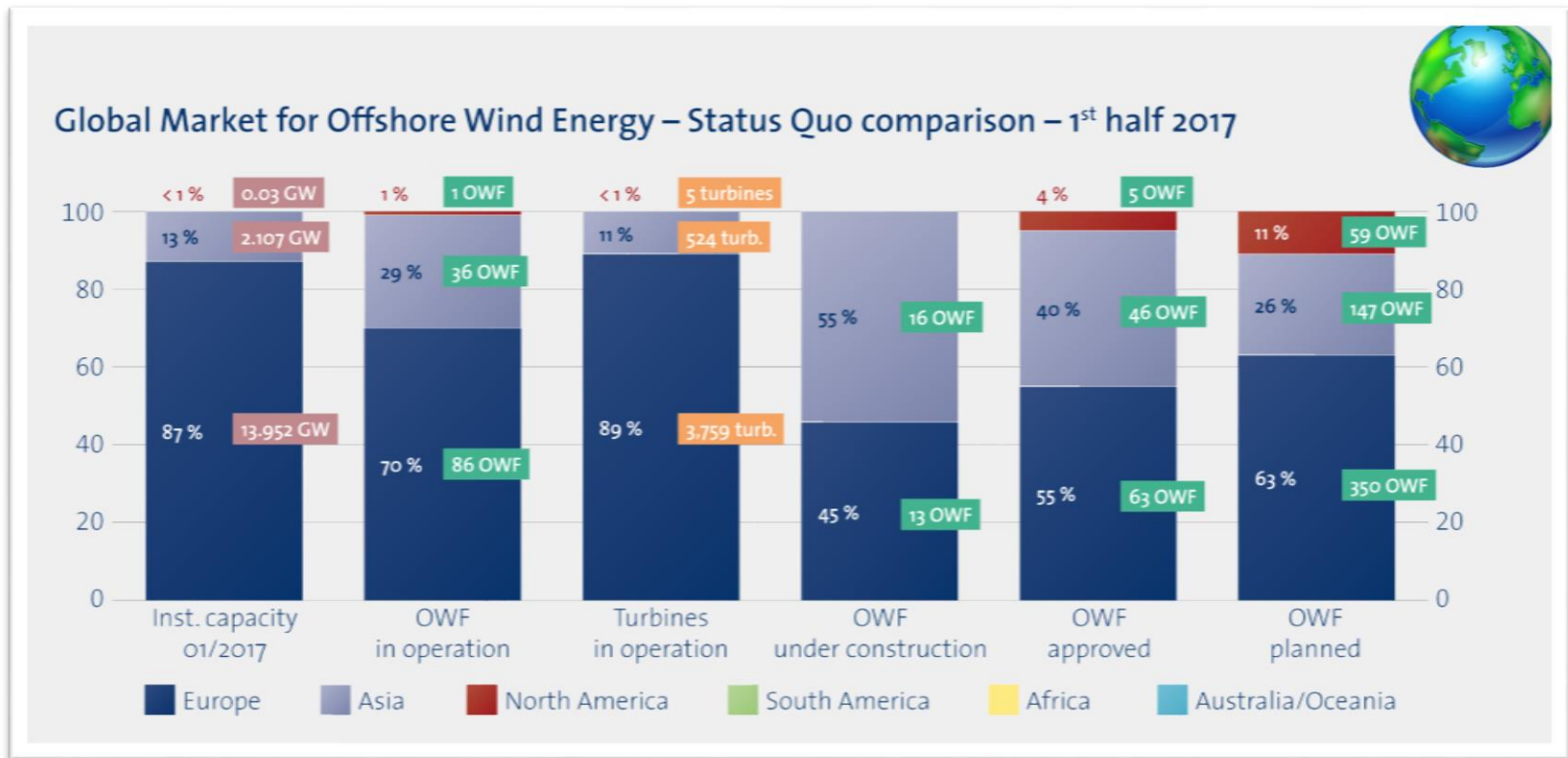
- A reformed EU emissions trading scheme (ETS)
- New indicators for the competitiveness and security of the energy system (e.g. price differences with major trading partners, diversification of supply, and interconnection capacity between EU countries)
- First ideas on a new governance system based on national plans for competitive, secure and sustainable energy



### 3. Status Quo OWE – 1<sup>st</sup> half of 2017

#### 3.1 Global developments Offshore Wind

» The largest market shares with regard to installed capacity, number of turbines in operation or projects under construction are currently dominated by Europe. «



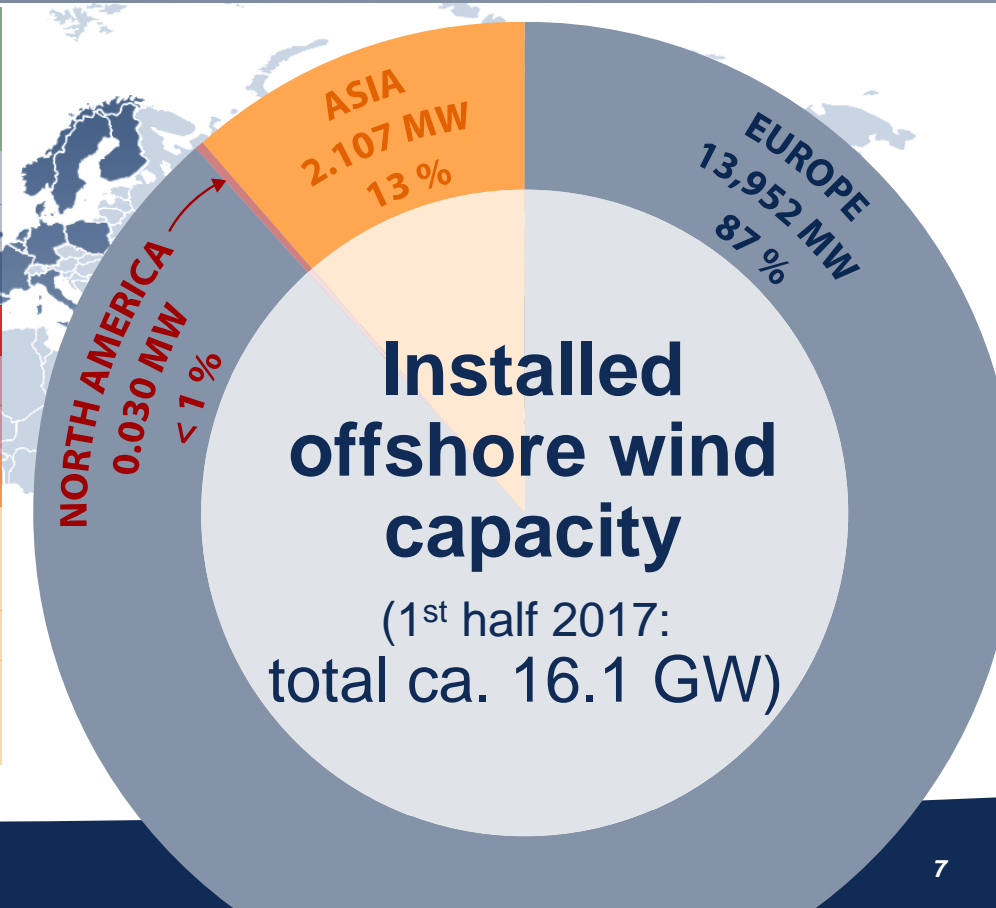
Note: without onshore built prototypes

### 3. Status Quo OWE – 1<sup>st</sup> half of 2017

#### 3.1 Installed capacity

» In the 1st half 2017 most of global offshore wind power capacity is installed in Europe (87%), followed by Asia (13%). Proportionately less than 1% is installed in North America - exclusively in the USA. «

	Installed Capacity – 1st half 2017 (GW)		Installed Capacity – 1st half 2017 (GW)
Europe	13.952	Sweden	0.202
Belgium	0.877	Turkey	0.000
Denmark	1.265	United Kingdom	5.674
Finland	0.027	<b>North America</b>	<b>0.030</b>
France	0.008	USA	0.030
Germany	4.749	Canada	0.000
Ireland	0.025	<b>Asien</b>	<b>2.107</b>
Italy	0.000	China	1.927
Netherlands	1.118	Vietnam	0.099
Norway	0.002	Japan	0.059
Poland	0.000	South Korea	0.014
Portugal	0.000	Taiwan	0.008
Spain	0.005		

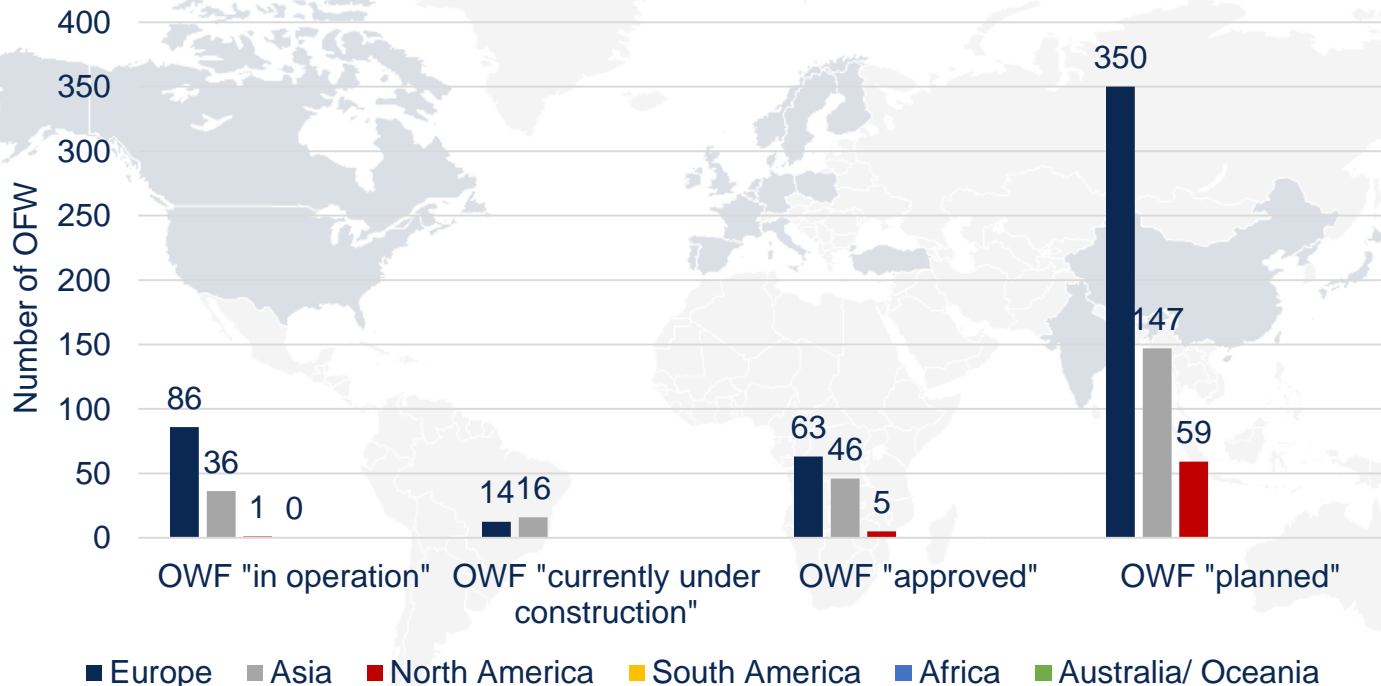


### 3. Status Quo OWE – 1<sup>st</sup> half of 2017

#### 3.1 Installed capacity worldwide

» The largest numbers with regard to offshore wind farms (OWF) in operation (86), approved wind farms (63) or planned OWF (350) are currently located in Europe. «

**Global Market for Offshore Wind Energy - Status Quo comparison - 1st half 2017 - offshore wind farms (OWF)**



Note: without onshore built prototypes

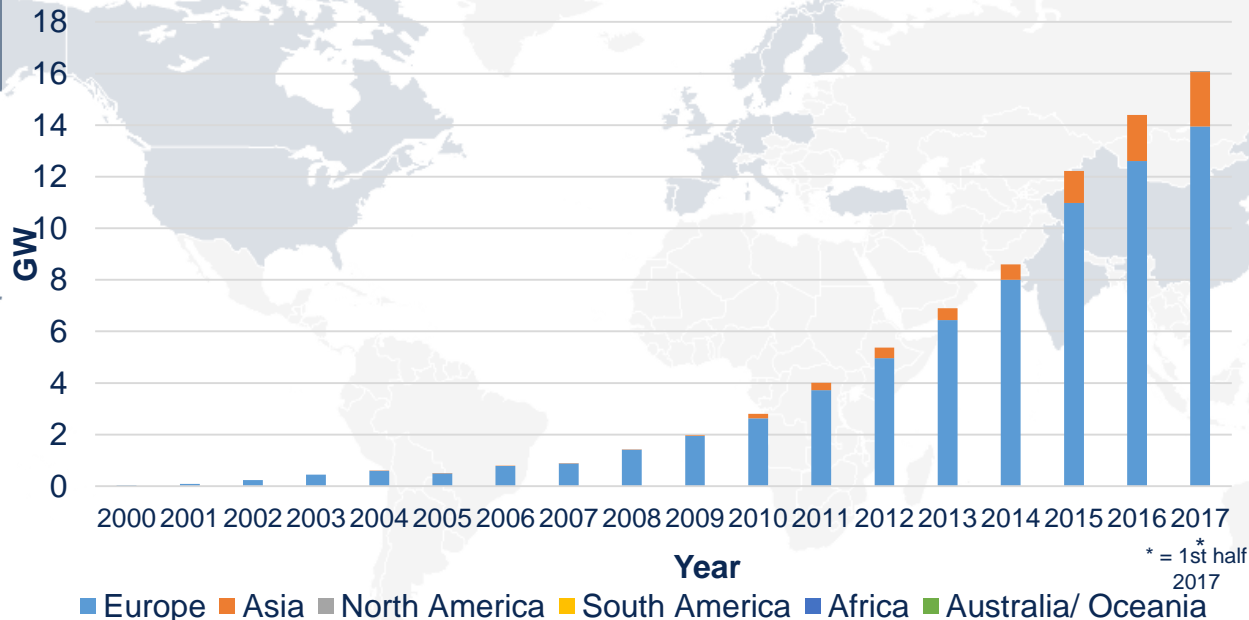


### 3. Status Quo OWE – 1<sup>st</sup> half of 2017

#### 3.1 Installed capacity development

» Since 2000, the installed capacity worldwide has grown massively - from approx. 36 MW to over 16 GW in the first half of 2017. This is a plus of 1.68 GW compared to 2016 (+10 %). «

**Expansion of global Offshore Wind Energy  
(in GW) - 2000 until 1st half 2017**

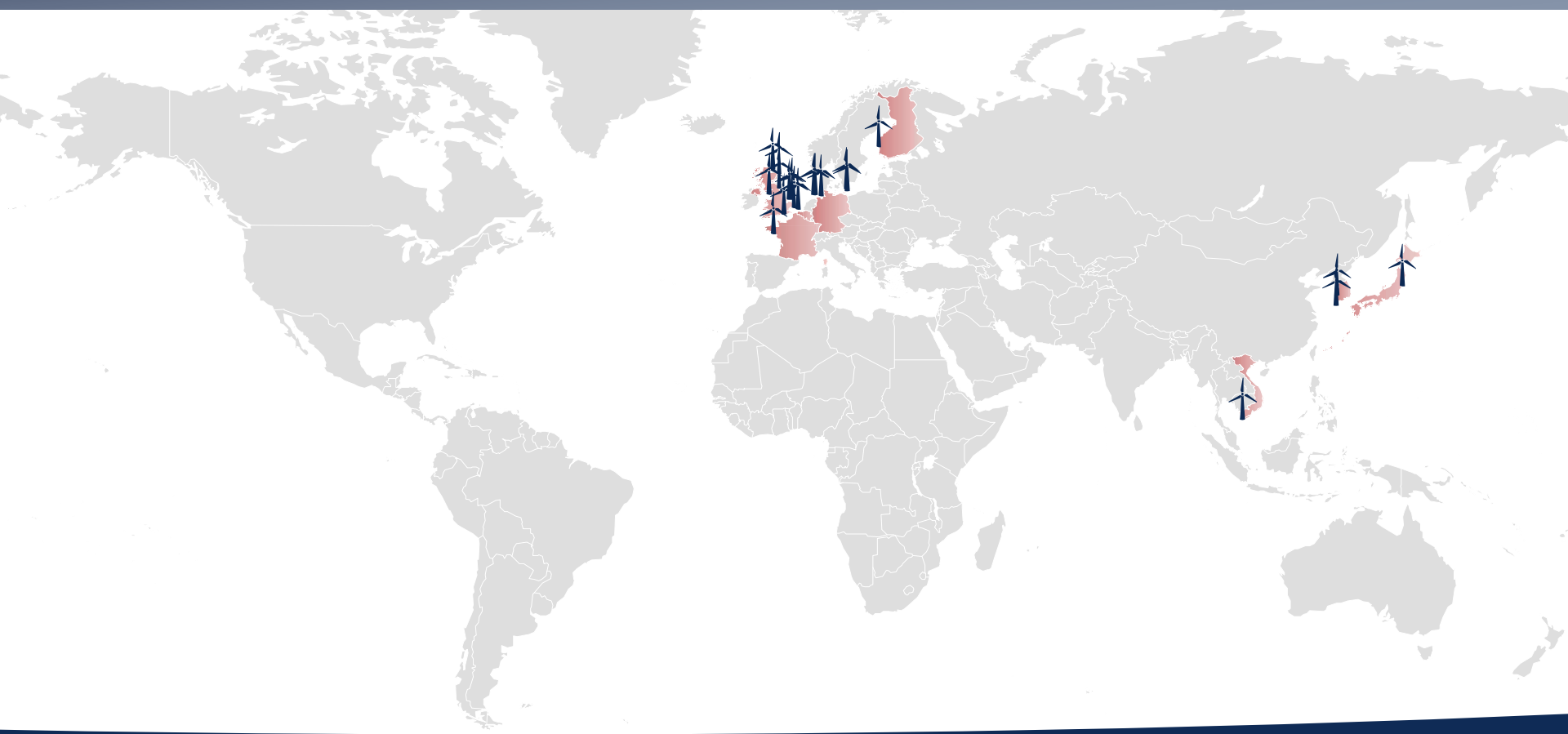


Note: without onshore built prototypes

## 3. Status Quo OWE – 1<sup>st</sup> half of 2017

### 3.2 OWF under construction

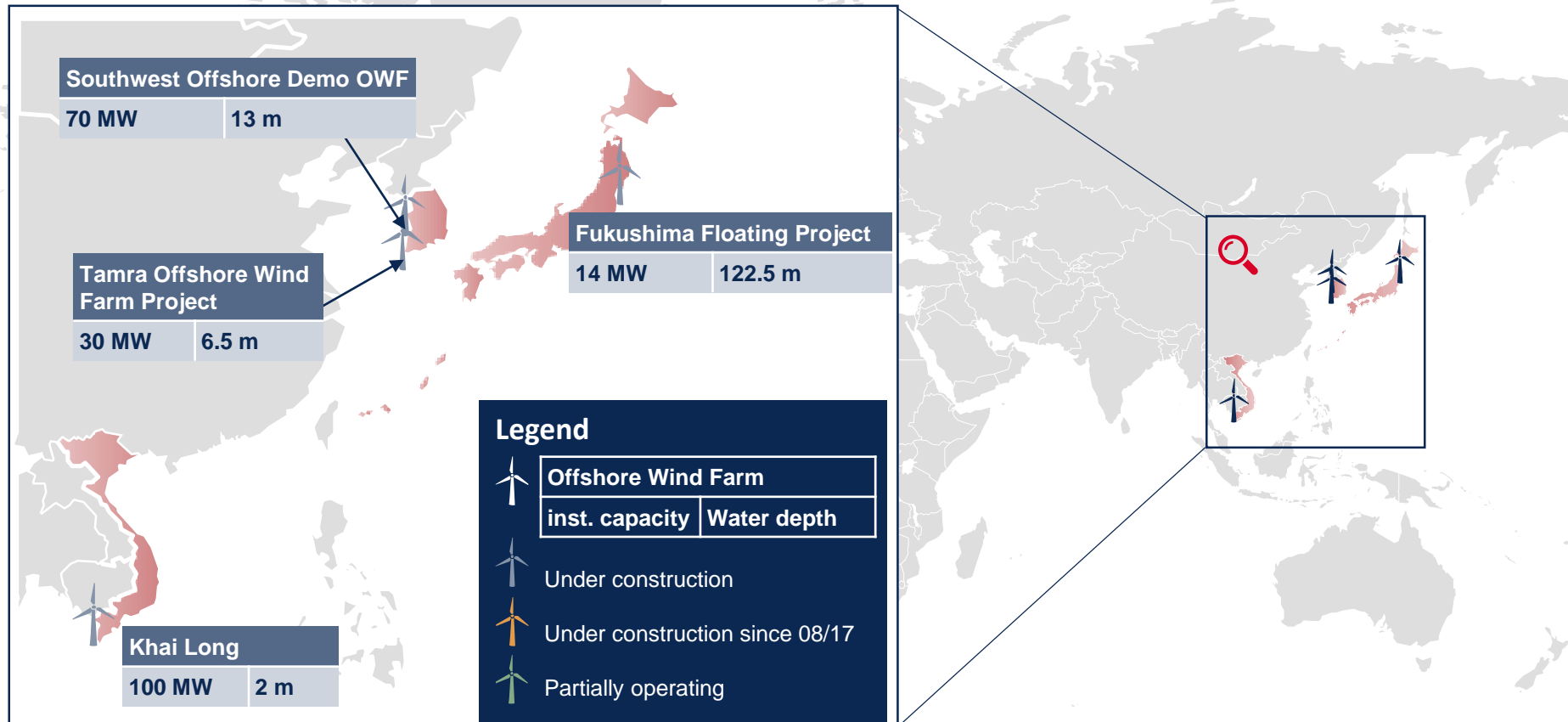
» *The average water depth of the OWF-projects under construction is approx. 33 meters.* «



### 3. Status Quo OWE – 1<sup>st</sup> half of 2017

#### 3.2 OWF under construction

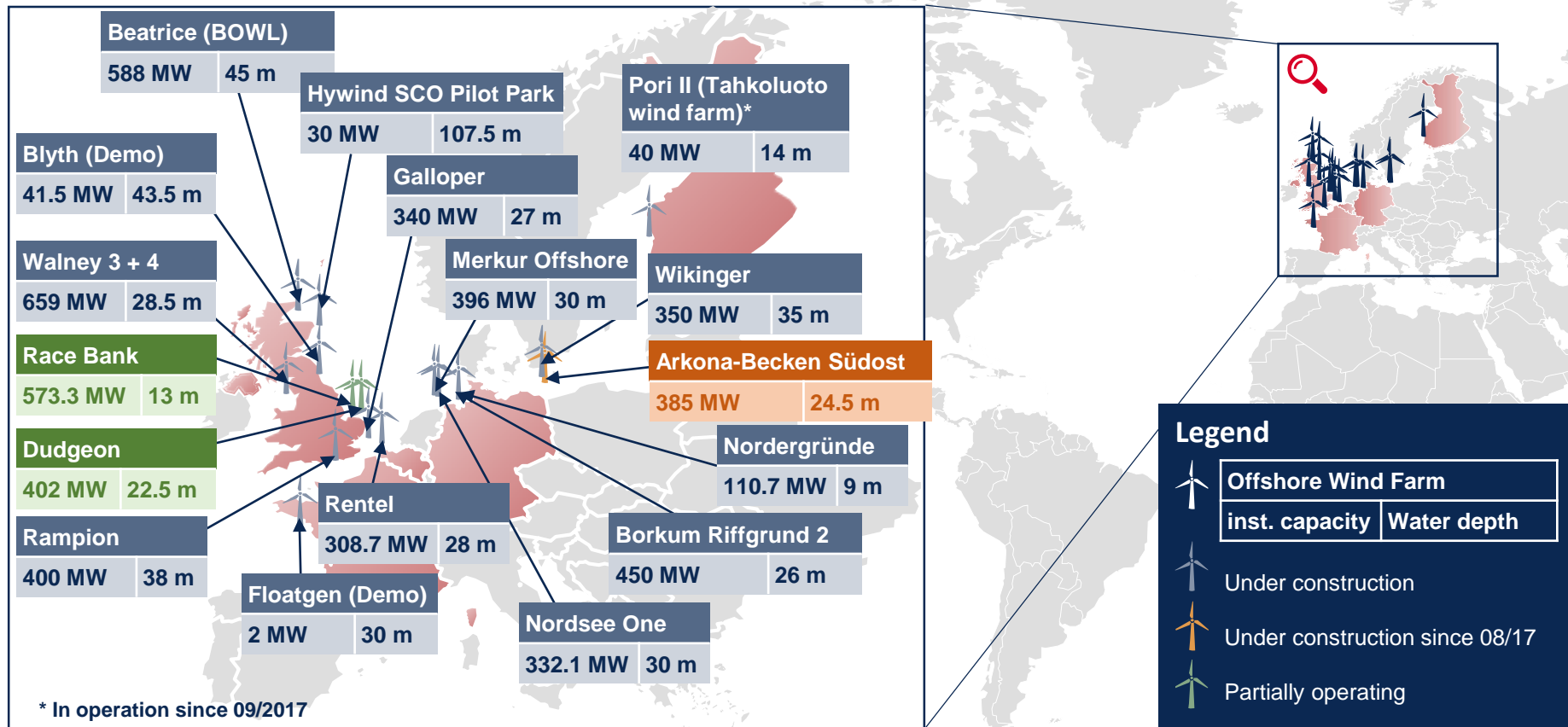
» Offshore wind farms currently under construction – selected Asian countries. «



# 3. Status Quo OWE – 1<sup>st</sup> half of 2017

## 3.2 OWF under construction

» Offshore wind farms currently under construction – European countries. «

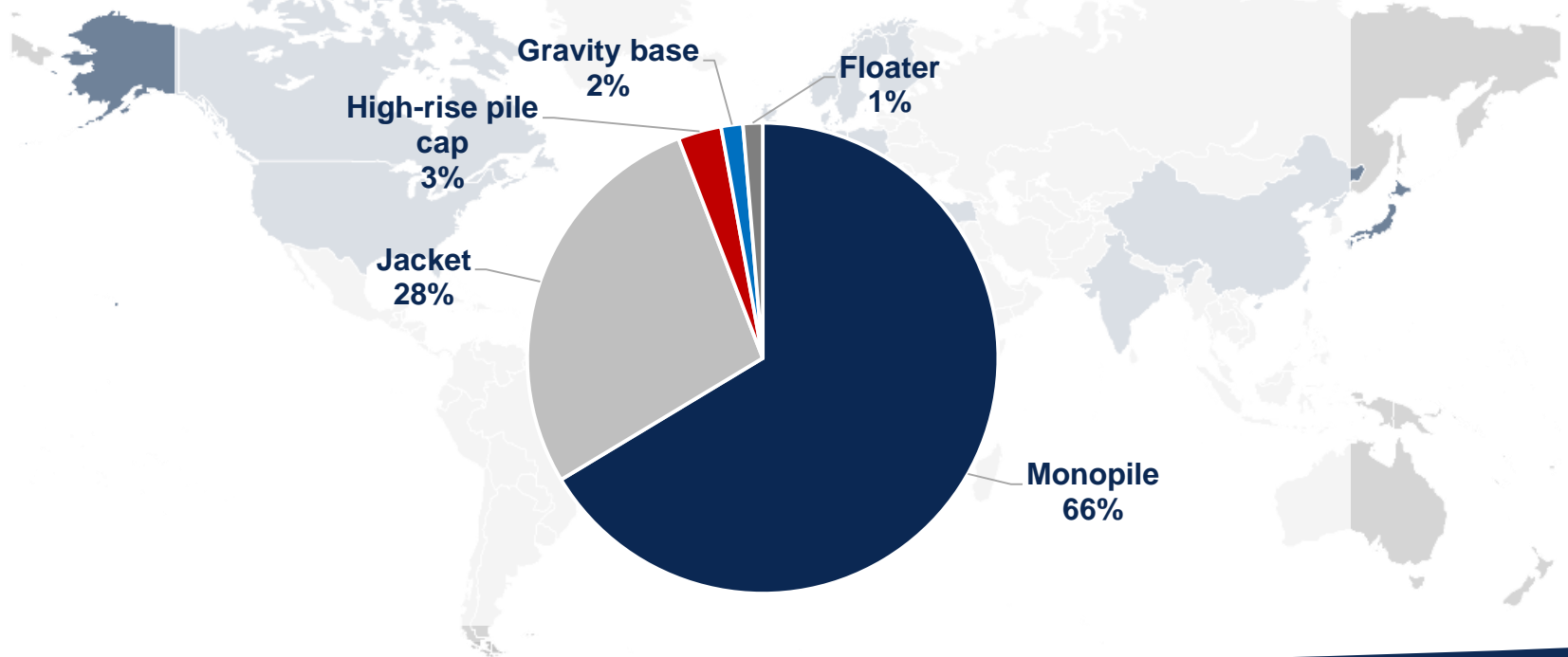


### 3. Status Quo OWE – 1<sup>st</sup> half of 2017

#### 3.3 Foundation types under construction

» *Monopile foundations dominate the market among OWF under construction.* «

**Offshore wind farms under construction (1st half of 2017) – foundation type**  
(according to number of plants)



### 3. Status Quo OWE – 1<sup>st</sup> half of 2017

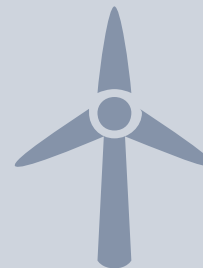
#### 3.4 Selected countries – Japan

» After the Fukushima accident in March 2011, Japan is focusing more and more on the expansion of renewable energies – including Offshore Wind Energy. «

#### Japan

In the first half of 2017, Offshore Wind Energy in Japan shows an installed capacity of 59 MW – in 9 offshore wind farms. One OWF are currently under construction.












Installed capacity (GW):	0.059
OWP in operation:	9
Wind turbines in operation:	28
OWF currently under construction:	1
OWF approved:	3
OWF planned:	26



## 4. Trends and developments OWE

### 4.1 Tenders

» Previous tender results (international) as well as approved quantities led so far to price reductions – but mind the details! «

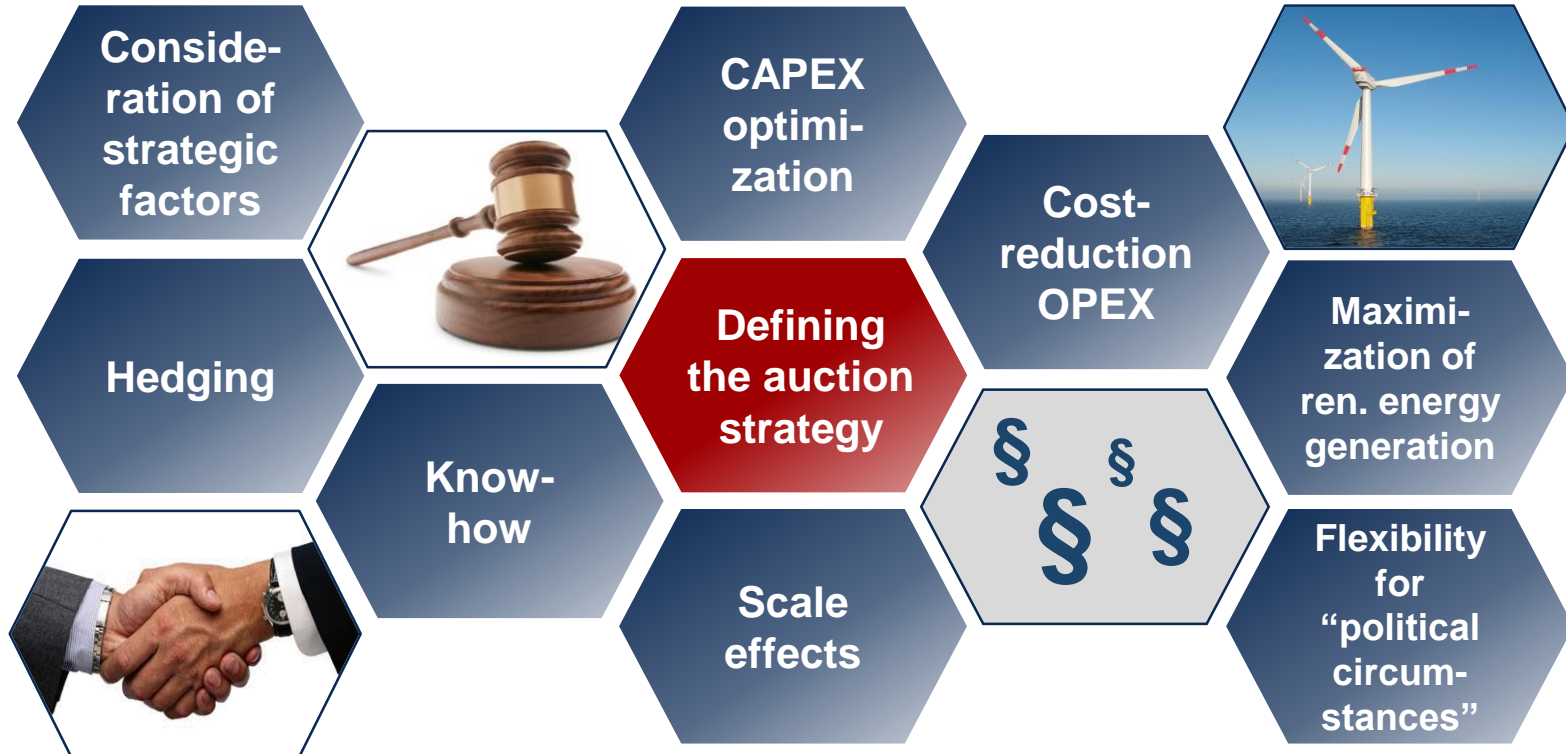
	Wind farm	Inst. capacity (MW)	Tariff (original)	Tariff (in ct/kWh)	Years granted	“Adjusted” tariff (re 20 years)	In operation (planned)
	Horns Rev 3	407 MW	77 Öre/kWh	10,31 ct/kWh	12	6,18 ct/kWh	2018
	Nearr na Gaoithe	450 MW	114,39 €/MWh	13,55 t/kWh	15	10,16 ct/kWh	2021
	East Anglia ONE	714 MW	119 €/MWh	14,2 ct/kWh	15	10,65 ct/kWh	2020
	Borssele 1,2	700 MW	7,27 ct/kWh	7,27 ct/kWh	15	5,45 ct/kWh	2020
	Kriegers Flak (DK)	600 MW	37,2 ct/kWh	37,2 ct/kWh (2,6 ct/kWh (1,5 y))	15	~ 3,7 ct/kWh?	2022
	Borssele 3,4	700 MW	54,2 ct/kWh	54,2 ct/kWh	15	< 5 ct/kWh	2023
	He dreiht (EnBW)	900 MW	0,0 ct/kWh	0,0 ct/kWh	20	0,0 ct/kWh	2025
	Borkum Riffgrund West II (DONG Energy)	240 MW	0,0 ct/kWh	0,0 ct/kWh	20	0,0 ct/kWh	2024
	OWP West (DONG Energy)	240 MW	0,0 ct/kWh	0,0 ct/kWh	20	0,0 ct/kWh	2024
	Gode Wind 3 (DONG Energy)	110 MW	6,0 ct/kWh	6,0 ct/kWh	20	6,0 ct/kWh	2024
	Hinkley Point C	3.340 MW	92,50 €/MWh	10,8 ct/kWh	35	18,9 ct/kWh	2026 (??)

**Not directly comparable!**

## 4. Trends and developments OWE

### 4.1 Tenders

» *The definition of the company's own bidding strategy depends on the knowledge of the market, the competition as well as its own criteria and their risk assessment.* «

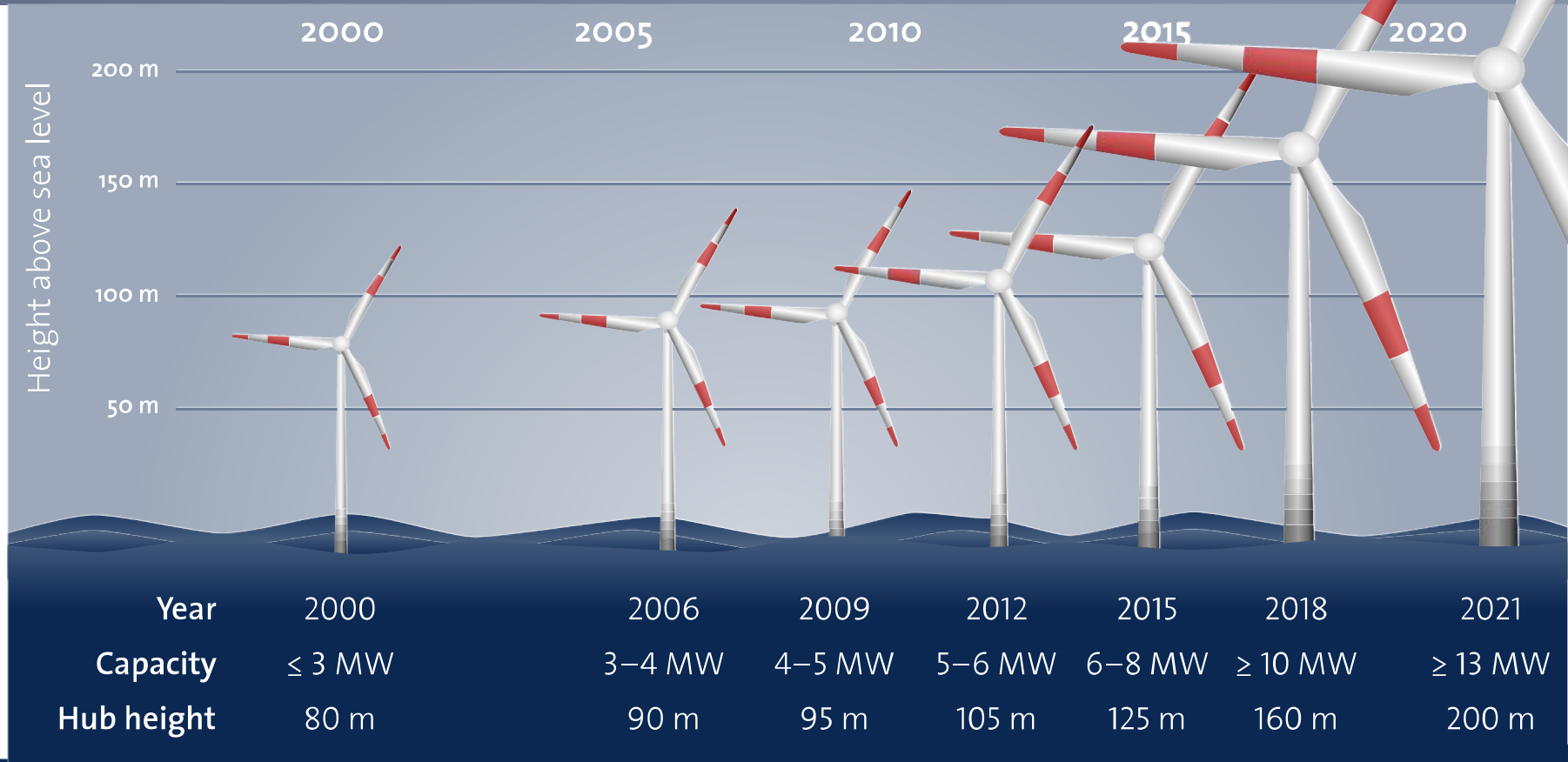




# 4. Trends and developments OWE

## 4.2 (New) Technologies

» *The potential for cost reduction (tcoe) can be seen mainly in the turbine size – has technical development come to an end?*



## 4. Trends and developments OWE

### 4.2 (New) Technologies

» *The international development of floating foundations becomes more and more important.* «

#### August 2017: Ideol's Floatgen foundation hits the water

- The Floatgen square ring-shaped floating foundation was launched on 23 August at the Port of Saint-Nazaire (France).

#### June 2017: Senvion setting stage for floating wind debut

- Senvion launches a study in the 2<sup>nd</sup> quarter of 2017 to identify technical modifications for 6.2M152 wind turbine ahead of its floating wind debut off France.

#### February 2017: Hexicon floater steps forward

- Hexicon has been given the blessing of Highland Council for its proposed Dounreay Tri floating project in the far north of Scotland (final approval in March 2017).

#### November 2016: France backs new floating duo

- France has awarded contracts to two additional projects as part of its first floating wind tender. EDF EN won support to build its 24 MW PGL OWF at the Faraman site.

**Siemens Hywind Floating Wind Turbine**

**Example**



The diagram shows a cross-section of the turbine. Key dimensions include: Turbine height: 65 m, Rotor diameter: 82.4 m, Diameter at water line: 6 m, Water depths: 120-200 m, and Diam. submerged body: 8.2 m.

**SIEMENS**  
**Statoil**

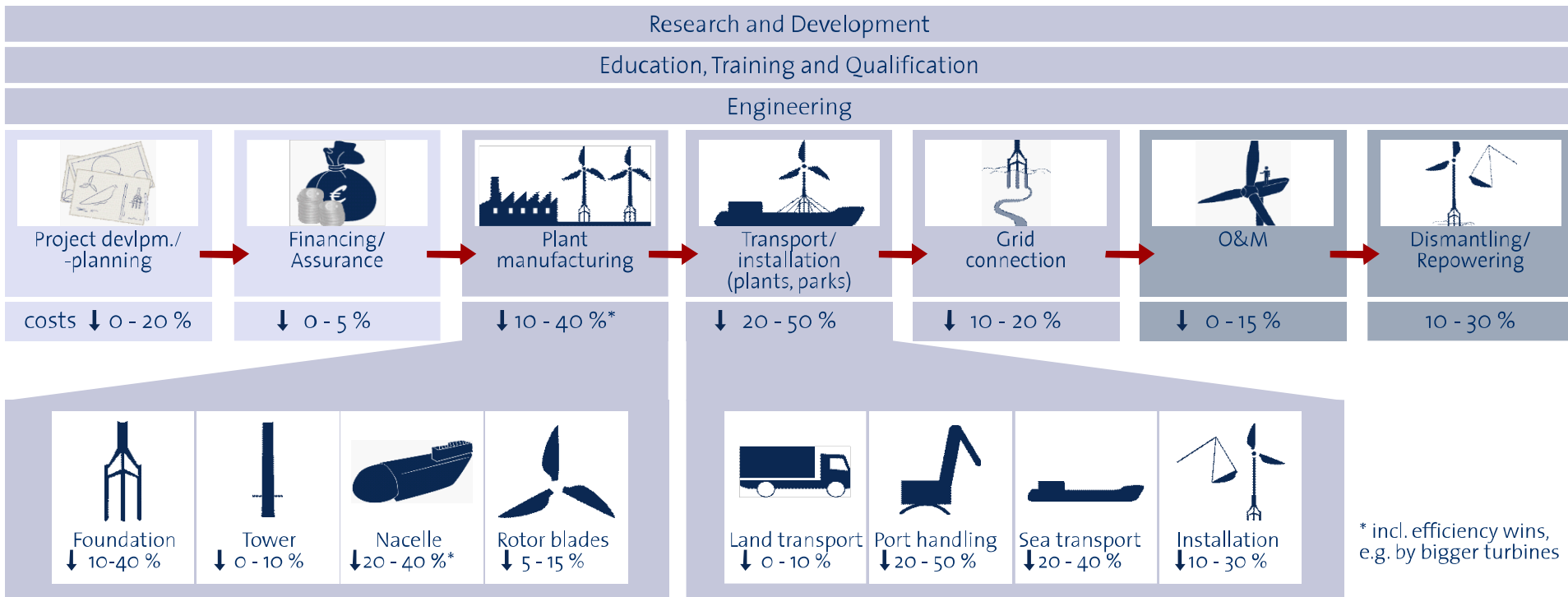
<b>Distance from shore</b>	10 km
<b>Draught</b>	100 m
<b>Water depth</b>	210 – 220 m
<b>Total weight</b>	5,300 t
<b>Sub-construction</b>	Steel
<b>Assembly</b>	Onshore

• Turbine Size: 2.3 MW  
• Turbine weight: 138 tons  
• Draft hull: 100 m  
• Displacement: 5300 m3

# 4. Trends and developments OWE

## 4.3 Costs and consolidations

» *Cost reduction potentials in the offshore wind energy along the value chain: Currently increasing costs; perspectivevely decreasing costs of electricity production.* «



## 4. Trends and developments OWE

### 4.4 Opportunities and risks

» *The global market for Offshore Wind Energy is influenced by various opportunities and risks that have a major impact on future project development.* «

#### Opportunities (overview)

- ✓ Technological developments (more turbine output, new foundation types, ...)
- ✓ Increase of further cost reduction potentials
- ✓ Sector coupling, wind2power, e-mobility, other sectors
- ✓ Rising electricity prices and CO<sub>2</sub>-certificate prices
- ✓ Growth opportunities of the global offshore wind market
- ✓ M&A opportunities due to consolidation
- ✓ Growth opportunities in „following“ markets, e.g. O&M
- ✓ On the long run: Repowering and Dismantling

#### Risks (overview)

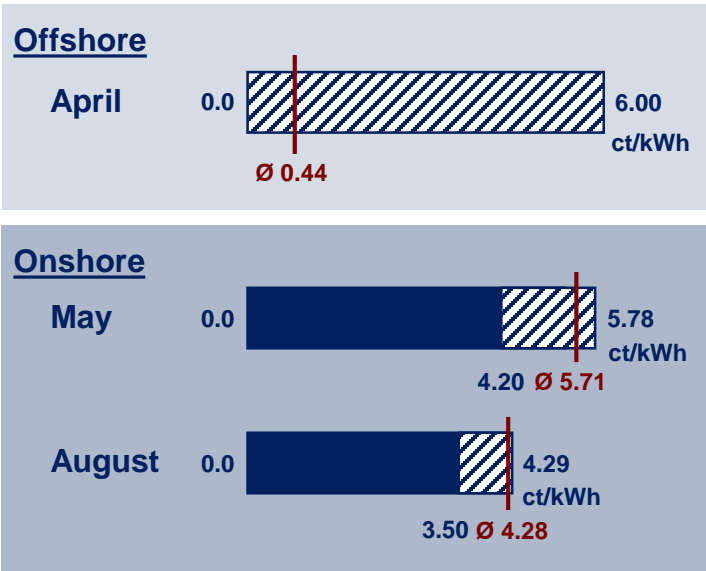
- Political frameworks, especially regarding subsidy schemes, targets and grid extension
- Decreasing electricity prices and CO<sub>2</sub>-certificate prices
- Delayed withdrawal from energy production from fossil fuels or nukes
- Rising water depths and distances from the shore, higher O&M-costs
- High competitive pressure due to consolidation/concentration
- Missing/delayed market maturity of the technological developments
- Delayed project realization, contractual penalties
- Increasing interest rates

# 4. Trends and developments OWE

## 4.4 Opportunities and risks: political framework

» *The German tender model has various advantages and disadvantages for the market players involved, among them citizen projects, manufacturers etc.* «

### German tender results offshore/onshore in 2017 in ct/kWh



### Citizen energy projects

- Really successful (> 95 %)
- But: have to approve their projects only within 54 months (not 24)
- Second tender: 60 % related to one company
- No “real” citizen energy projects

### Manufacturers/ suppliers/banks

- Default rate caused by non approval
- Long durations may lead to delays
- Quota of not approved projects?
- Insufficient planning base
- Breach of expansion targets
- Job cuts
- Destruction of shareholder-value
- Consolidation/ insolvencies/ acquisitions

### Politics and market

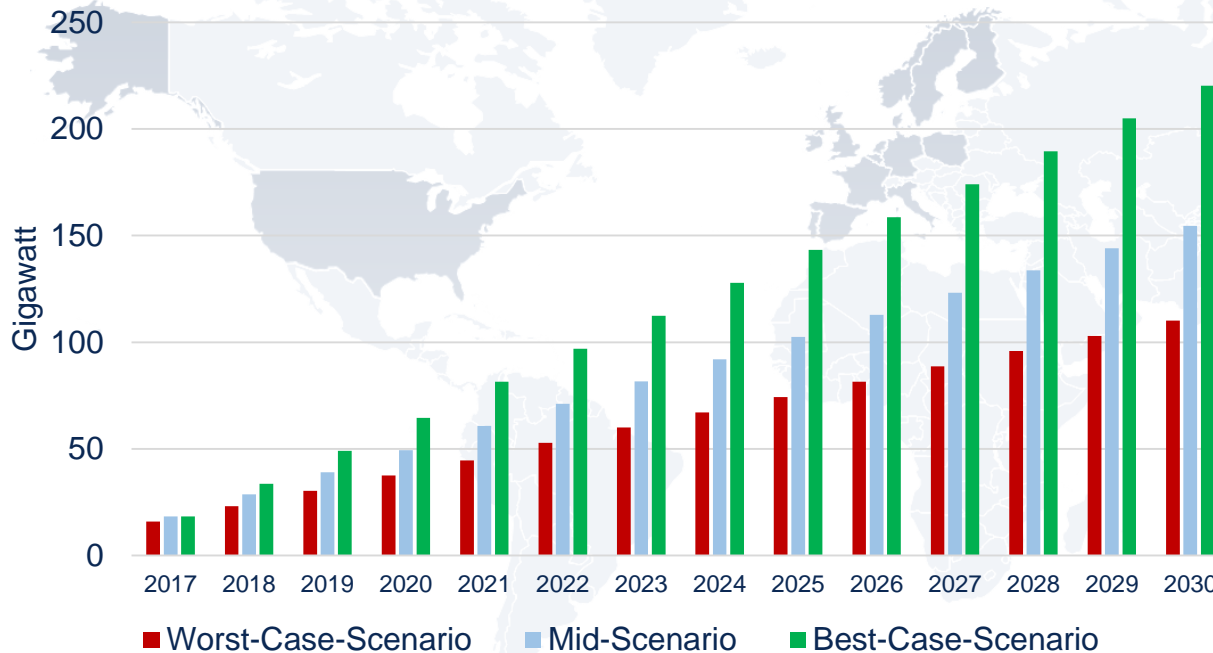
- Exceptions for the citizen energy projects lead to distortion of the market
- Expansion target will probably not be achieved

# 5. Outlook and Conclusion

## 5.1 Outlook 2030

» The market development until 2030 varies between 220 GW of installed power in the Best-Case-Scenario and approx. 110 GW in the Worst-Case-Scenario. «

Development of global Offshore Wind Energy, installed capacity (2017 - 2030)



The “Best-Case”-Scenario is decisively influenced by the following factors (examples):

- ✓ Technological development (more powerful turbines, new foundations, ...)
- ✓ Increase of further cost reduction potentials
- ✓ Rising electricity prices and CO<sub>2</sub>-certificate prices
- ✓ Quick approval procedures
- ✓ No obstructions through the population, authorities etc.

# 5. Outlook and Conclusion

## 5.2 Conclusion

» *The market for offshore wind is considerably influenced by the following trends:* «

- **Strong upturn of the global market for Offshore Wind Energy: approx. 16.1 GW installed capacity now in the first half of 2017 (+ 1.7 GW compared to the year 2016).**
- **Cost reduction is still the key topic in the offshore wind market, actually forced by the zero bids. Tendering seems to change the market dramatically.**
- **Tenders:** The most discussed topics in the last 6 months were the results of the last tenders, especially the German tender, resulting in „zero bids”.
- **Technologies:** Technically, the size and/or number of turbines per wind farm will increase in the following years, so foundations with higher load-bearing capacity (e.g. XL-/XXL-MP) are needed. Floating would be a game changer.
- **Costs and consolidation:** Depending on the political targets and because of environmental regulations, wind farms may be build further offshore and in greater water depths, which will see higher CAPEX and OPEX. There is an enormous need for cost effective structures.
- **Outlook:** The Best-Case-Scenario - essentially based on the political development objectives of the respective states - assumes a high market dynamic up to 220 GW in 2030. The industry will benefit, if it handles the opportunities in the right manner, e.g. cost reduction potentials, emerging or new markets in terms of countries, e.g. Taiwan, Japan, USA etc., sector coupling, storage solutions, rising energy prices and a new ETS.



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**Order form „The Global Market for Offshore Wind Energy: Status Quo and Market Potentials until 2030“** fax to 0421 . 43 73 0-11

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**Table of Contents**

<b>1</b>	<b>Executive Summary .....</b>	<b>2</b>
<b>2</b>	<b>Basics.....</b>	<b>11</b>
2.1	Introduction	
2.2	Design and contents of the report	
2.3	Aims and benefits of the report	
2.4	Methodology	
2.5	Selection of countries	
<b>3</b>	<b>Main framework conditions .....</b>	<b>18</b>
3.1	Political and legal conditions	
3.2	Geographical conditions	
3.3	Infrastructural conditions (e.g. grid connection)	
3.4	Frameworks for selected countries (see countries on the left)	
<b>4</b>	<b>Status Quo: installed, currently under construction and planned offshore wind parks/capacity .....</b>	<b>89</b>
4.1	Global overview	
4.2	Europe (see countries on the left)	
4.3	North America (see countries on the left)	
4.4	Asia (see countries on the left)	
<b>5</b>	<b>The market for Offshore Wind Energy until 2030 .....</b>	<b>126</b>
5.1	Development of the global Offshore Wind Energy until 2030	
5.1.1	Best-Case-Scenario	
5.1.2	Mid-Scenario	
5.1.3	Worst-Case-Scenario	
5.2	Other markets: maintenance and service	
<b>6</b>	<b>Trends, opportunities and risks .....</b>	<b>132</b>
6.1	Trends, e.g.	
6.1.1	Goals for Offshore Wind Energy	
6.1.2	Tendering process and results	
6.1.3	Technologies	
6.1.3.1	Turbines	
6.1.3.2	Foundations (e.g. floating foundations)	
6.1.3.3	Blades	
6.1.3.4	Others	
6.1.4	Installation and logistics	
6.2	Opportunities, e.g.	
6.2.1	Cost reduction potentials	
6.2.2	New technologies	
6.2.3	“New” markets – operations and maintenance	
6.2.4	Emerging or new markets	
6.2.5	Sector coupling	
6.2.6	Storage	
6.3	Risks, e.g.	
6.3.1	Political support/framework conditions	
6.3.1.1	Goals	
6.3.1.2	Auctioning systems	
6.3.2	Consolidation and concentration in the industry	
6.3.3	Further Risks	
<b>7</b>	<b>Conclusions .....</b>	<b>189</b>

### *Do you wish...*

- further information on our study „The Global Market for Offshore Wind Energy: Status Quo and Market Potentials until 2030“?
- further information on Cockpit Offshore Wind?
- further information on wind:research and its services?
- some data about the current situation of the market or competition?
- to see current forecasts?
- an overview of our wind studies?

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