

Status and Prospects of Offshore Wind Energy in Germany

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German Offshore Wind Energy Foundation

- Founded in 2005 as an **independent, non-profit organisation** to promote the utilization and research of offshore wind in Germany
 - Acquisition of ownership rights of the test field **alpha ventus** - moderated/accompanied establishment of Germany's first OWF
 - Platform for offshore wind/maritime industry, incl. trade associations, policy-makers and R/D
 - Involved in **various projects**, grid-related et al e.g. PROMOTioN
- Baltic InteGrid



PROMOTioN
PROGRESS ON MESHED HVDC
OFFSHORE TRANSMISSION
NETWORKS



Baltic
InteGrid
Integrated Baltic Offshore
Wind Electricity Grid Development

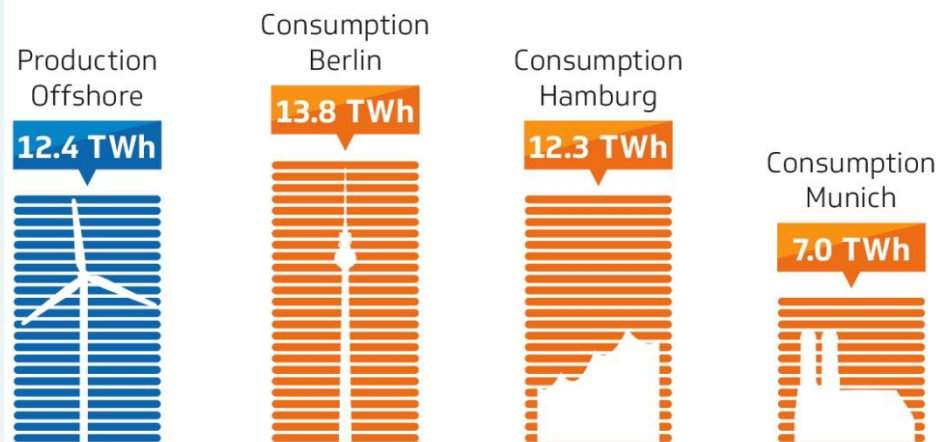


Offshore wind power established itself in the German energy mix

- In 04/2010, the first OWF in German waters, the test site *alpha ventus* was commissioned (12 turbines)
- By summer 2017, > 1,000 offshore turbines operational (grid-connected)
- By end 2016, almost 13 TWh of electricity generated – enough for the electricity demand of a major city



OFFSHORE WIND CAN SUPPLY MAJOR CITIES



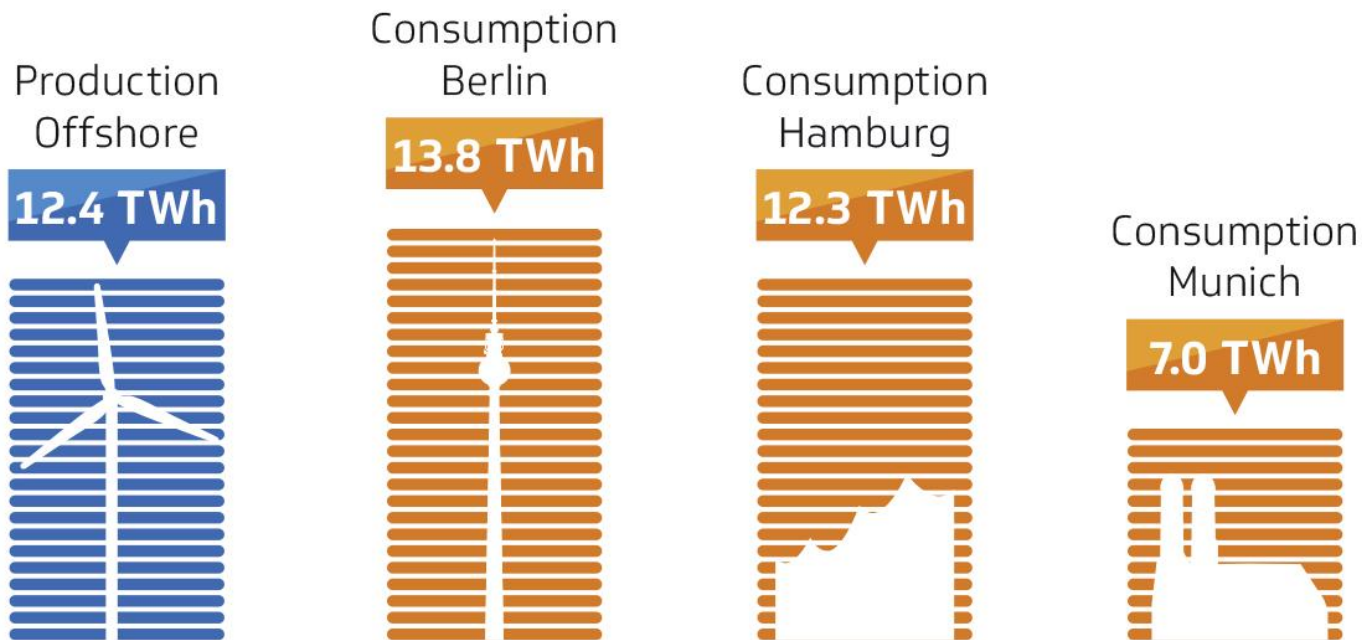
Electricity production offshore 2016 and energy consumption of German cities
Source: Agee-Stat 2017, municipal utilities

Infographics: Ahnen&Enkel

Offshore wind fully established in the energy mix

12.4 TWh offshore wind power in 2016 (i.e. energy consumption of roughly 3 million households)

OFFSHORE WIND CAN SUPPLY MAJOR CITIES

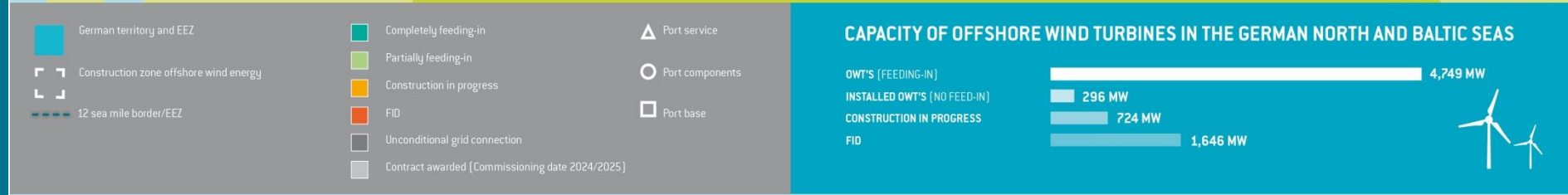


Electricity production offshore 2016 and energy consumption of German cities

Source: Agee-Stat 2017, municipal utilities

Infographics: Ahnen&Enkel

Status Offshore Wind Germany, 30 June 2017:
Approx. 4,700 MW grid-connected – 17 OWF in operation



POLICY CONTEXT AND TENDER RESULTS

June 2016	MoU signed for North Seas Energy Cooperation , acc. by wind industry's cost reduction statements (< 80 €/MWh)
	NL tender results for Borselle 1+2 , → 72,7 €/MWh
July 2016	New German RE Act passed – Fundamental shift from FIT to a competitive auction regime
Sep. 2016	DK Nearshore tender results → 60,8 €/MWh
Nov. 2016	DK Kriegers Flak tender result → 49,9 €/MWh NL Borssele 3+4 tender result → 54,5 €/MWh
	EU Clean Energy Package proposals
April 2017	German first transitional tender results – paradigm shift! → three bids at 0 support, one bid for 60 €/MWh

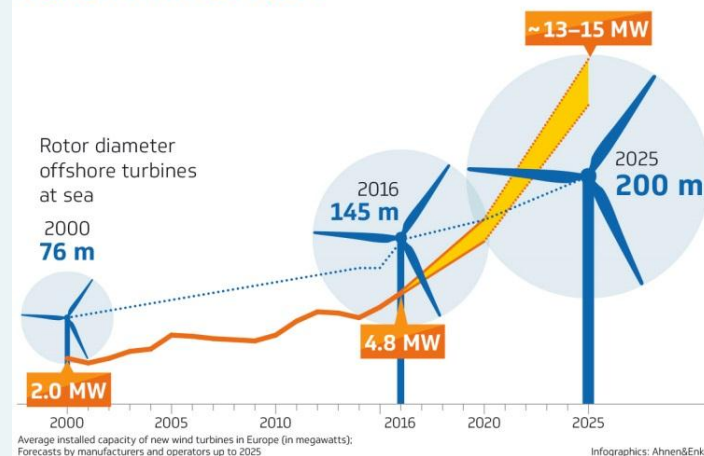
First Tender results in Germany, 13 April 2017 – Zero bids, a paradigm shift

Project	Owner	Capacity	Award price (€/MWh) – Support on top of the market price	Planned commissioning date
He Dreiht	EnBW	900	0	2025
OWP West	DONG	240	0	2024
Borkum Riffgrund West 2	DONG	240	0	2024
Gode Wind 3	DONG	110	60	2024

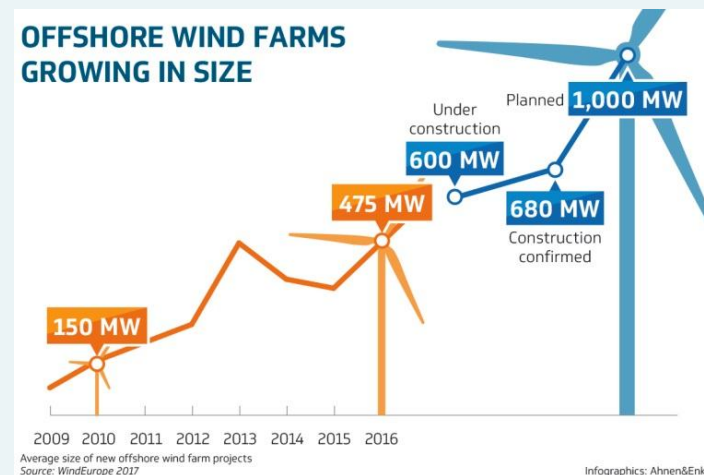
Cost reduction drivers – latest auction results

- **Increase in energy production**
caused by: - latest turbine technology
 - continuous innovation
- **Economies of Scale** characterized by:
 - large projects,
 - improved procurement and
 - more standardisation
- **Good site location** characterized by
 - strong winds,
 - moderate water depth,
 - synergies with neighboring OWF
- **Good planning and political support/targets**
allowed the industry to mature and
accelerate learning curve

A GROWTH IN CAPACITY



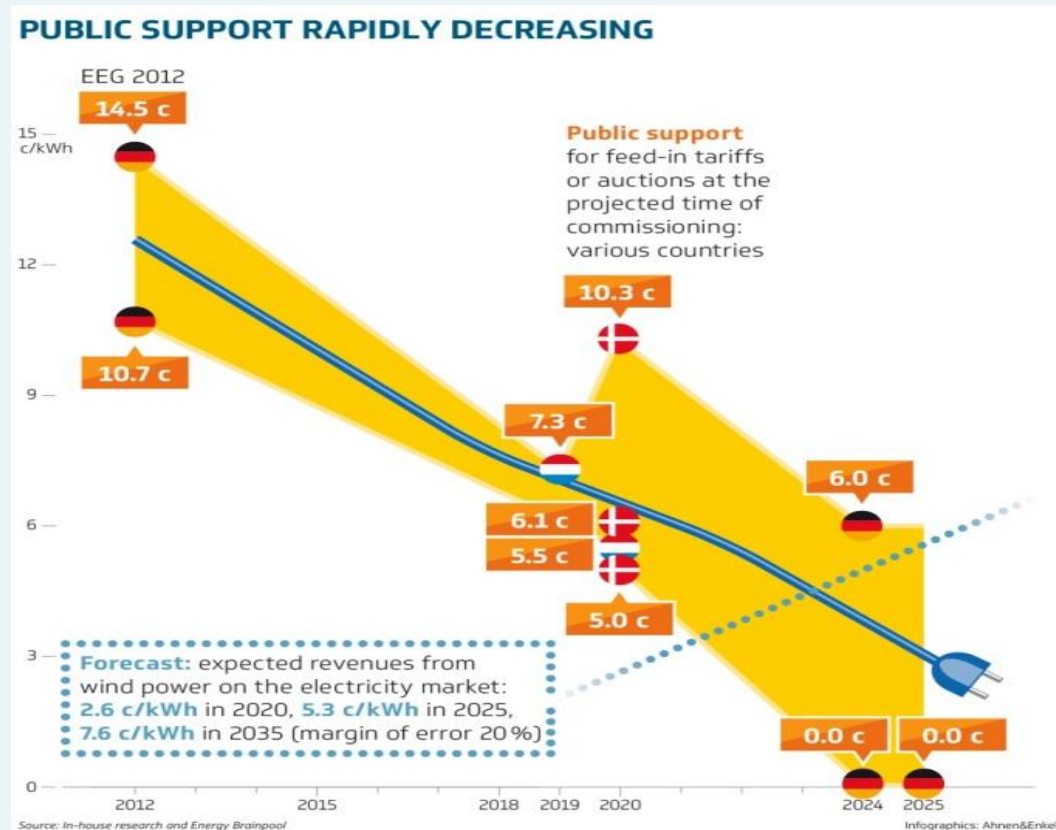
OFFSHORE WIND FARMS GROWING IN SIZE



Reasons for the drastic price reductions

Electricity price development assumptions

- Experts forecast
an electricity market price of:
 - 5.3 c/kWh in 2025 and
 - 7.6 c/kWh in the year 2035



First Tender results in Germany: Conclusions and Industry Requests

- The dramatic drop in prices to a maximum of 6.0 cents/kWh reflects, above all, the rapidly lowering costs through industrialization and a steep learning curve in the industry
- The federal government is requested to increase expansion targets for offshore wind via **Cuxhavener Appell 2.0**
Coastal states, offshore wind industry and trade unions are demanding at least 20 GW by 2030 and 30 GW by 2035
- Bold measures for grid expansion and the implementation of sector coupling must be taken quickly to take advantage of the positive prospects of offshore wind energy
- Offshore wind energy has proved to be at the core of a low-cost and sustainable energy transition in the near future



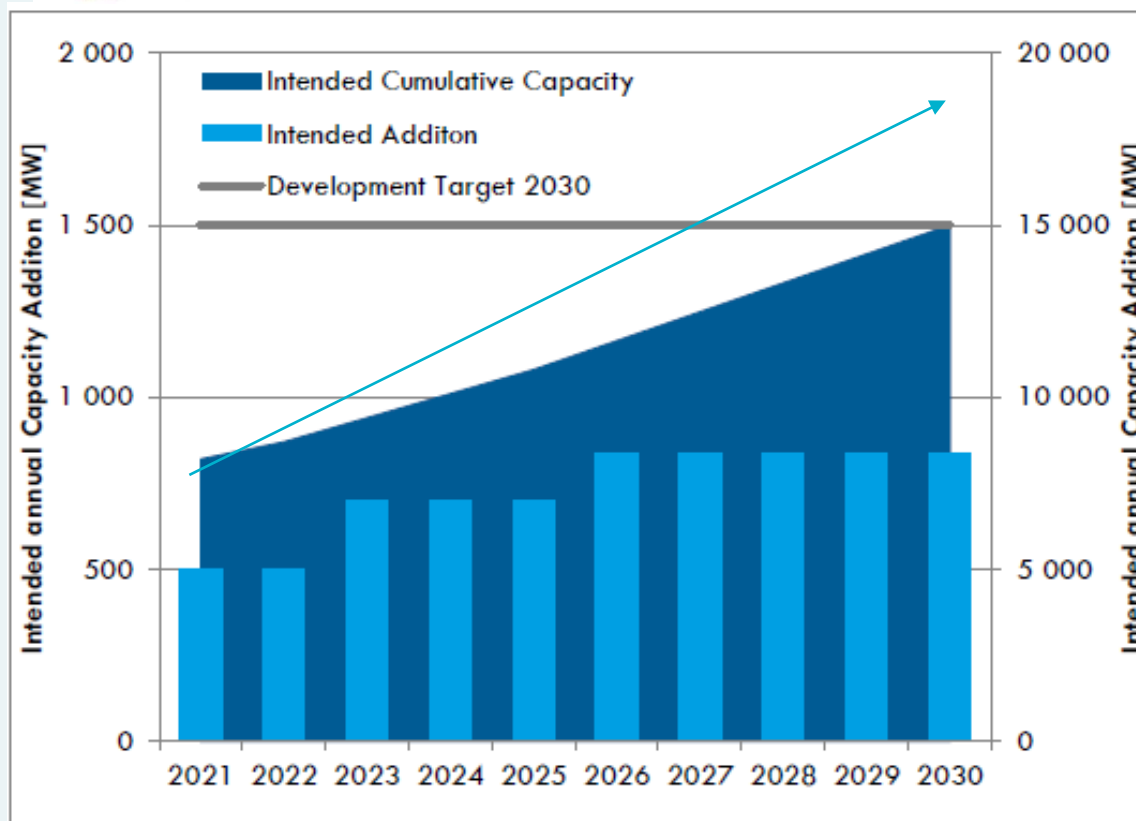
Cuxhavener Appell 2.0 (11 Sep. 2017)



Five coastal Länder
plus



Offshore Industry,
Trade Unions and majors



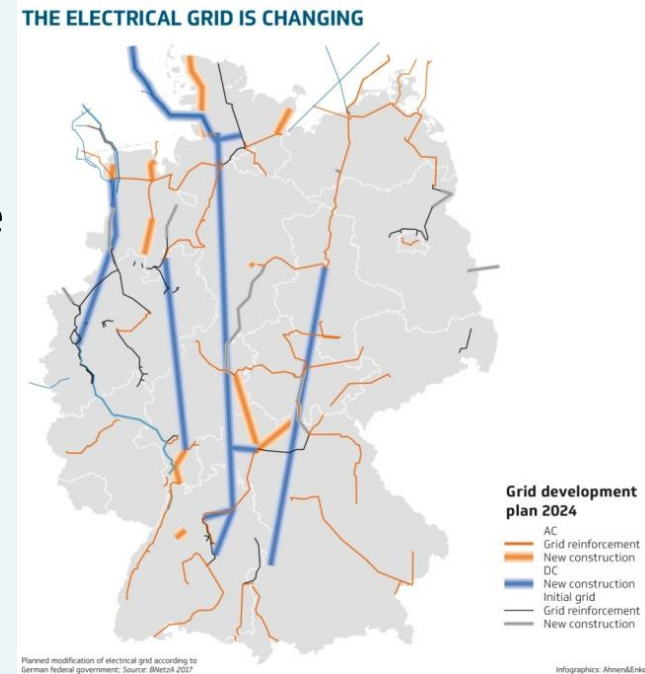
Calling for raising the bar:

>20 GW by 2030
(15 GW acc. to EEG2017/
WindSeeG),

>30 GW by 2035
(18-19 GW acc. to
O-NEP2030)

Grids: Indispensable to the Energy Transition

- Energy transition requires rapid expansion and redesign of the existing grid infrastructure
- Current studies (DENA, AGORA) show that climate change commitments goals can only be achieved through a rapid increase of renewables, which requires a fast, steady grid expansion
- A more ambitious development of renewables requires additional investments in the grid system
- **Innovative transmission concepts and sector coupling** provide opportunities to bypass bottlenecks in the grid

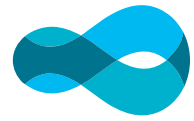


Grids: Constant System Changes of Legal Framework

- **12/2006** EnWG, para 17 (2a) – TSOs obliged to connect OWF
- 2009 – BNetzA publishes ‘position paper’ on OWF grid connection
- 2011/12 – Fukushima (Energiewende) and grid connection delays in N. Sea (TenneT) leading to another **system change of EnWG in 2013**, incl. offshore grid planning (O-NEP), i.e. more sync. of OWF development and grid expansion, liability regime for TSOs and OWF developers
- Consultations for grid development in Germany (NEP 2030, and O-NEP 2030) till 16 Oct. 2017
 - More flexibility is essential (only 2 grid projects foreseen post 2025)
 - future cost reductions needs to be better reflected by O-NEP, e.g. 15% cost reduction at DolWin6 already achieved, 30 % seems feasible by 2030 (according to findings of Fichtner study)

Better management of the grid system is also essential

- Recent studies (DENA/BET) show that cost of managing grid congestion could be reduced by €200 million per year
- A working group at BMWi has proposed seven actions that can help reducing costs for redispatch and increases grid capacity in the short-term, in addition to grid expansion plans (NEP, O-NEP)
- These include ***better grid monitoring, and reinforcing five sections of the transmission system***, particularly by adding new to or upgrading transmission lines on existing pylons
- The working group also recommends developing a strategy for ***improving cooperation between the different grid operators on re-dispatch***



STIFTUNG
OFFSHORE
WINDENERGIE

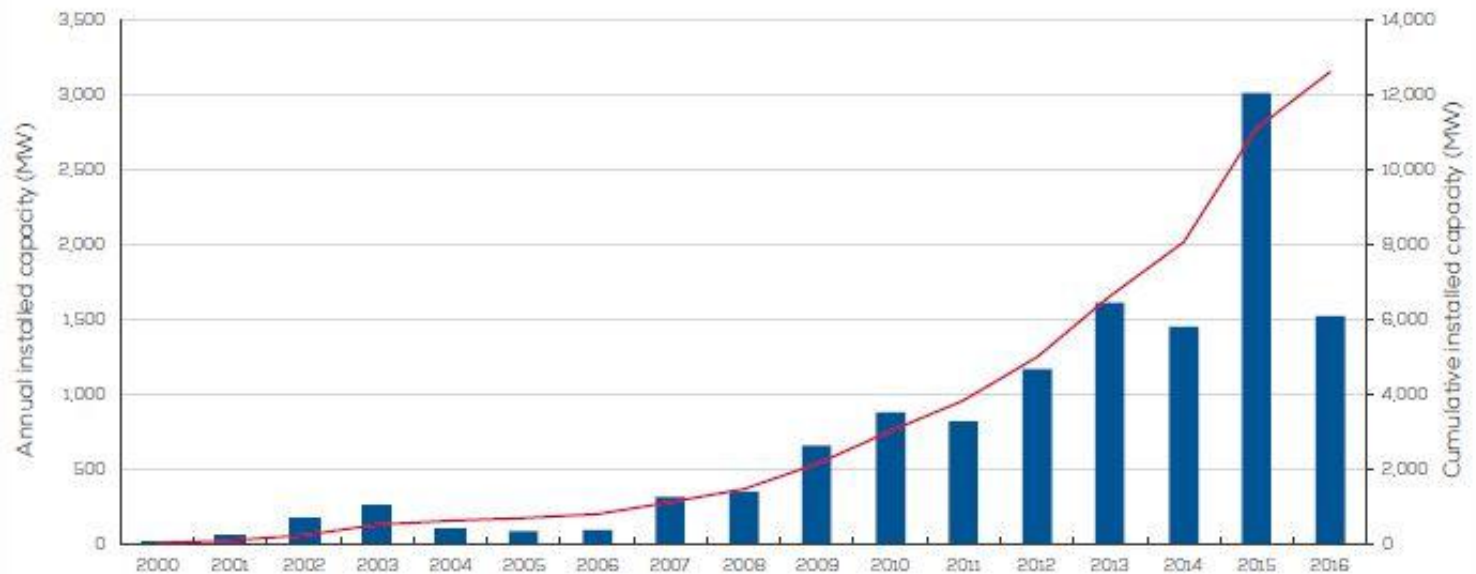
Development of offshore wind energy in Europe



Europe installed 1,558 MW of new offshore wind in 2016 with cumulative capacity reaching 12,631 MW

FIGURE 1

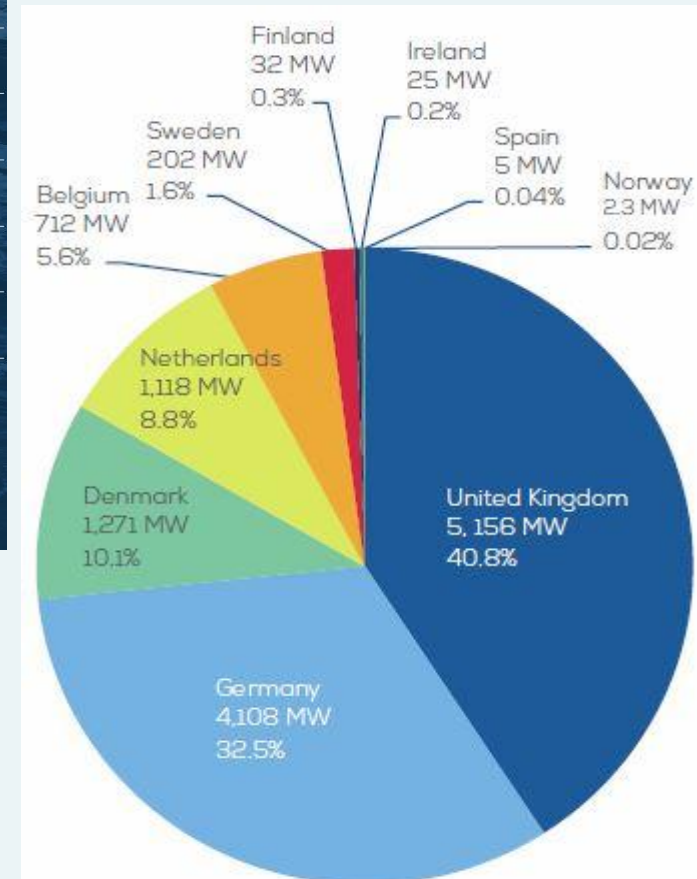
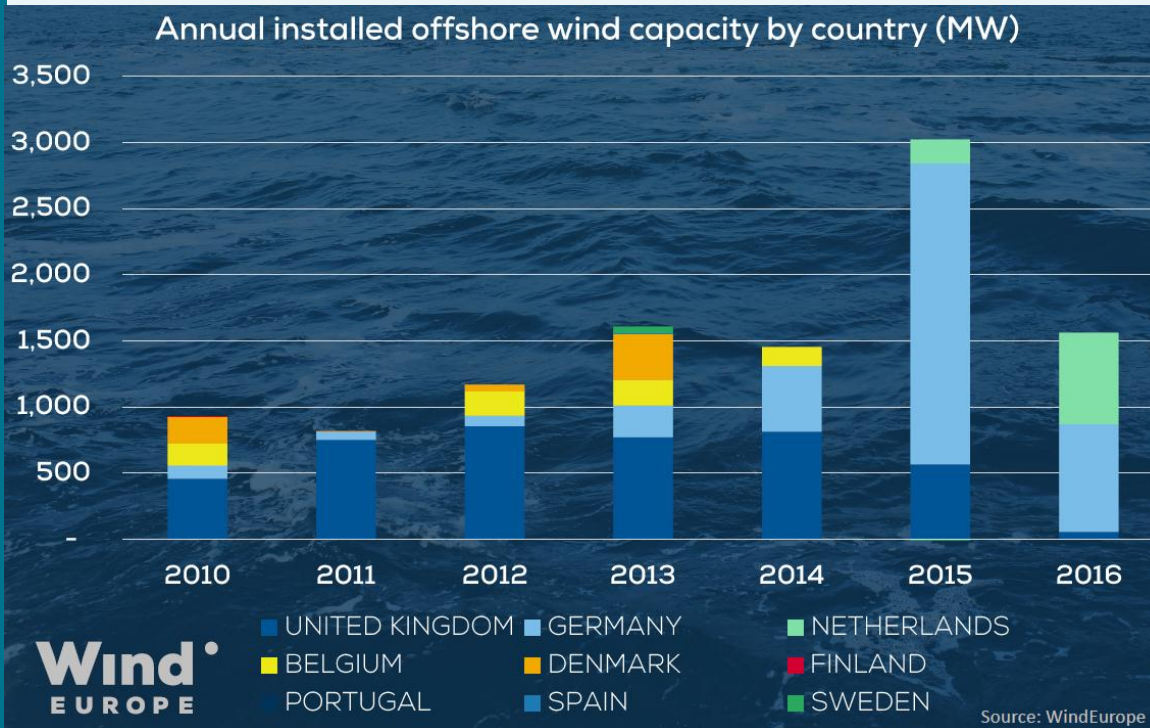
Cumulative and annual offshore wind installations 2000-2016



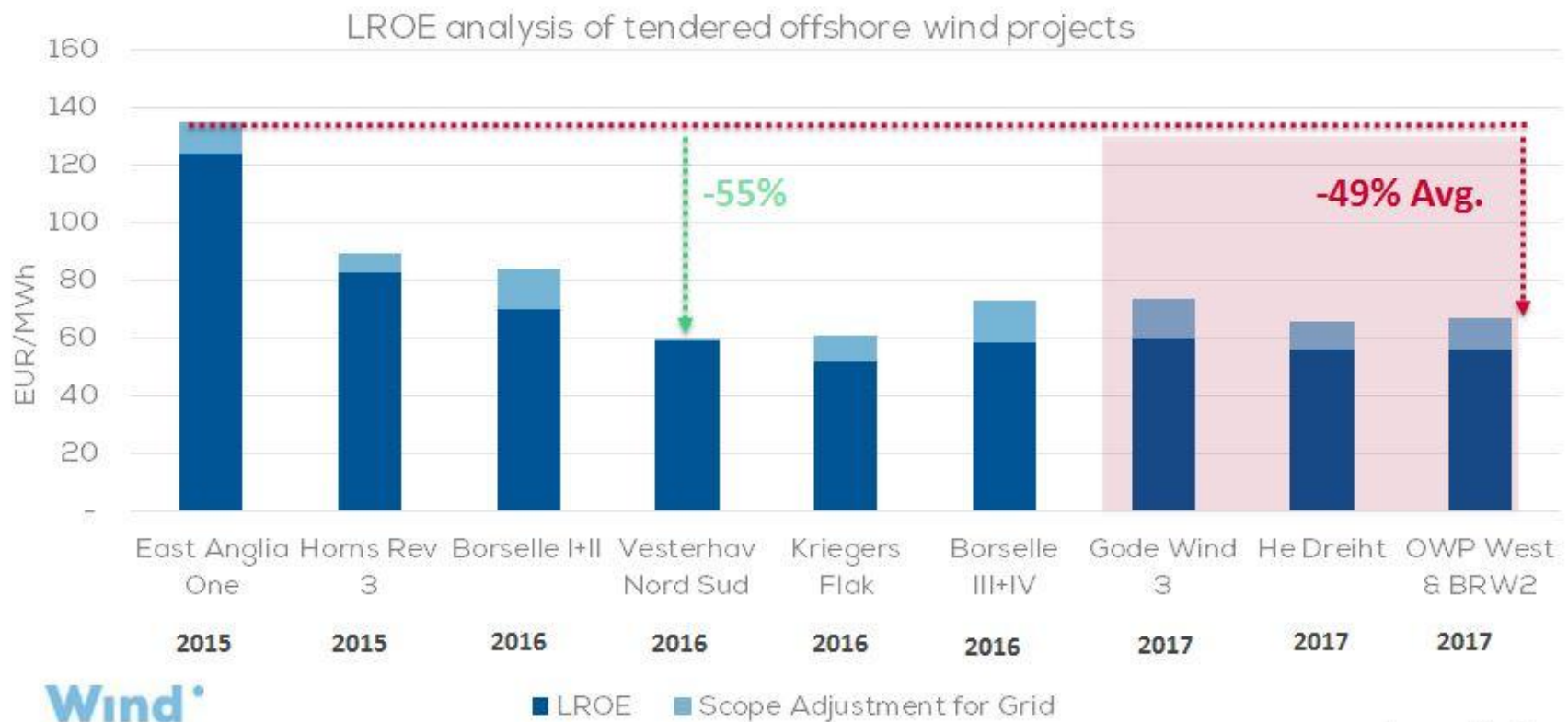
Source: WindEurope



Development of offshore wind energy in Europe



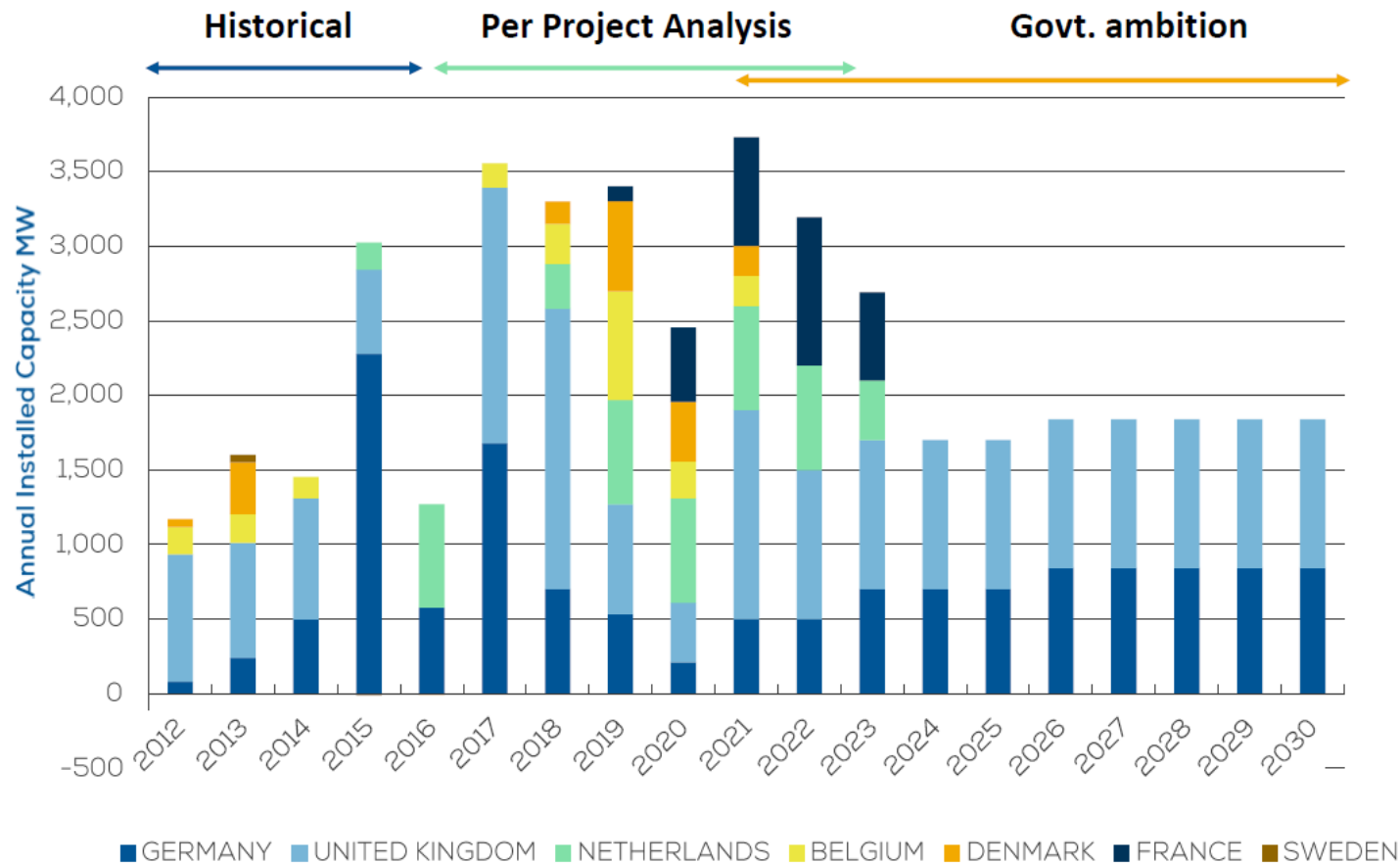
Prices are cut in half



Source: WindEurope

WindEurope: Current market projection

Market projection to 2030



*BE+FR projects conditional on gaining full consent

Source: WindEurope

Joint Statement of European Industry and European Governments, 6th of June

Volumes key to cost reduction

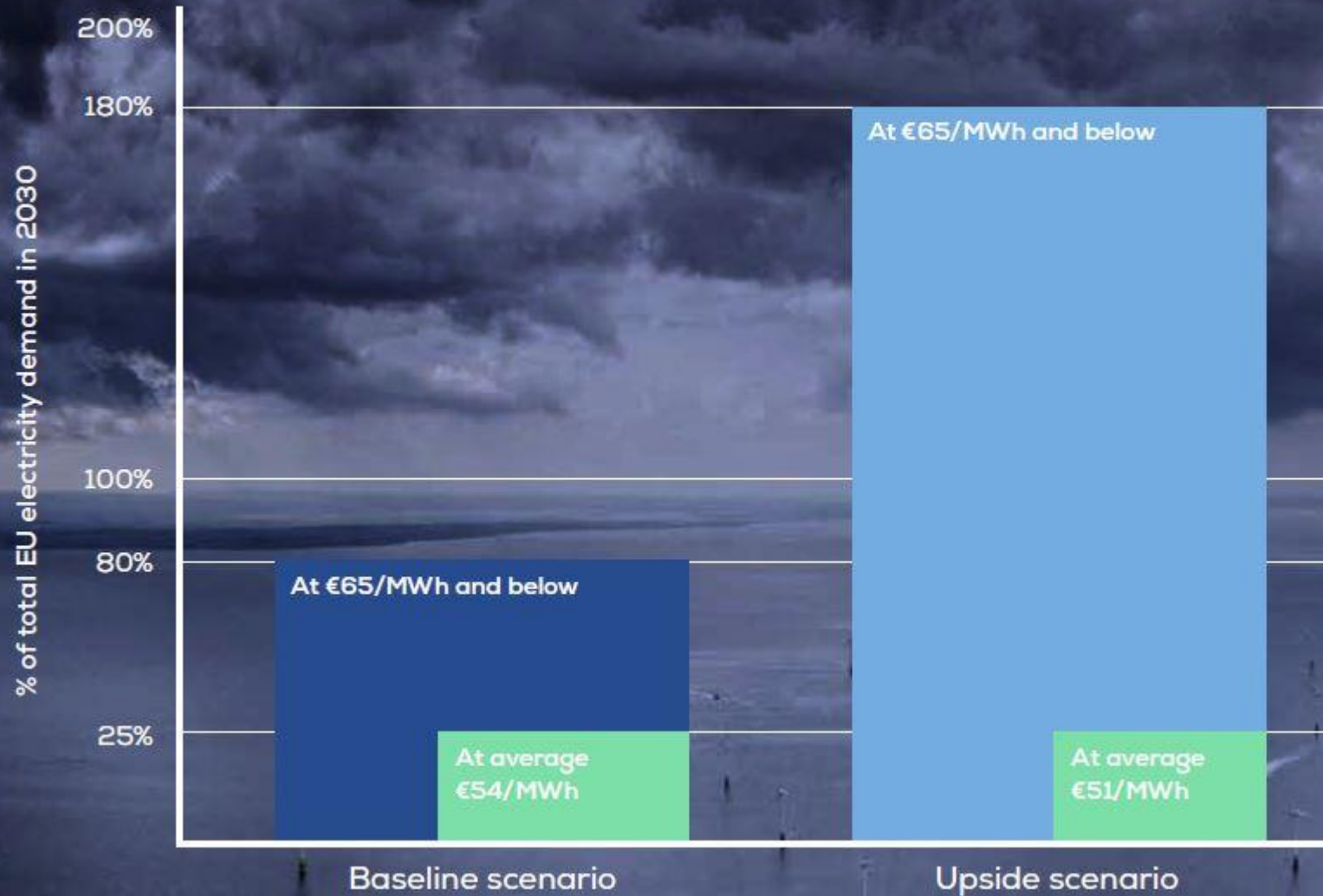
- 4 GW/yr
- 6–7 GW/yr

in Europe is a minimum for a sustainable industry,
is necessary to remain at the forefront in
world wide industry.

Volumes will sustain competition, investment and growth in the supply chain



Economically attractive resource potential at the end of 2030



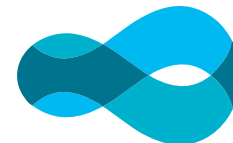
European cooperation and coordination key to grid expansion and energy security



- A European grid helps to reduce fluctuations and to improve energy security, e.g. NordLink
- Wider geographical distribution, more balanced production, and better exploitation of supply and demand
- A regulatory framework and technical solutions for a meshed grid have to be developed, e.g. PROMOTioN project



PROMOTioN
PROGRESS ON MESHED HVDC
OFFSHORE TRANSMISSION
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Thank you for your attention!

**German Offshore Wind Energy
Foundation**

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