

Offshore Wind in Germany

Status and Prospects

Andreas Wagner

Managing Director
Stiftung OFFSHORE-WINDENERGIE
German Offshore Wind Energy Foundation

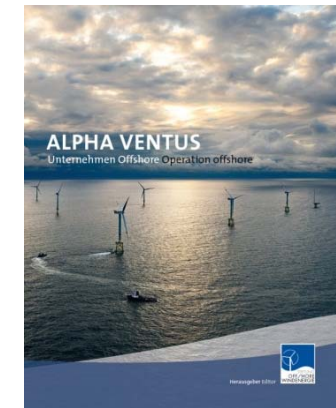
2014 GLOBAL OFFSHORE WIND
Glasgow, 11 June



German Offshore Wind Energy Foundation



- Founded in 2005 as an independent, non-profit organisation to promote the utilization and research of offshore wind
- Acquisition of **ownership rights (permit) of alpha ventus** (Sep. 2005) – moderated/accompanied process
- Platform for **offshore wind/maritime industry**, incl. **trade associations, policy-makers and research**
- Offices in Varel and Berlin (since Q4/2011)
- **Initiator** of studies/initiatives
 - *Cost reduction* study (Prognos-Fichtner, 2013)
 - *Energy system benefits* study (Fraunhofer IWES, 2013)
 - Collaborative WG between maritime industry and the offshore wind sector
- *Involved in various projects, e.g. OffWEA* - consultation, support and moderation
- PR and public acceptance work **International (EU) Projects**



German Offshore Wind Farms

Operational and grid-connected (Q1/2014)

alpha ventus (DOTI)

- Fully online since 04/2010
- 12 turbines, 60 MW total capacity
- Annual electricity production appr. 250 GWh
- 30 m water depth, 45 km distance to shore

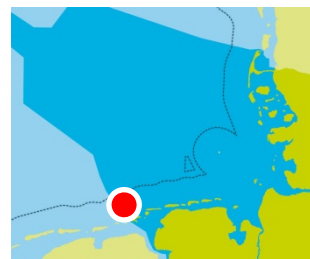


Baltic 1(EnBW)

- Fully online since 05/2011
- 21 turbines, 48 MW total capacity
- 18 m water depth, 15 km distance to shore
- Annual electricity production appr. 190 GWh

BARD Offshore 1 (BARD/Ocean Breeze)

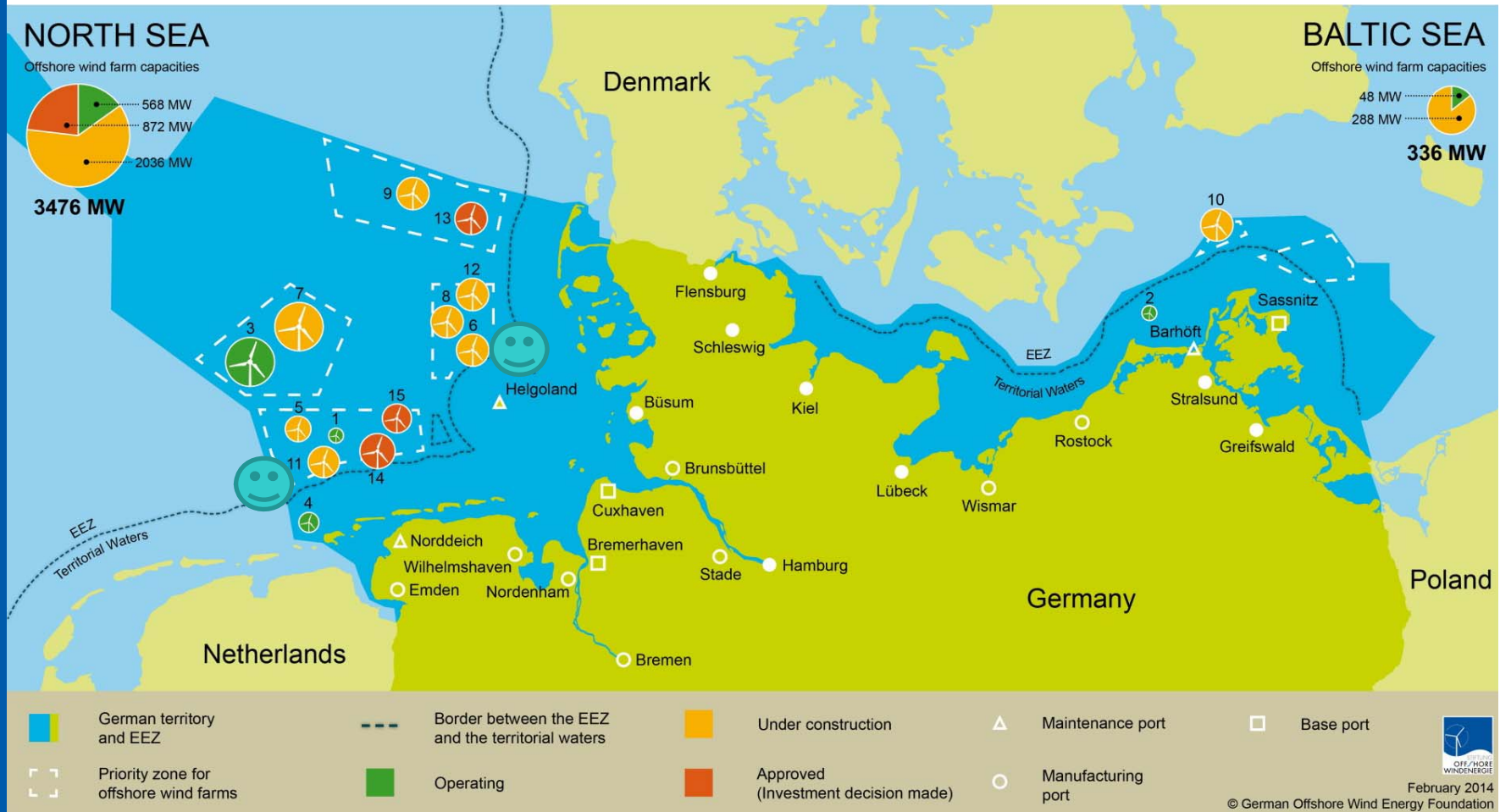
- Fully online since 08/2013
- 80 turbines, total capacity: 400 MW
- 40 m water depth, 90 km distance to shore
120 km HVDC sea cable



Riffgat (EWE)

- Fully online since 02/2014
- 30 turbines, 108 MW installed capacity
- 20 m water depth, 15 km distance to shore
- Grid connection delays (OWF completed in 08/2014)

Overview German Offshore Wind Farms (Status Q1/2014)



- 616 MW operating (online)
- 2,324 MW under construction – meanwhile 2,667 MW (6/2014)
- 872 MW investment decision made – meanwhile 582 MW (6/2014)

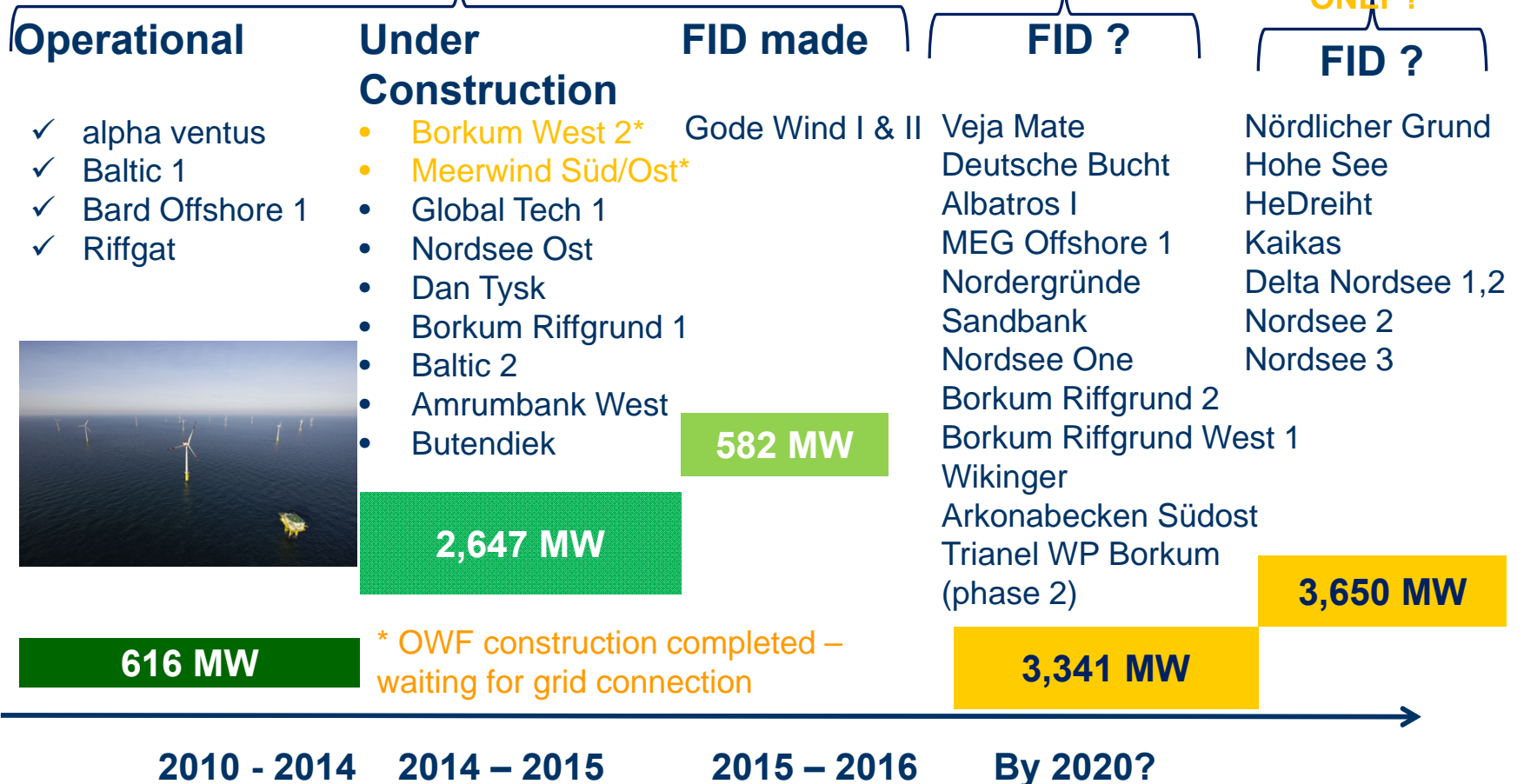
Overview German Offshore Wind Farms (Status Q1/2014)



> 3,5 GW initiated by EEG 2009/12

Initiated by EEG 2014?

Initiated by ONEP?
FID ?



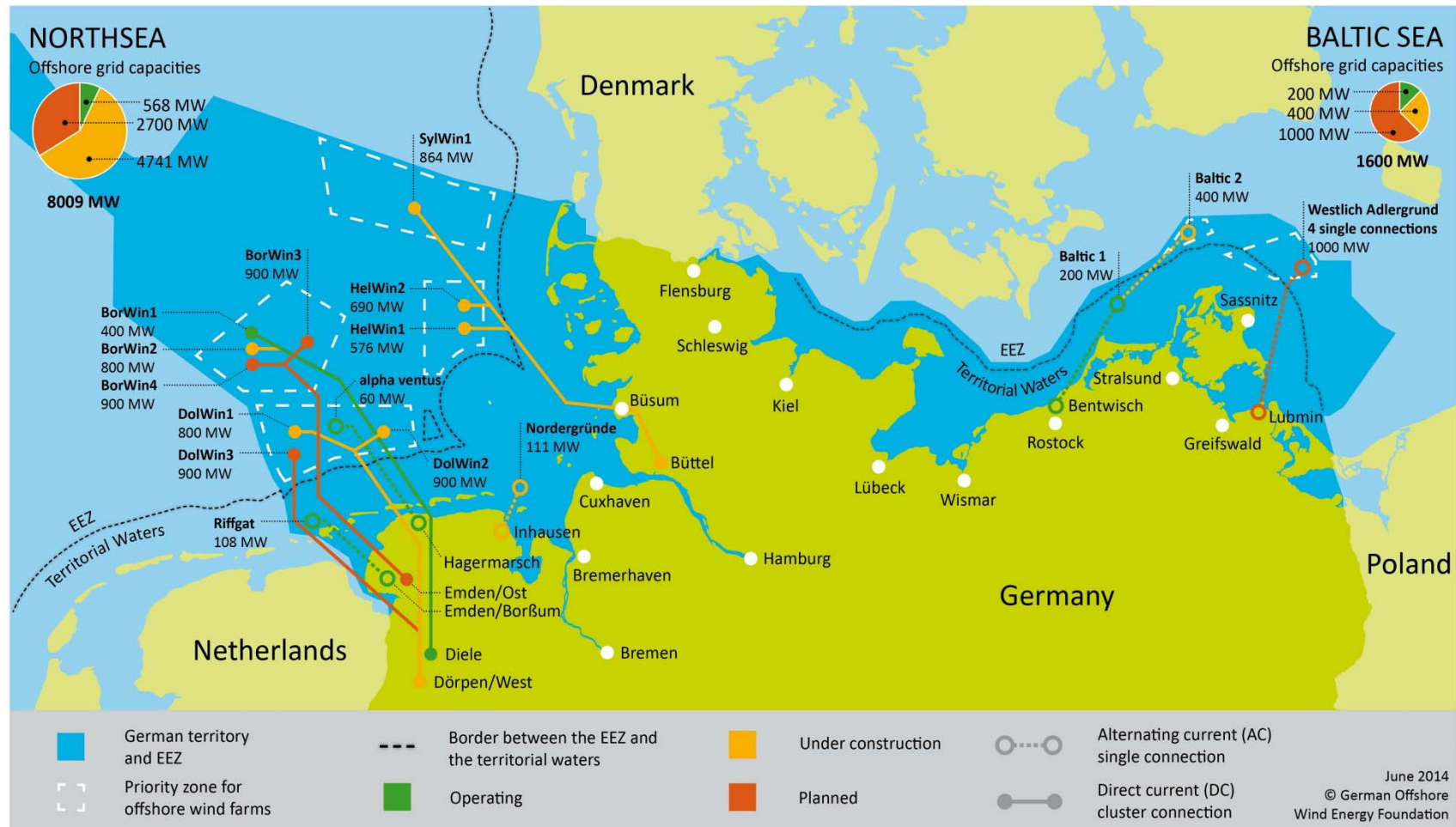
20+ offshore wind farms fully permitted – almost **7 GW additional capacity**

Offshore Grid Connection - a long line of delays, regulatory uncertainty and system change



Dec. 2006	§17 (2a) EnWG: TSOs obliged for grid connection, (in time!)
Oct. 2009	Position Paper by regulator est. criteria for offshore grid connection
Since 2010/11	Grid connection delays – up to 50-60 (+) months instead of 30. TenneT letter to the government (7 Nov. 2011), raising liability and financing issues
Q1/2012	WG Accelerated Grid Connection (moderated by:SOW) - recommendations to govt. on how to overcome delays
Q3-4/2012	Draft bill for change of EnWG (on system change/liability issues) issued & adopted by govt., adopted by Parliament in late 2012
Jan. 2013	New EnWG enters into force, i.e. regulatory system change → Implementation Guidelines (BNetzA) on liability, capacity transfer, ONEP development by TSOs (OGDP)
April 2013	
Sep. 2013	Federal Election
Dec. 2013	Coalition Treaty - New Targets for RE , including Offshore Wind
Jan. 2014	<i>ONEP 2013 published – enters into force</i>
April 2014	<i>Start of consultation on ONEP 2014 and on grid capacity allocation (with regulator)</i>

Offshore Grid Development Plan ,Start Grid' according to ONEP 2013



Provision of timely(!) grid connection is a prerequisite to achieve government targets!

Offshore grid connection projects – German North Sea

Project	Capacity (MW)	Year of operation
In operation		
alpha ventus	60	2009
BorWin 1	400	2010
Riffgat (delayed by 6 months)	108	Feb. 2014
Under construction/ awarded		
BorWin2	800	2015
DolWin1	800	2014
DolWin2	900	2015
HelWin1	576	2014
HelWin2	690	2015
SylWin1	864	2014
Nordergründe	111	2015
DolWin3	900	2018
Σ built / awarded	6,209	
In tender phase/recently awarded		
BorWin3, BorWin4	1,800	2019/20
To be tendered until 2023 according to O-NEP2013		
6 addtl. DC-connections	5.400	

Initial Offshore Grid Structure HVDC cable routes & platforms



Source: TenneT, 2013, updates SOW 2014

Legal Framework for Offshore Wind

A short History of the EEG (RE Act)

Support for renewable energy - specifies FIT, technology differentiation since 2000

Issues in the past for offshore wind (prior to 2009)

- No investments due to insufficient remuneration (9,1 ct/kWh)

EEG of 2008 (effective since 1st Jan. 2009)

- ✓ Increase of initial Feed-in-Tariff (FiT) to **13.0 ct/kWh**, plus **starter bonus of 2 ct**, granted for **12 years** after commissioning (for new OWF until 1st Jan. 2016)

EEG of 2011 (effective since 1st Jan. 2012)

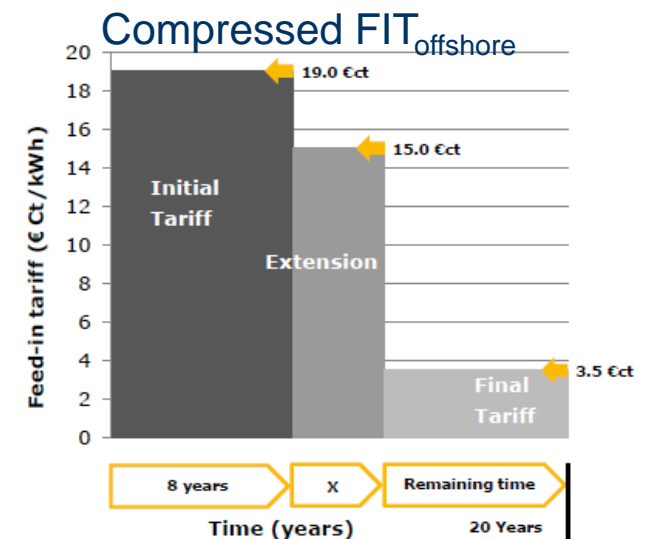
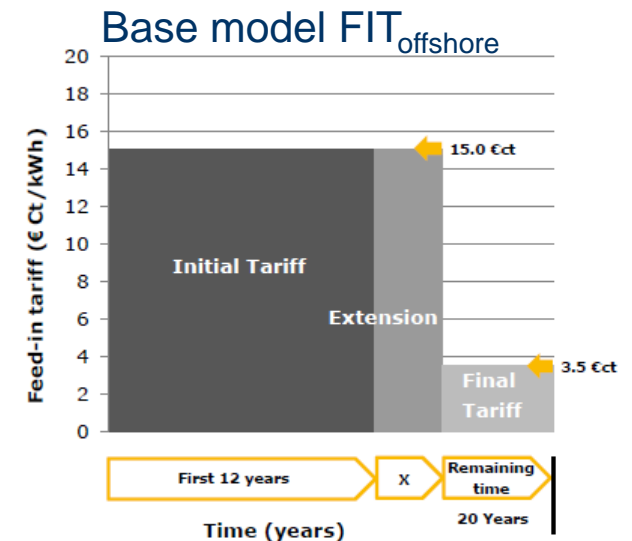
- ✓ **Compressed FiT**: Option to claim a higher **initial rate of 19 ct/kWh** – granted for **8 years**, afterwards FiT drops to 3.5 ct/kWh
Applied for new OWF until 2017
→ Important boost for investment decisions

New challenges emerging in 2012/13:

Grid connection issues and “**Electricity price brake**” debate (*‘Strompreisbremse’*) – **Uncertainty** about future of the Renewable Energy Act and RE targets

Sep. 2013 - Federal Election →

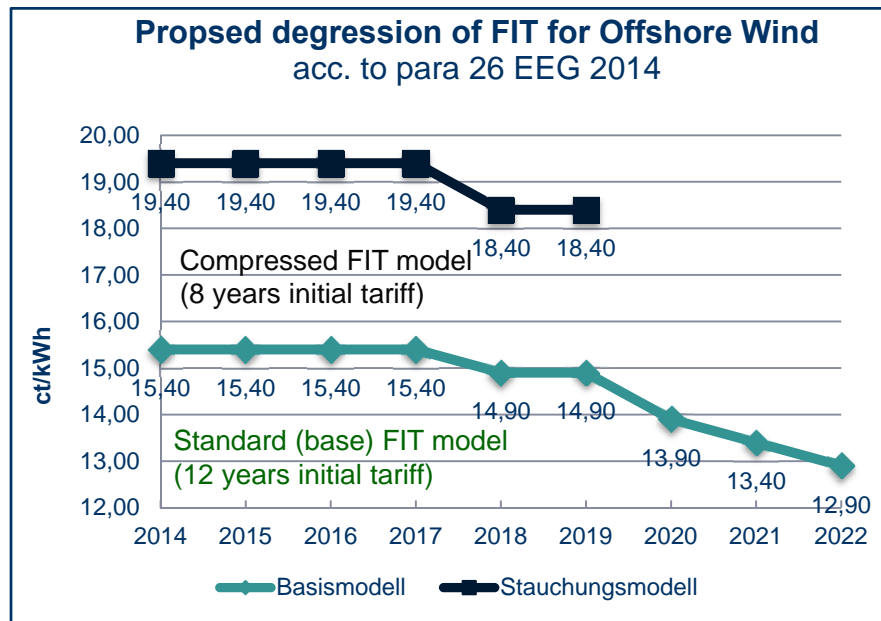
Coalition Treaty of Dec. 2013: **new RE targets** (incl. offshore wind) and **EEG reform in 2014**



EEG 2014 – Revised targets for OWE (Govt. Proposal of April 2014)

Year	IECP* of 2007	§ 3 EEG 2014
2020	10 GW	6,5 GW
2030	25 GW	15 GW

* Integrated Energy and Climate Programme of German Govt.



... **but** 2-year FIT-extension
until Dec. 2019;

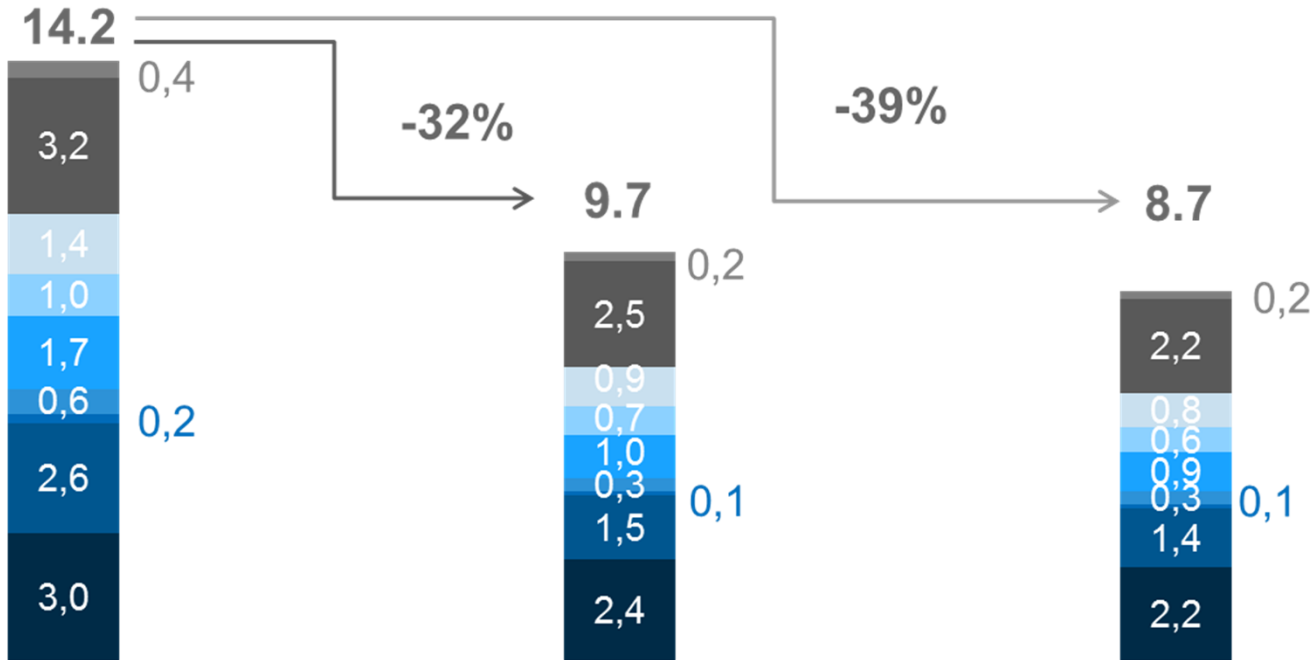
NOTE: After 2020, new tendering
system for OWE proposed –
For other RE tender scheme
planned in 2017, based on outcome
of PV (greenfield) pilot tender

Degression of FIT	para 20 EEG 2012	para 26 EEG 2014
Standard (base) model	7 % annual degression after 2017	in 2018: 0.5 €ct/kWh in 2020: 1.0 €ct/kWh
Compressed FIT	No degression	in 2018: 1.0 €ct/kWh

Cost Reduction Potentials for OWE

Projection of levelized cost of energy (LCOE)

Site B, results in €cent/kWh, based on 2012 real terms



© Prognos/Fichtner, 2013

- Turbine
- Transformer station
- Contingency

- Support structure
- Installation
- Operational costs

- Cabel
- Certification/Approval
- Decommissioning



- Decommissioning
- OpEX
- Contingency
- Certificat./Approval
- Installation
- Substation
- Internal cable
- Support structure
- Turbine

Learning Curve Effect caused by *constant growth*

→ economies of scale, increasing competition and growing turbine size

Energy System Benefits of Offshore Wind

Key assumptions/study results

1. German Energiewende requires 800 TWh coming from wind and solar (by 2050) – *can only be realized with large offshore wind capacities!*
2. Offshore wind leads to **reduced cost for flexibility measures**
→ least-cost option by 2050
3. Offshore wind has considerable **power plant characteristics** – important for security of supply (provision of balancing power, high schedule reliability, etc.)
4. **Stable and continuous expansion** of offshore wind capacities **required** to harvest energy system benefits and cost reduction potentials

More information at:

http://www.offshore-stiftung.com/60005/Uploaded/SOW_Download|FraunhoferIWES_OffshoreStudy_ExecutiveSummary.pdf

THE IMPORTANCE OF OFFSHORE WIND ENERGY IN THE ENERGY SECTOR AND FOR THE GERMAN ENERGIEWENDE

Summary



COMMISSIONED BY THE

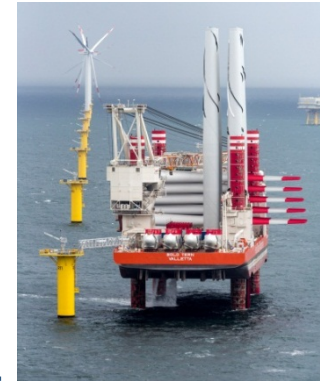
**Study launched in Nov. 2013, at
EWEA Offshore 2013, Frankfurt₁₂**

Offshore Wind Energy in Germany – An illustration of initial achievements

Positive operational results:

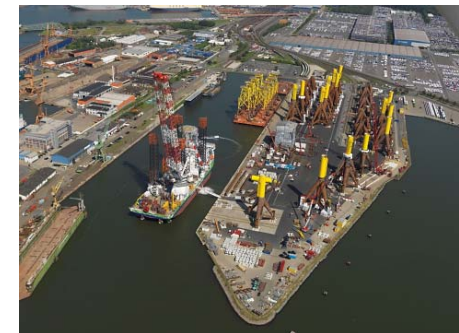
- **alpha ventus**: > 4.450 full load hours in 2011 (267 GWh)
→ 15 % above expectations,
- **Baltic I** – similar results; turbine availability 98 %

→ **Important contribution to energy system reliability!**



- **More than 1 bn Euro already invested** along German coast -
Port infrastructure, production facilities (offshore turbines/components),
construction vessels, (converter) platforms etc.
→ **Vast opportunities for maritime industries!**

- **10 billion Euro investment for Offshore Wind Farms**
→ 8 OWP under construction during Q1/2014

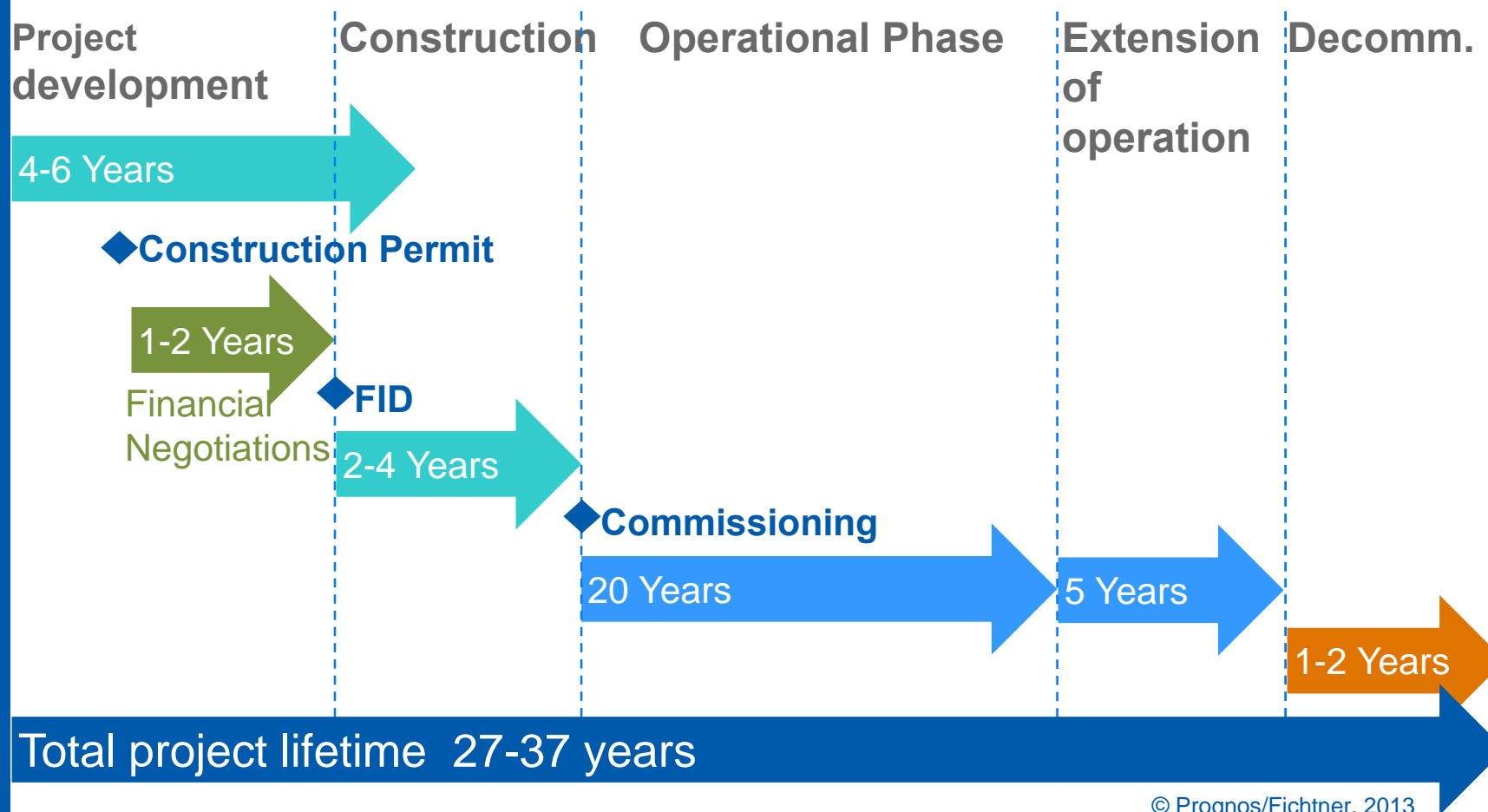


- **1/3 cost reduction potential possible by 2023** –
provided a steady project pipeline is secured by
stable, reliable framework conditions

- **18,000 jobs** created by 2012 (98,000 jobs in onshore wind)
→ Need for new and adjusted **professional/vocational training**
and university education!

Lesson learned: Long lead times for OWF need to be reflected by legal framework

Idealized (!) Project Schedule for an OWF in Germany



→ **Stable, long-term political framework conditions essential**
for investors, technology innovation and cost reduction!!!

Many thanks for your attention!

Andreas Wagner, CEO

Berlin Office

Schiffbauerdamm 19, D-10117 Berlin

Phone: +49-30-27595-141

Fax: +49-30-27595142

berlin@offshore-stiftung.de



Varel Office

Oldenburger Str. 65, D-26316 Varel

Phone: +49-4451-9515-161

Fax: +49-4451-9515-249

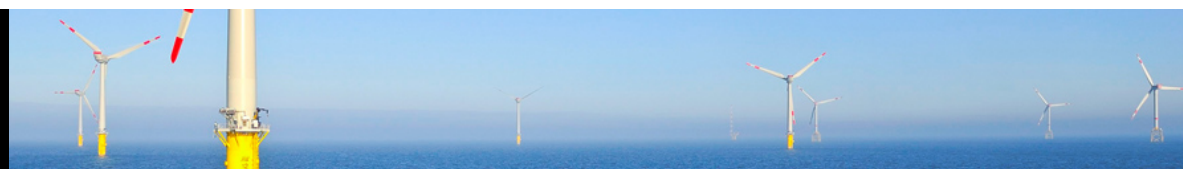
varel@offshore-stiftung.de

www.offshore-stiftung.de



More news & information (German/English)

OFFSHORE-
WINDENERGIE.NET



Backup Slides

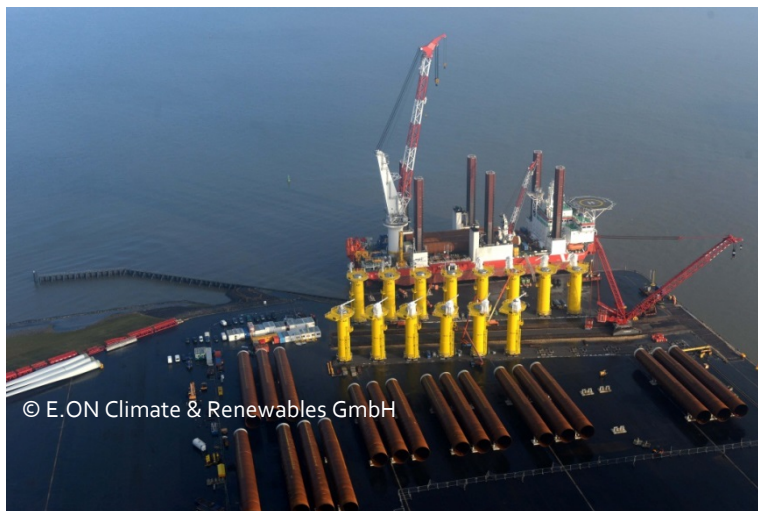
German Offshore Windfarms under Construction
> 2.5 GW under construction

Status Report, as of 1st June 2014



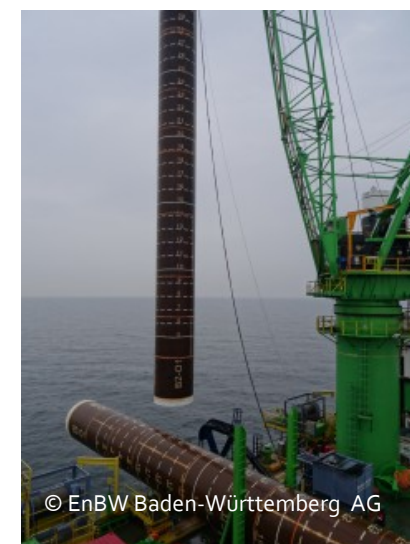
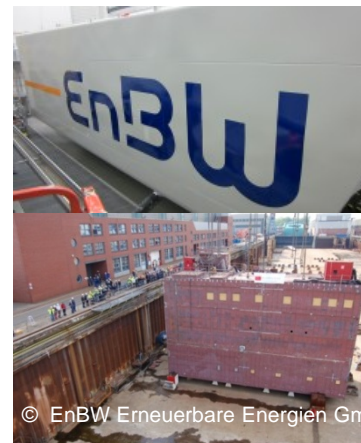
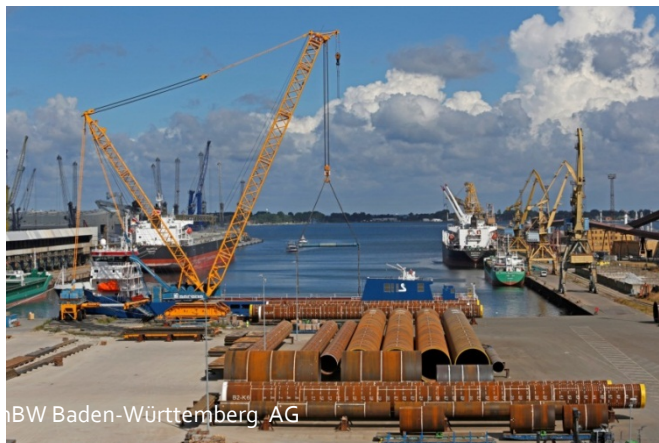
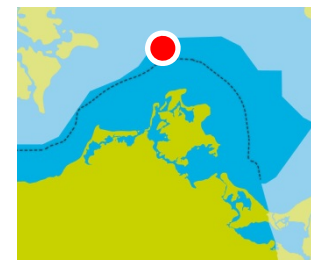
Amrumbank West (288 MW)

- 80 turbines (each 3.6 MW)
- **Start of construction:** April 2013
- Expected start of commissioning: Q1/2015
- **Grid connection delay:** > 12 months
- Construction progress: 30 foundations installed, Transformer station installed, Infield-cabling under construction
- **Estimated start of full operation:** Q3/2015 (depending on grid connection)
- Water depth: 19 - 24 m
- Distance to shore: ~ 40 km (north of Helgoland)



Baltic 2 (288 MW) – Baltic Sea

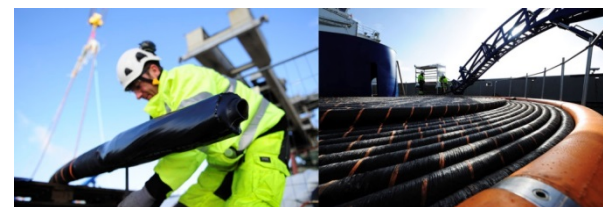
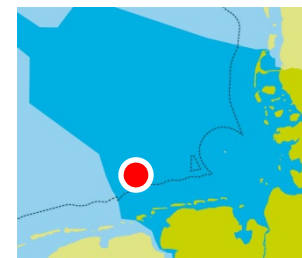
- 80 turbines (each 3.6 MW)
- **Start of construction:** July 2013
- Expected start of commissioning: End of 2014
- Construction progress:
 - Monopiles and Jacketpiles installed,
 - Jacket installation starting in mid 2014,
 - Turbine delivery, infield cabling in mid 2014,
 - Transformer station installation by end of 2014,
 - Installation of wind turbines in summer 2014
- **Expected start of full operation:** Spring 2015
- Water depth: 23 to 44 m
- Distance to shore: 32 km, north of Rügen



Borkum Riffgrund 1 (312 MW)

- 80 turbines (each 4 MW)
- **Start of construction:** 2013
- Expected start of commissioning: Autumn 2014
- Construction progress: 45 foundations installed
- **Expected start of full operation:** by early 2015
- Water depth: 28 to 32 m
- Distance to shore: 54 km (NW of Borkum)

DONG
energy



Butendiek (288 MW)

- 80 turbines (each 3.6 MW)
- **Start of construction:** April 2014
- Expected start of commissioning: Middle of 2015
- **Grid connection delay:** 3 months
- Construction progress: 36 foundations installed, Transformer station installed, Infield-cabling starting in mid June 2014
- **Expected start of full operation:** End of 2014
- Water depth: 17 bis 22 m
- Distance to shore: 32 km west of Sylt, 53 km to mainland

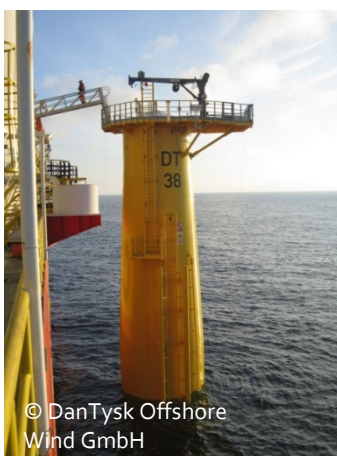


DanTysk (288 MW)

- 80 turbines (each 3.6 MW)
- **Start of construction:** End of 2012
- Expected start of commissioning: Oktober 2014
- **Grid connection delay:** 12 months
- Construction progress: foundations and transformer station installed in 2013, infield-cabling 70% completed, Installation of wind turbines starting in Sep. 2014
- **Expected start of full operation:** Fall 2014
- Water depth: 21 - 32 m
- Distance to shore: 70 km west of Sylt

VATTENFALL 

SW/M



Global Tech I (400 MW)

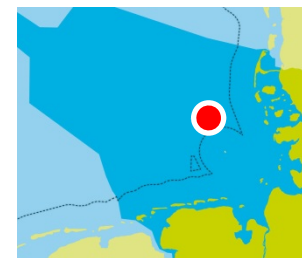
- 80 turbines (each 5 MW)
- **Start of construction:** Middle of 2012
- **Grid connection delay:** 24 months
- Construction progress: transformer station installed, 78 foundations and 26 wind turbines installed
- **Expected start of full operation:** Autumn 2014 (BorWin II)
- Water depth: 39 to 41 m
- Distance to shore: 110 km to Cuxhaven (base port)



Meerwind Süd/Ost (288 MW)

- 80 turbines (each 3.6 MW)
- **Start of construction:** 2012
- Expected start of commissioning: 2013
- **Grid connection delay:** 24 months
- Construction progress: foundations, transformer station and offshore wind turbines completely installed since march 2014
- **Expected start of full operation:** October 2014
- Water depth: 30 m
- Distance to shore: 23 km NE of Helgoland, 105 km to Cuxhaven, 120 km to Bremerhaven

WindMW



Nordsee Ost (295 MW)

- 48 turbines (each 6.15 MW)
- **Start of construction:** 2012
- Expected start of commissioning: Fall 2013
- **Grid connection delay:** approx. 24 month
- Construction progress: foundations, infield-cabling completely installed, Installation of wind turbines since May 2014
- **Expected start of full operation:** Spring 2015
- Water depth: 22 - 26 m
- Distance to shore: 32 - 45 km

VORWEG GEHEN



Trianel Windpark Borkum (phase 1: 200 MW)

- 40 turbines (each 5 MW)
- **Start of construction:** Summer 2011
- Expected start of commissioning: End of 2012/Beginning 2013
- **Grid connection delay:** 18 months
- Construction progress: OWF completely installed since 1st June 2014
- **Expected start of full operation:** Summer 2014
- Water depth: 29 to 33 m
- Distance to shore: 45 km north of Borkum

