Wind & Maritim 2014 – Forum G

The Offshore Wind Energy Market in Germany

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German Offshore Wind Energy Foundation

Rostock, 08 May 2014

German Offshore Wind Energy Foundation

- Independent, non-partisan institution to support the development of offshore wind energy, founded in 2005
- **Platform for offshore wind** (and maritime) industry, for policy-makers and research-oriented stakeholders
- **Board of Trustees** - industry & policy stakeholders
- PR and public acceptance activities, e.g. offshore exhibition
- **Policy initiatives & studies** (cost reduction, energy system benefits)

- *OffWEA project*
  Consulting and supporting the federal government in realising and advancing the German offshore wind energy strategy
- *OFT project* (Offshore Test Site)
- Initiated/Coordinating *WG of Connecting Maritime Industry with Offshore Wind*

EU Projects:

- *WINDSPEED*
- *SEANERGY 2020*
- **Interreg Projects:**
  4POWER, South Baltic OFF.E.R.

Historical Timeline –
Offshore Wind in Germany: Progress/Obstacles

1999
First application for an OWP in German EEZ (Borkum West)

2001
First permit awarded for OWP Borkum West

Plans for FINO

2002
Offshore-Strategy of German govt. (500 MW by 2006, 2-3 GW by 2010 20-25 GW by 2025/2030

2004
(Onshore)
Installation of first Multi-MW prototypes (up to 5 MW)

Erection of a 5 MW Neashore turbine in the Ems (ENERCON)

2005
Call for an Offshore Test Site (4. NMK)

Creation of Stiftung OFFSHORE-WINDENERGIE → Acquisition of permit (Borkum West)

2006
Creation of DOTI to build & operate test site alpha ventus

Lease contract between Stiftung and DOTI

2007
alpha ventus: contract signed with Multibrid (Areva)

2008
alpha ventus: Start of construction

Contract signed with REpower

Start of R&D initiative RAVE (research at alpha ventus)

2010
Commissioning of alpha ventus - first German OWP (Testfeld)

Start of construction for Baltic 1 and BARD Offshore 1

2011
Commissioning of Baltic 1 (Ostsee)

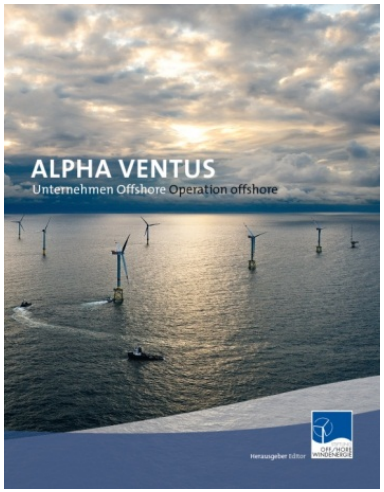
March: Fukushima - Energiewende,

2013
Commissioning of BARD Offshore 1
Completion of Borkum Riffgat

Pioneering project *alpha ventus*

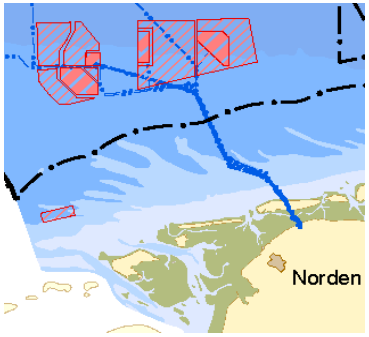
First Offshore Wind Farm (OWF) in Germany,
'Test Field' constructed 2008-10

- 12 wind turbines (à 5 MW) → 60 MW
- 2 turbine manufacturers
  (AREVA/Multibrid,REpower)
- 2 types of foundations (tripods, jackets)



- **60 km distance** to shore, **30 m water depth**

- Permits acquired by SOW in 2005
- Leased to DOTI (EWE, E.ON, Vattenfall)
- Commissioning in late 2009/early 2010
- Extensive ecological and technological research -
  50 M€ R&D program (RAVE)
- Impressive operational results –
  50 % capacity factor (4,450 full load hours)



AW1

German Offshore Wind Farms in Operational and grid-connected (Q1/2014)

STIFTUNG OFFSHORE WINDENERGIE

alpha ventus (DOTI)

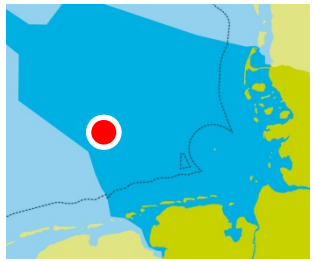
- Fully online since 04/2010
- Installed capacity: 60 MW
- Number of wind turbines: 12
- Water depth: 30 m / Distance to shore: 45 km

Baltic 1(EnBW)

- Fully online since 05/2011
- Installed capacity : 48 MW
- Number of wind turbines: 21
- Water depth: 18 m / Distance to shore: 15 km

BARD Offshore 1 (BARD)

- Fully online since 08/2013
- Installed capacity: 400 MW
- Number of wind turbines: 80
- Water depth: 40 m / Distance to shore: 89 km



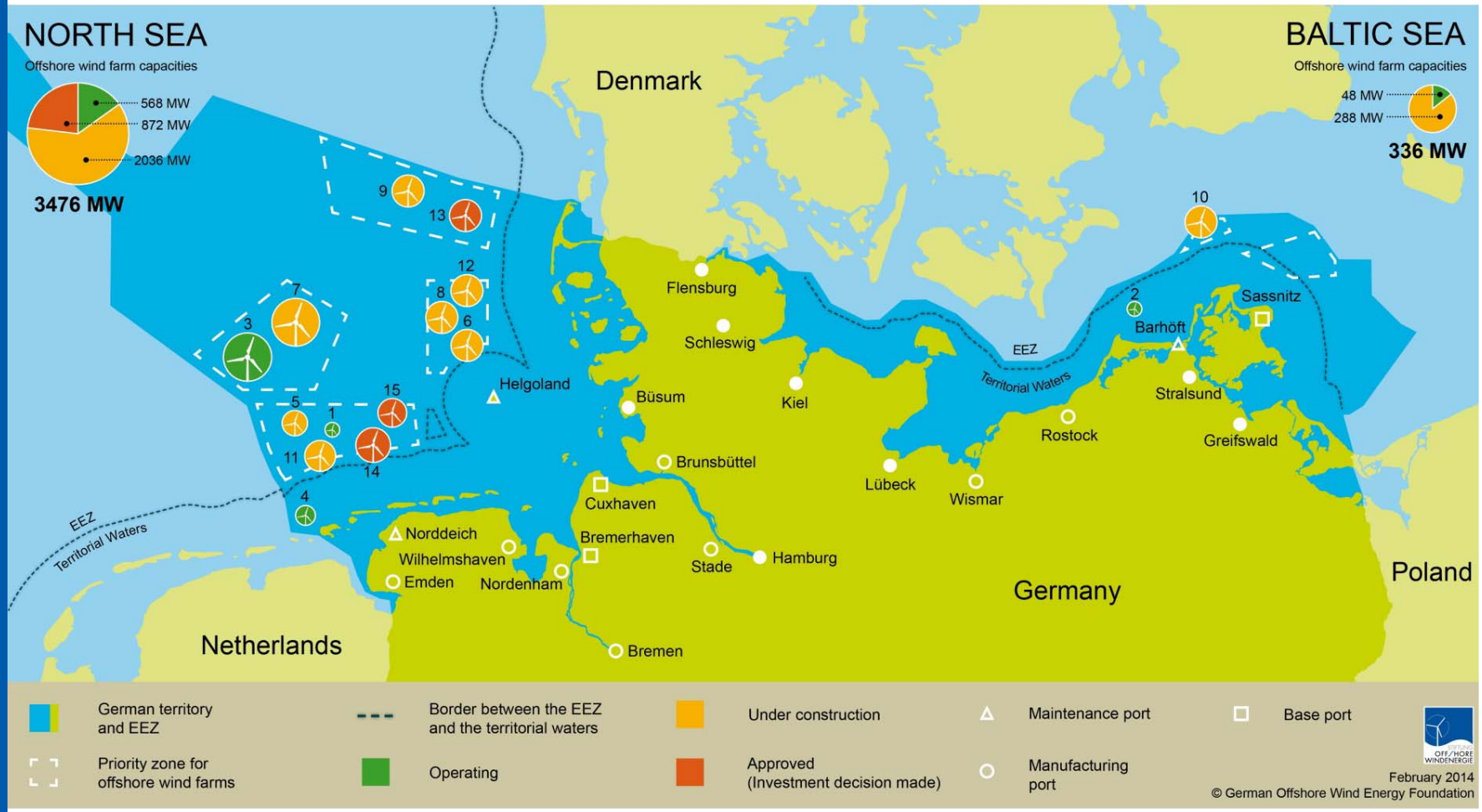
Riffgat (EWE)

- Fully online since 02/2014
- Installed capacity: 108 MW
- Number of wind turbines: 30
- Water depth: 20 m / Distance to shore: 15 km

Folie 5

AW1 Bitte andere und auch verschiedenartigere Fotos, d.h. Totale aus der Luft von gesmaten OWPs, Fotos mit Errichterschiff, Umspannplattform, usw.
Insbesondere das Riffgat-Motiv muss ausgetauscht werden - sieht total verzogen aus.
Aber auch alpha ventus, Baltic 1 sind nicht besonders prickelnd
Andreas Wagner; 28.03.2014

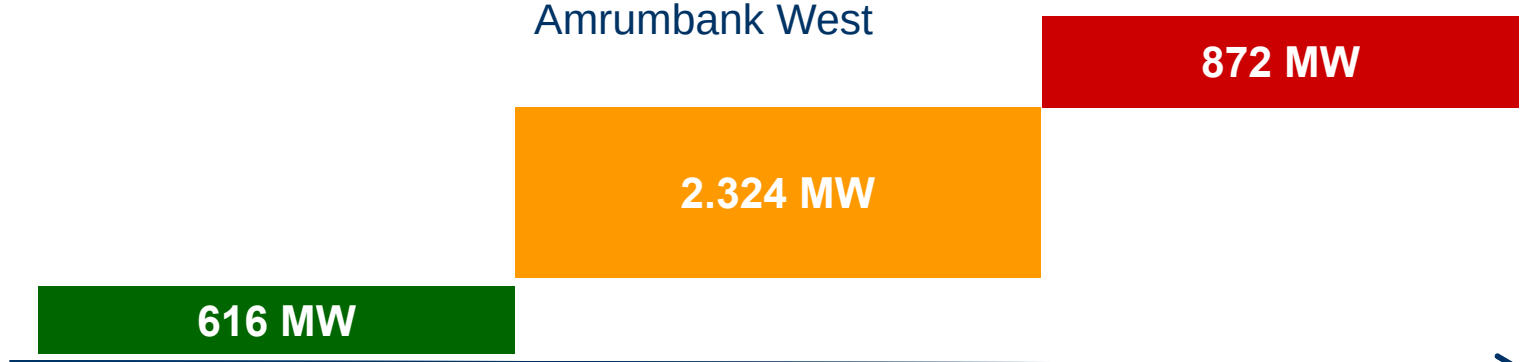
Overview German Offshore Wind Farms
(Status Q1/2014)



- 616 MW operating
- 2324 MW under construction
- 872 MW investment decision made already

Overview German Offshore Wind Farms
(Status Q1/2014)

Operating	Under Construction	Investment Decision
alpha ventus	Borkum West 2	Butendiek
Baltic 1	Meerwind Süd/Ost	Gode Wind I & II
Bard Offshore 1	Global Tech 1	
Riffgat	Nordsee Ost	
	Dan Tysk	
	Borkum Riffgrund 1	
	EnBW Windpark Baltic 2	
	Amrumbank West	



Some 20+ offshore wind farms have a building permit – additional capacity of another 6,000 MW.

Legal Framework for Offshore Wind
The Renewable Energy Act - EEG

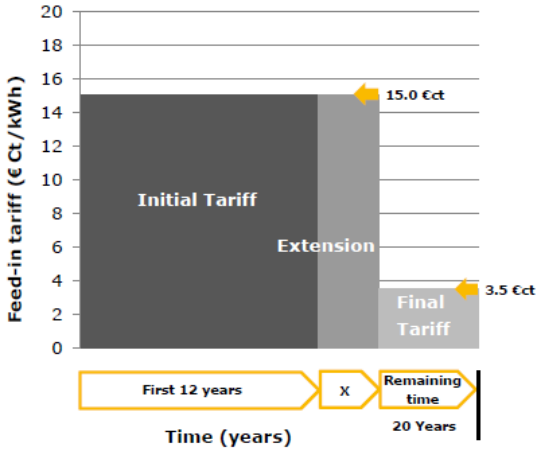
Support for renewable energy - specifies remuneration, technology differentiation since 2000

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

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

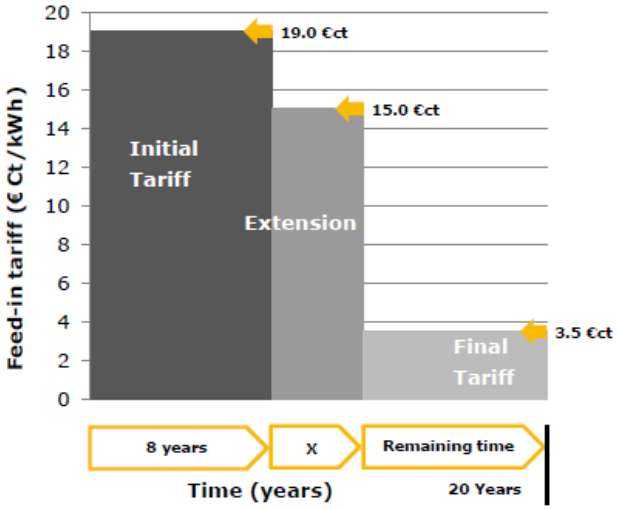
EEG of 2008 (entered into force on 1st Jan. 2009)

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



EEG of 2011(entered into force on 1st Jan. 2012)

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



New issues emerged in 2013

"Electricity price brake" (*Strompreisbremse*) – Debate since Feb. 2013 - **Uncertainty** about future of the Renewable Energy Act and RE targets

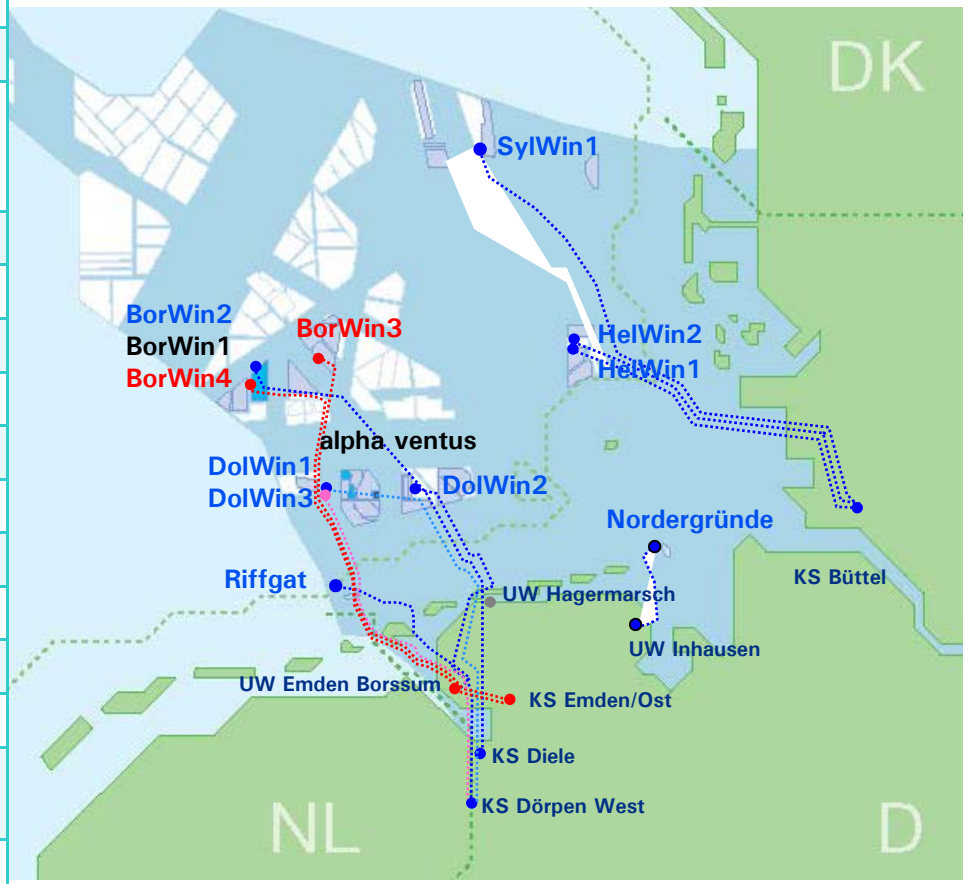
Offshore Grid Connection - Delays, Regulatory Uncertainty and System Change

Dec. 2006	**§17 (2a) EnWG**: TSOs obliged for grid connection, **(in time!)**
Oct. 2009	Criteria for offshore grid connection defined acc.to **PP BNetzA**
Since 2010/11	Grid connection delays – up to 50(+) months (instead of 30) **TenneT letter** to the government (7 Nov. 2011), Liability and Financing issues
Q1/2012 - **Q3/2012**	**AG Beschleunigung** Offshore-Netzanbindung (moderator:SOW) recommendations to the government on how to overcome delays Government issues & adopts draft bill for change of EnWG (on system change/liability issues)
Q4/2012	Bundestag / Bundesrat adopt the bill
Jan. 2013	**New EnWG** enters into force
2013	Introduction of regulatory system change → ONEP development Implementation Guidelines (BNetzA) on liability, capacity transfer
Sep. 2013	Federal Election
Dec. 2013	Coalition Treaty - **New Targets for RE**, including Offshore Wind
Jan. 2014	*ONEP 2013 published and confirmed*
April 2014	*Start of consultation on ONEP 2014 and on capacity allocation*

Offshore grid connection projects – German North Sea

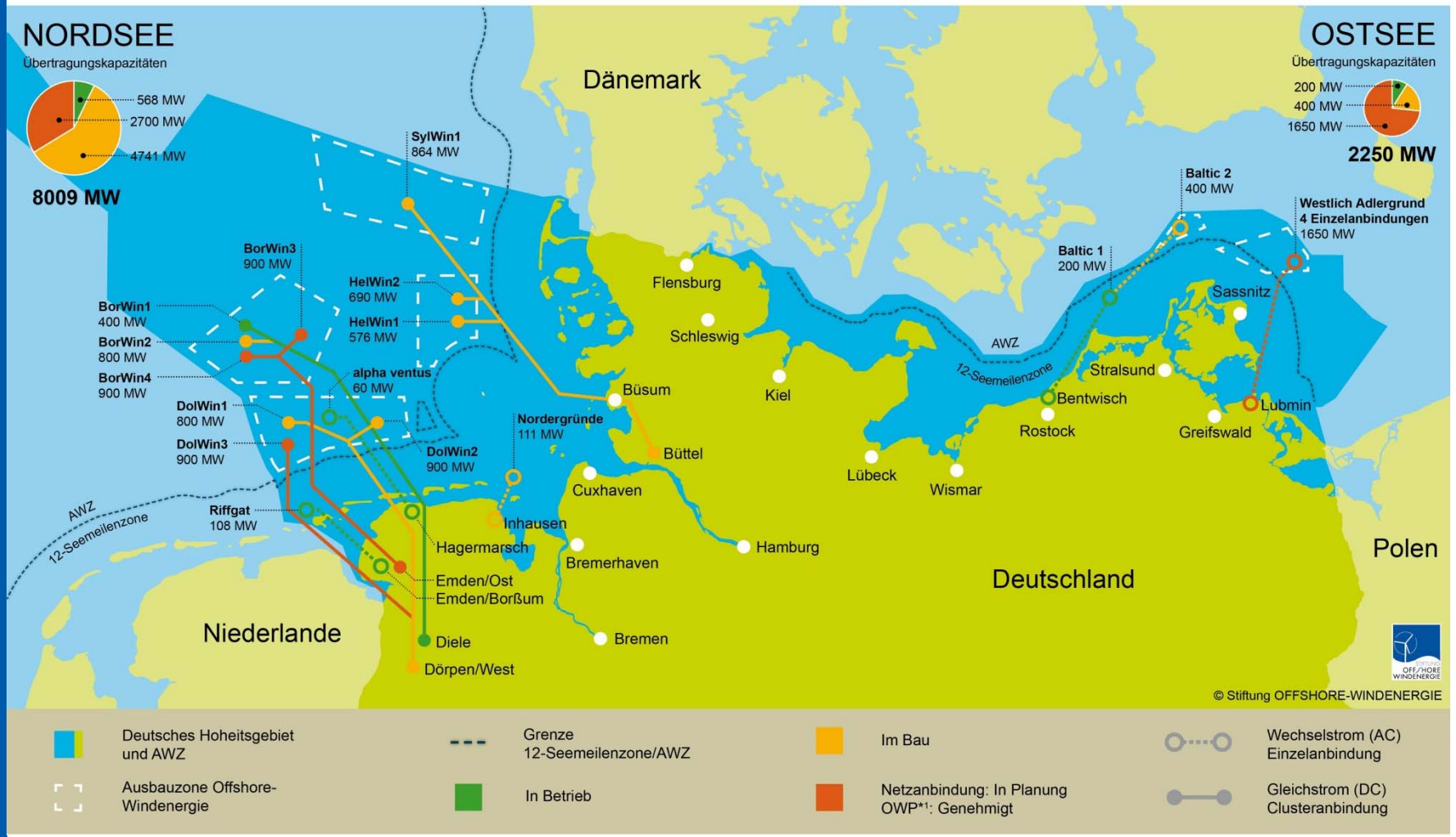
Project	Capacity (MW)	Year of operation
In operation		
alpha ventus	60	2009
BorWin 1	400	2010
Riffgat *(delayed by 6 months)*	***108***	***Feb. 2014***
Under construction/ awarded		
BorWin2	800	2015
DolWin1	800	2014
DolWin2	900	2015
HelWin1	576	2014
HelWin2	690	2015
SylWin1	864	2014
Nordergründe	111	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 DC-connections	**5.400**	

Initial Offshore Grid Structure
HVDC cable routes & platforms



Source: TenneT, 2013, updates SOW 2014

Offshore Grid Development – ‚Start Grid' according to ONEP 2013

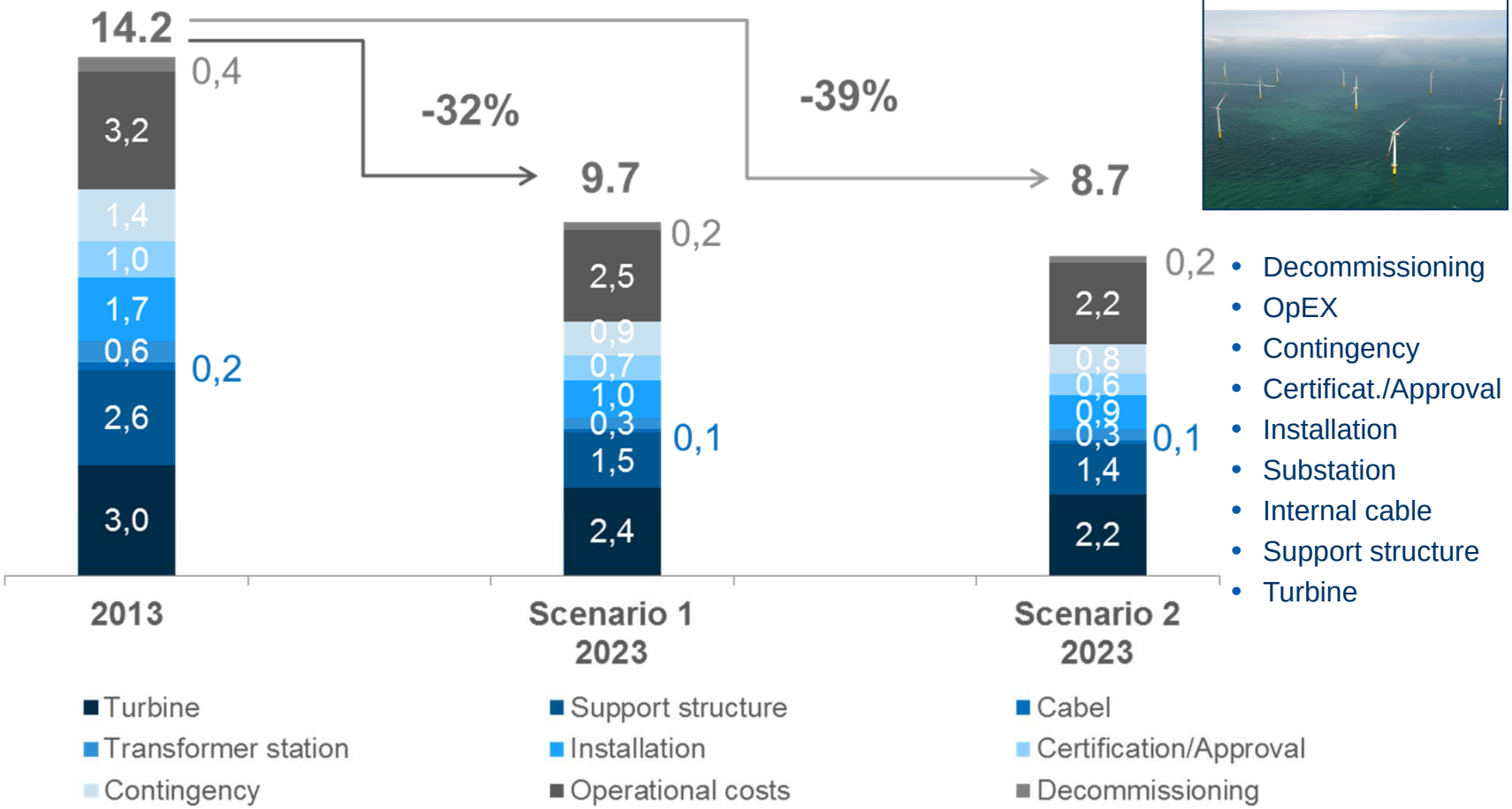


Provision of timely(!) grid connection is a prerequisite to achieve government targets

Projection of levelised cost of energy (LCOE)

€cent/kWh (example of site B, based on 2012 real terms)

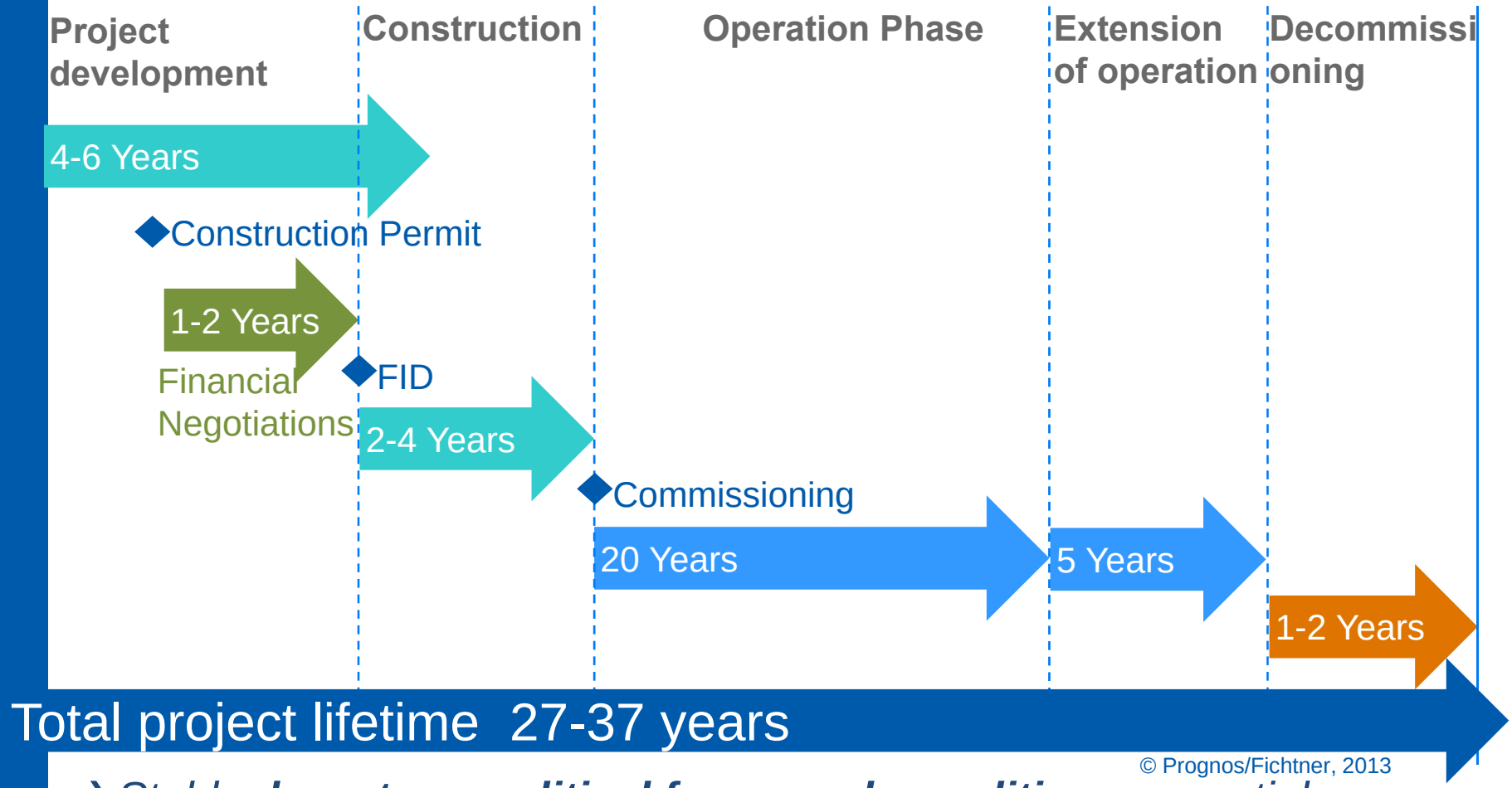
Learning Curve Effect caused by ***constant growth*** - economies of scale, increasing competiton and turbine size



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

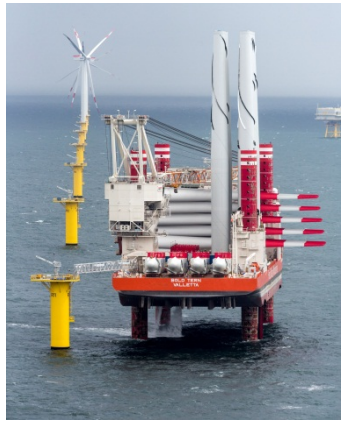
Take into account long lead times for OWF (large power plant schedules)

Idealized (!) Project Schedule for an OWF in Germany



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

Offshore Wind Energy in Germany – An illustration of initial positive results

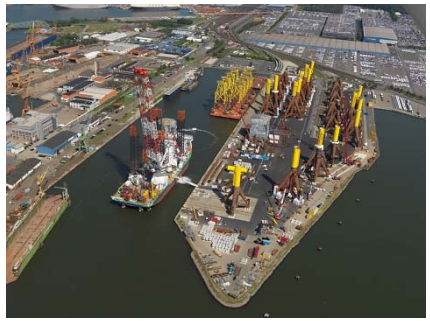


Positive operational results:

- **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!**

- **>1 billion 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 by 2023** – provided a steady project pipeline is provided by stable legal framework conditions

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

Energy System Benefits of Offshore Wind

Key assumptions/study results

1. Energiewende requires 800 TWh 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*** – lowest 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, continuous expansion*** of offshore wind capacities ***required*** to harvest energy system benefits and cost reduction potentials

Study launched in Nov. 2013,
(EWEA Offshore 2013, Frankfurt)

Vielen Dank!
Thanks for your Attention!

Andreas Wagner, CEO

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