



DEXIA

About Offshore Wind Energy in Germany

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September 2008 / Vittel

Summary



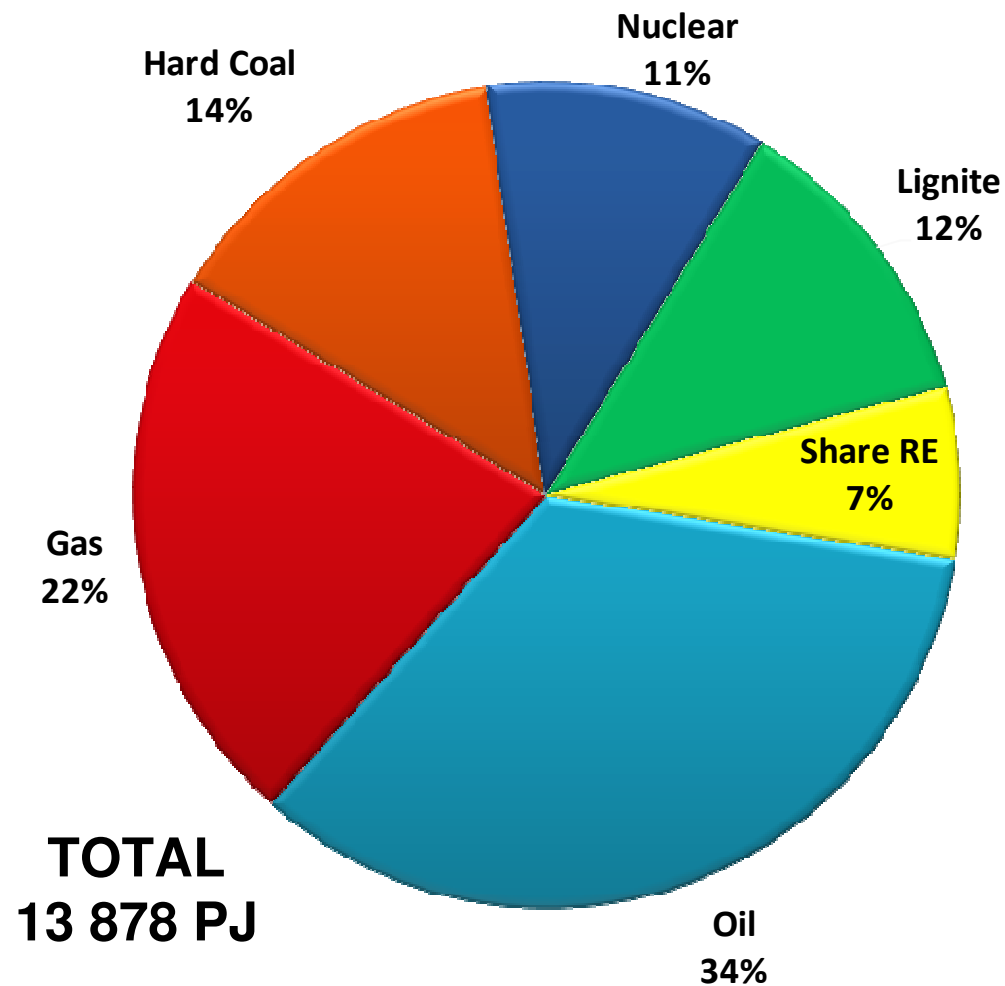
- Renewable Energy Act and market status in Germany
- Status of licenses (BSH)
- Players in the German market
- Dexia's position
- Annex



Energy sources in Germany in 2007



Total Primary Energy Consumption in Germany in 2007

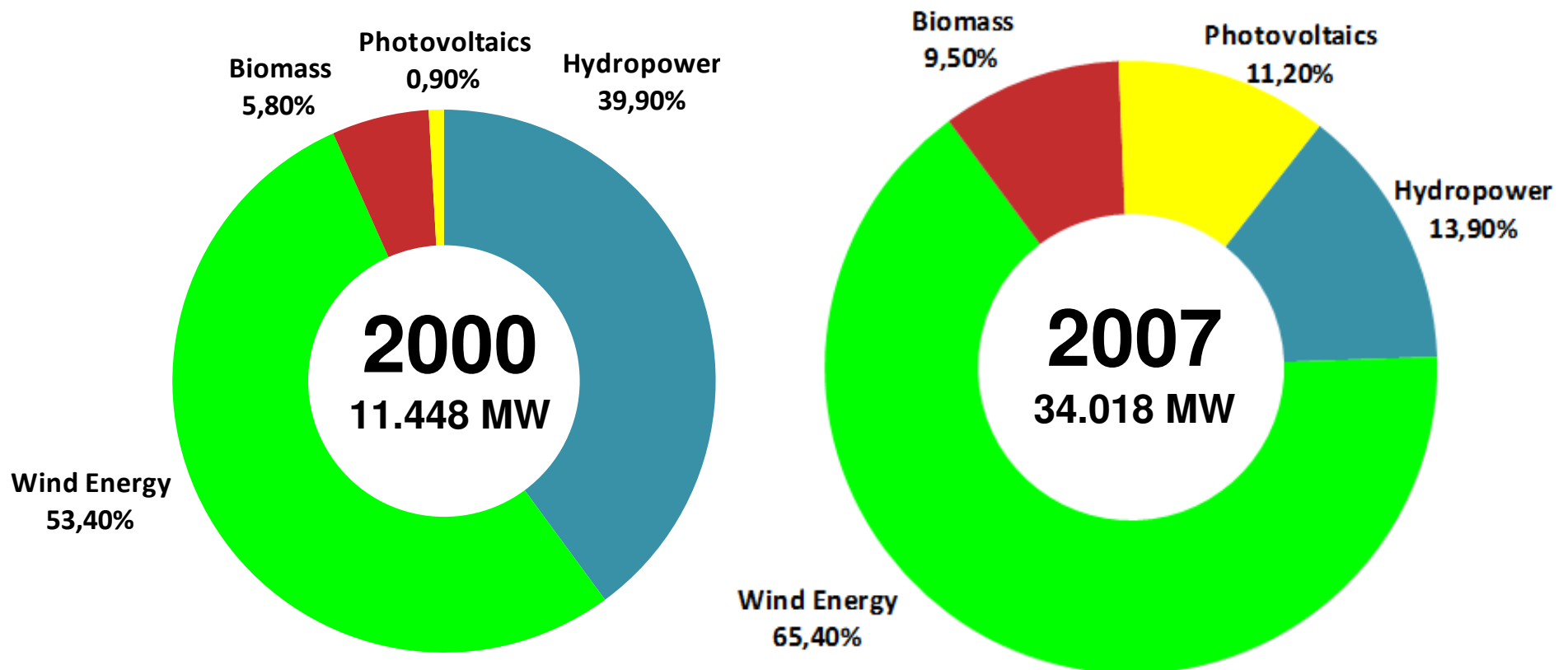


Source: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Energy sources in Germany in 2007



Share of total installed capacity of renewable energy sources, 2000 and 2007



Source: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Renewable Energy Sources Act



A strong incentive for the development of renewable energy in Germany

- /// The Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz / EEG) **regulates the feed-in power tariff in Germany (currently for offshore wind €15 cent/kWh)**
- /// It was adopted **in April 2000** by the German Government.
- /// It was **revised in 2004** and **amended in 2008** in order to adapt tariffs to new market conditions and technological developments.



Objectives of the Renewable Energy Sources Act

German Government objectives:

- To increase the amount of renewable energies in the power supply to **12.5 % by 2010 and to 20% by 2020**
- To reduce German carbon dioxide emissions
- To avoid **dependency on external energy**
- To promote a **sustainable renewable energy industry**

Renewable Energy Sources Act



First payoff of the Renewable Energy Sources Act in Wind Energy sector

- /// The German initial target, **12.5% of Germany's electricity consumption** to be met by renewable energy by 2010, was **already exceeded in 2007 with a share of 14%**
- /// The government recently increased **its target for 2020 to 30%**, up from the **previous target of 20%**
- /// Turbine manufacturers are **among the market leaders**, representing a **global market share of 22%**
- /// Equipment manufacturers generated **€6 billion in exports in 2007**
- /// The wind energy sector employs **more than 100,000 people**

Renewable Energy Sources Act



Wind energy minimum price system and feed-in compensation

- /// Grid operators are obliged to **pay for all offshore wind power** and buy it at a **minimum price within their supply area**
- /// The average feed-in tariff **over 20 years** for onshore turbines installed in **2007 ranged from 8.19 euro cent/kWh** ('initial tariff') to **5.17 euro cent/kWh** ('basic tariff').
- /// In order to allow for technological progress and continuous cost reduction, **the initial tariff is reduced by 2% every year**
So it will be **8.03 to 5.07 euro cent/kWh for onshore turbines installed in 2008** but **9.02 to 5.02 euro** from **January 2009** according to the amendment (degression: 1% per year)



Wind energy minimum price system and feed-in compensation

/// The ‘**initial tariff**’ for offshore wind farm is fixed for at least **12 years**, and may then be reduced to the ‘**basic tariff**’, depending on how local wind conditions compare to a “reference yield” (degression: 5% per year from 2015)

/// The initial tariff for offshore wind energy: **€ 0.13 per kWh for a period of 12 years (+ €0.2 per kWh for all turbines installed before 31 December 2015).**

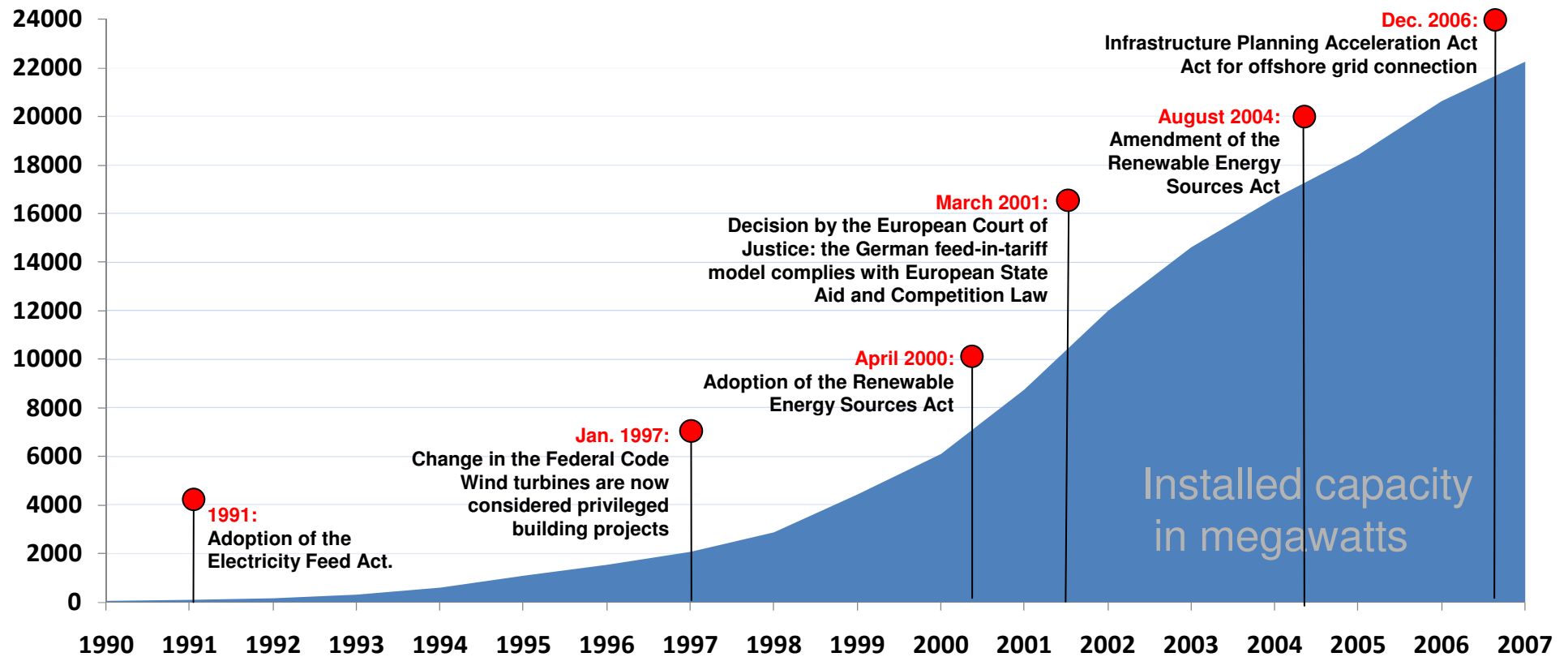
There is an additional prolongation for **deeper waters and a growing distance from the coast (max: €0.15 per kWh during 15 years)**

Evolution of installed capacity

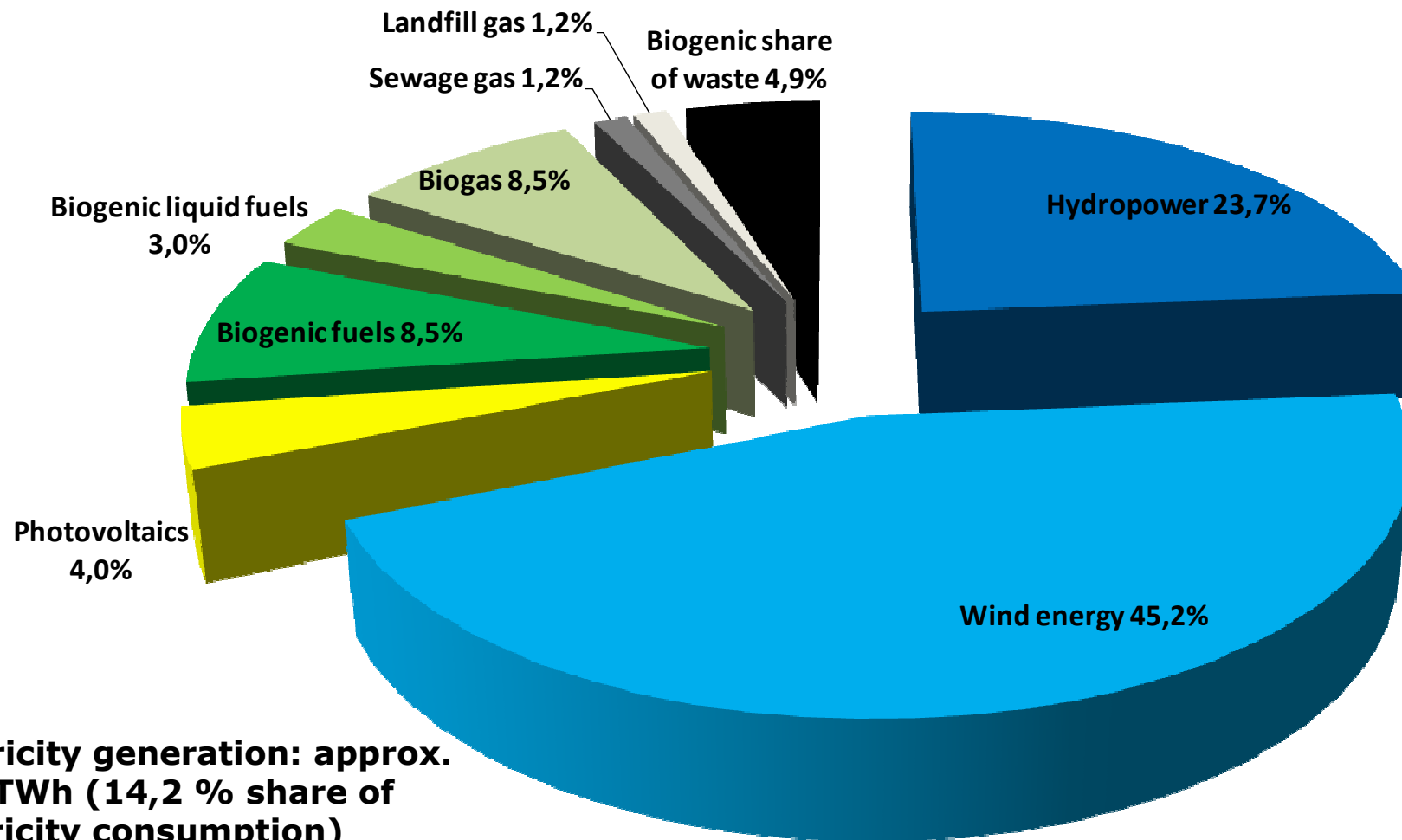


Wind Energy in Germany – Political Milestones

MW Installed
(nominal)



German electricity generation from renewable energy sources in 2007



Electricity generation: approx. 87,5 TWh (14,2 % share of electricity consumption)

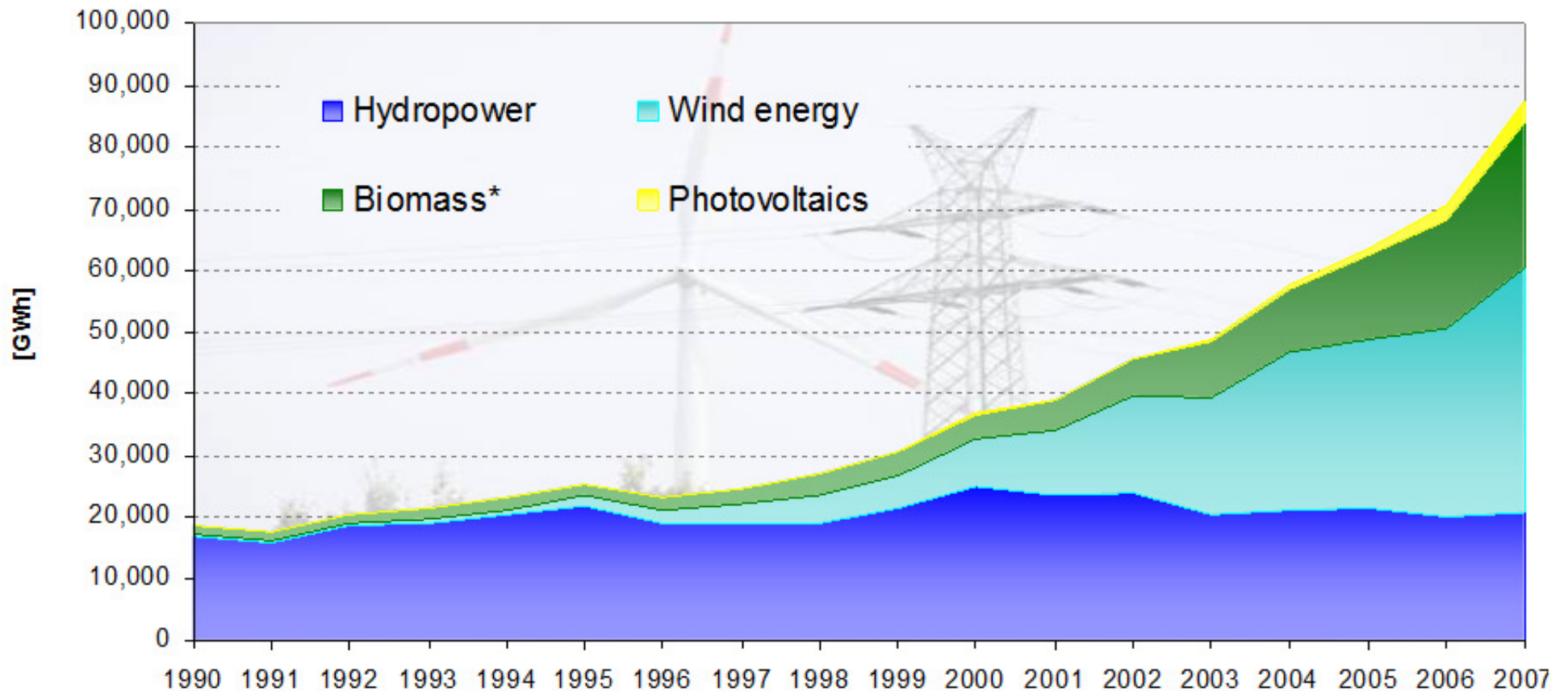


Source: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Evolution of renewable energy in Germany



Contribution of renewable energy sourced electricity generation in Germany

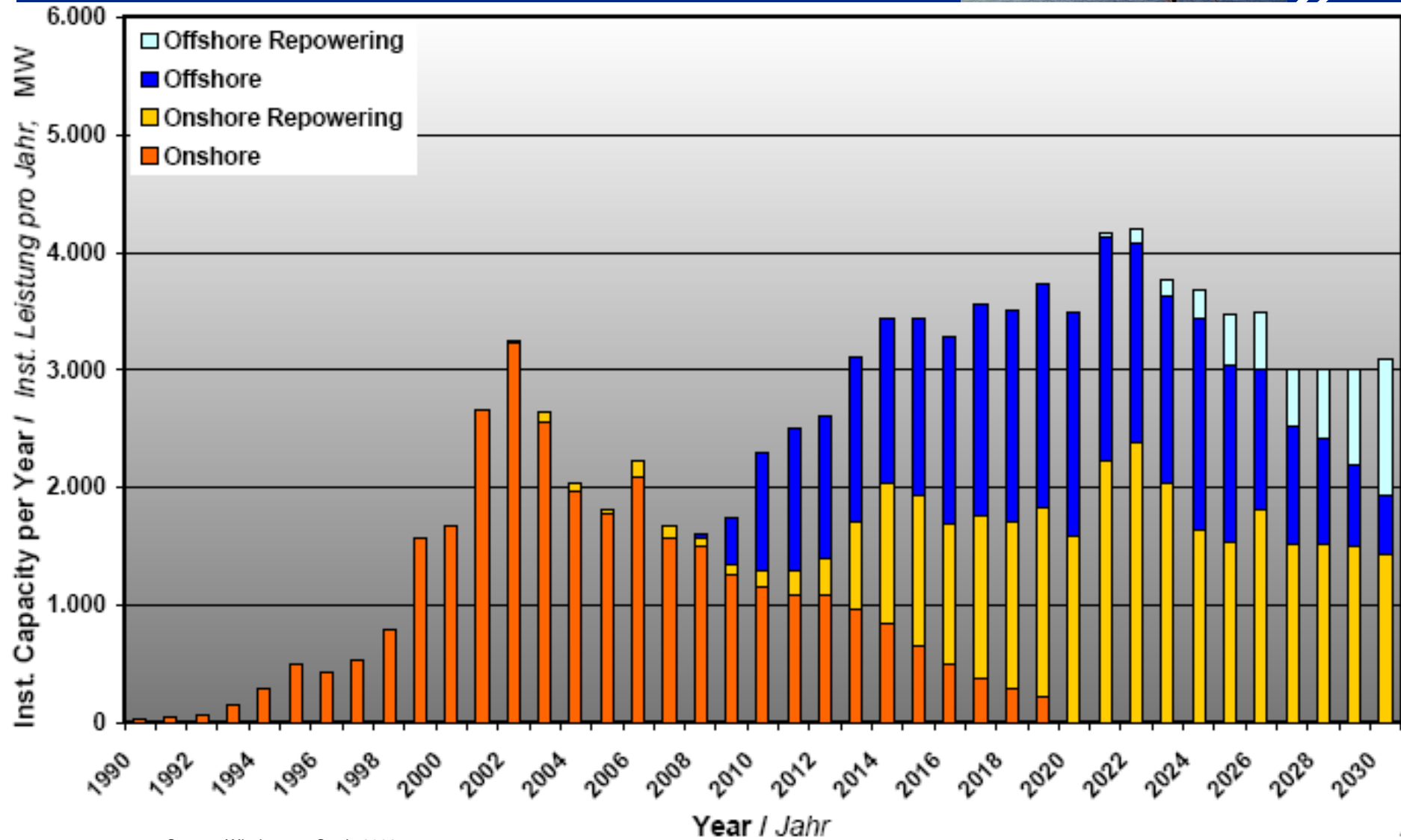


* solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas;

Electricity from geothermal energy is not presented due to the low volumes of electricity

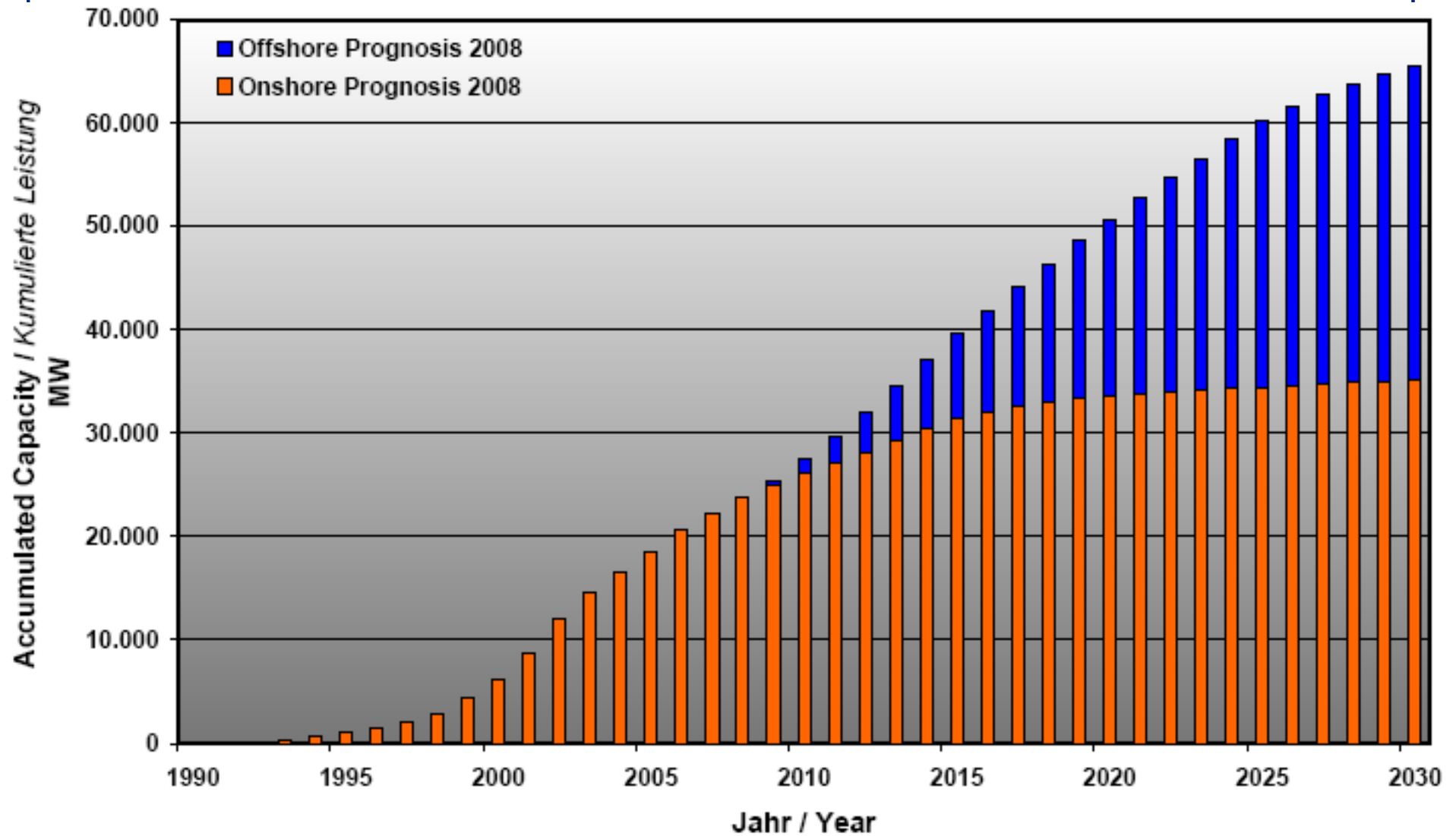
Source: BMU according to Working Group on Renewable Energies / Statistics (AGEE-Stat)

Installed Capacity per Year in Germany



Source: Windenergy Study 2008

Accumulated Capacity in Germany

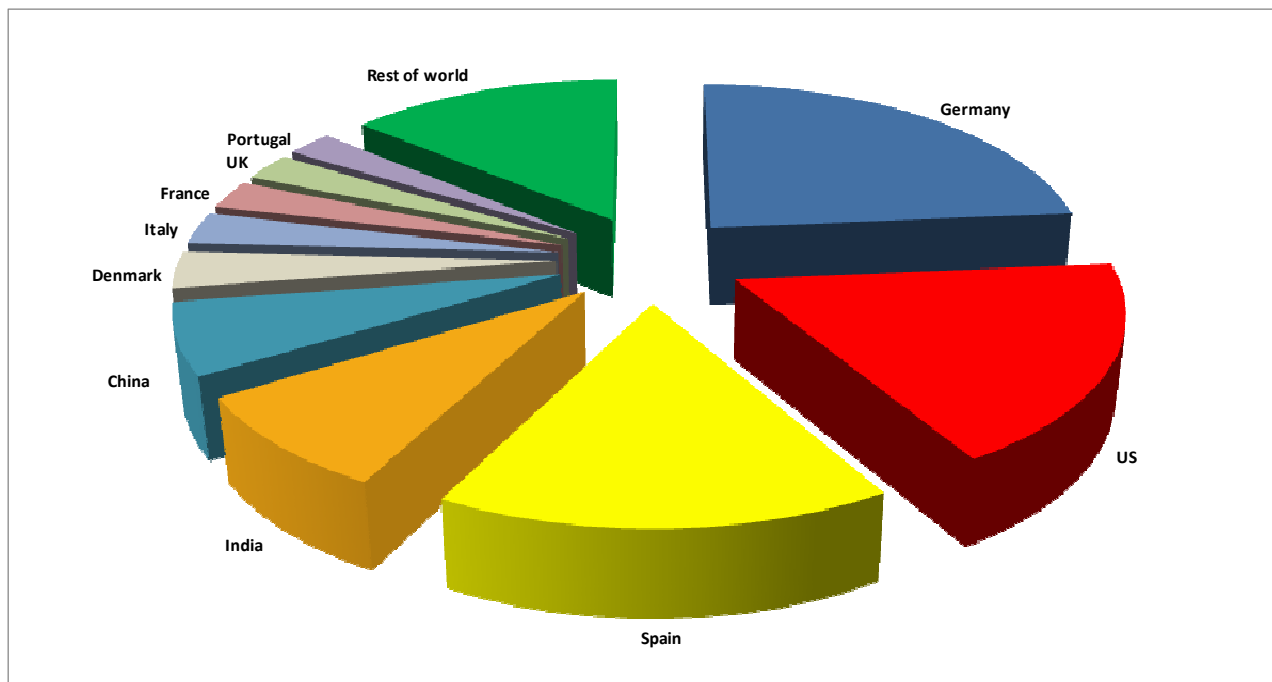


Source: Windenergy Study 2008

Top Ten Installed Capacity Worldwide 2007



Germany remains the world leader in windpower use but the US market grows faster



	MW	%
Germany	22,247	23,60%
US	16,818	17,90%
Spain	15,145	16,10%
India	8,000	8,50%
China	6,050	6,40%
Denmark	3,125	3,30%
Italy	2,726	2,90%
France	2,454	2,60%
UK	2,389	2,50%
Portugal	2,150	2,30%
Rest of world	13,019	13,80%

Wind power is the leading renewable energy in Germany, providing around 7% of the country's total electricity consumption

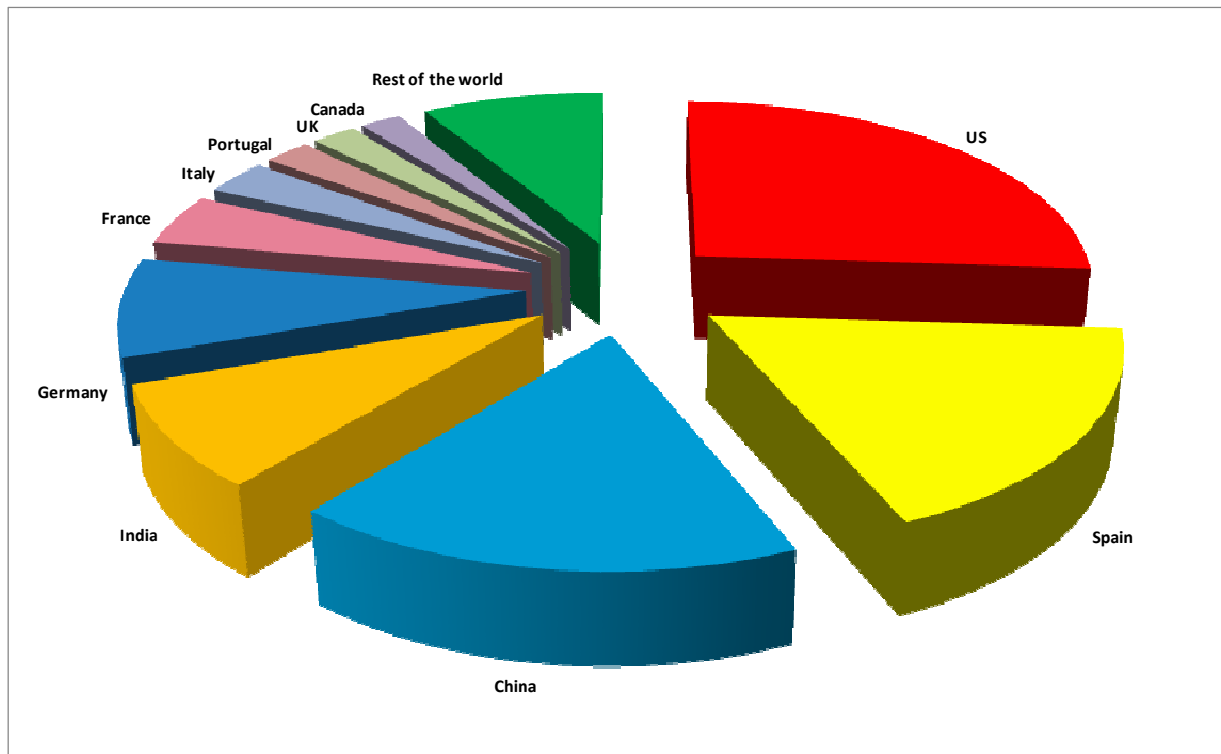


Source: Global Wind Energy Council

Top Ten New Capacity Worldwide 2007



A decrease in the installation of new wind turbines in Germany

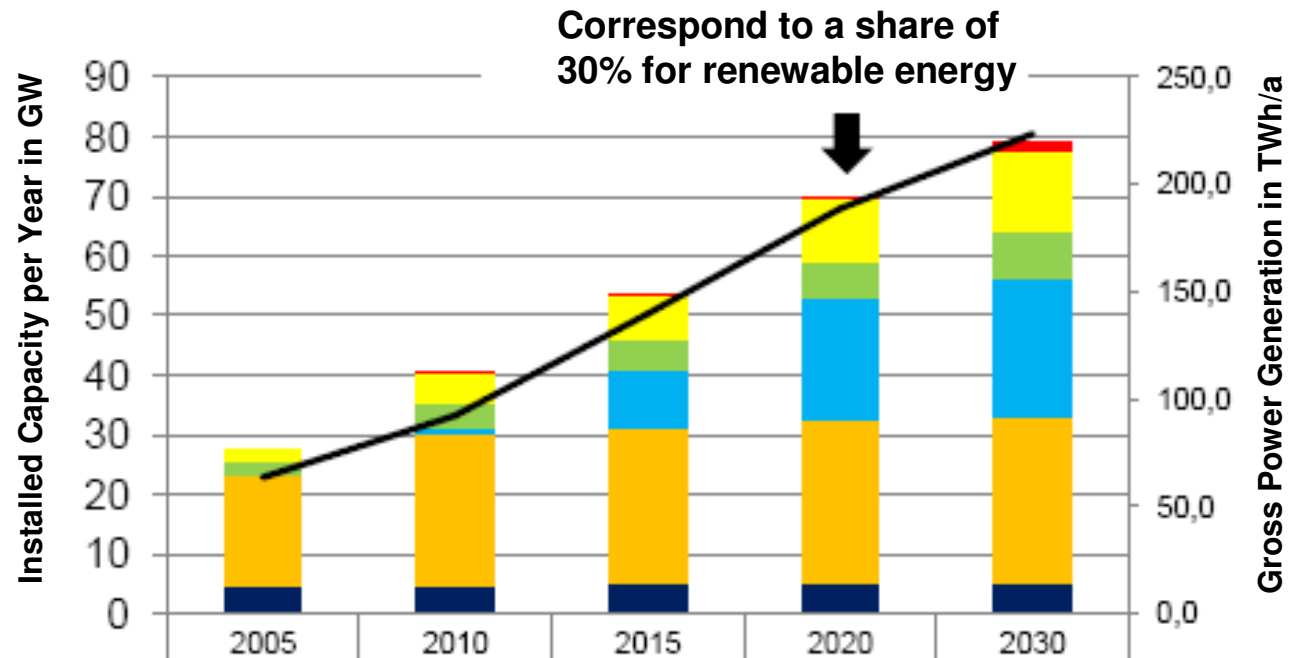


	MW	%
US	5,244	26,10%
Spain	3,522	17,50%
China	3,449	17,20%
India	1,73	8,60%
Germany	1,667	8,30%
France	888	4,40%
Italy	603	3,00%
Portugal	434	2,20%
UK	427	2,10%
Canada	386	1,90%
Rest of the world	1,726	8,60%



Source: Global Wind Energy Council

Expansion of renewable energy in Germany by 2030



■ Geothermal energy	0	0,1	0,25	0,5	1,3
■ Photovoltaics	1,8	4,9	7,4	10	13,7
■ Biomass	2,6	4,5	5,1	6,5	7,9
■ Offshore Wind	0	0,55	9,8	20,4	23
■ Onshore Wind	18,4	25,5	26,2	27,3	28
■ Hydropower	4,7	4,9	5	5,1	5,1
— Gross Power Generation	63,5	92,2	139,7	188,7	223,5

New network according to Prior Network Plan and dena-Netzstudie I



In Prior Network Plan (2013) and dena-Netzstudie I (2015)

- | | |
|----------------------------------|--------|
| 1. Hamburg/Nord-Dollern | 45 km |
| 2. Halle-Schweinfurt | 220 km |
| 3. Neuenhagen-Bertikow/Vierraden | 110 km |

Only in Prior Network Plan (2013)

- | | |
|-----------------------------------|--------|
| 4. Bertikow/Vierraden-Krajnik(PL) | 15 km |
| 5. Hamburg/Krümmel-Schwerin | 90 km |
| 6. Kasso(DK)-Hamburg/Nord | 170 km |
| 7. Preilack(DE) –Baczyna(PL) | 65 km |

Only in dena-Netzstudie I (2015)

- | | |
|----------------------------|--------|
| 8. Diele-Niederrhein | 200 km |
| 9. Wahle-Mecklar | 190 km |
| 10. Ganderkesee-Wehrendorf | 80 km |

Total New Lines

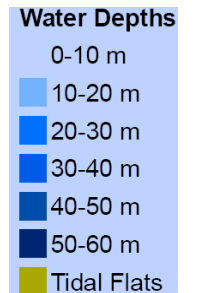
1185 km

Licenses and authorizations



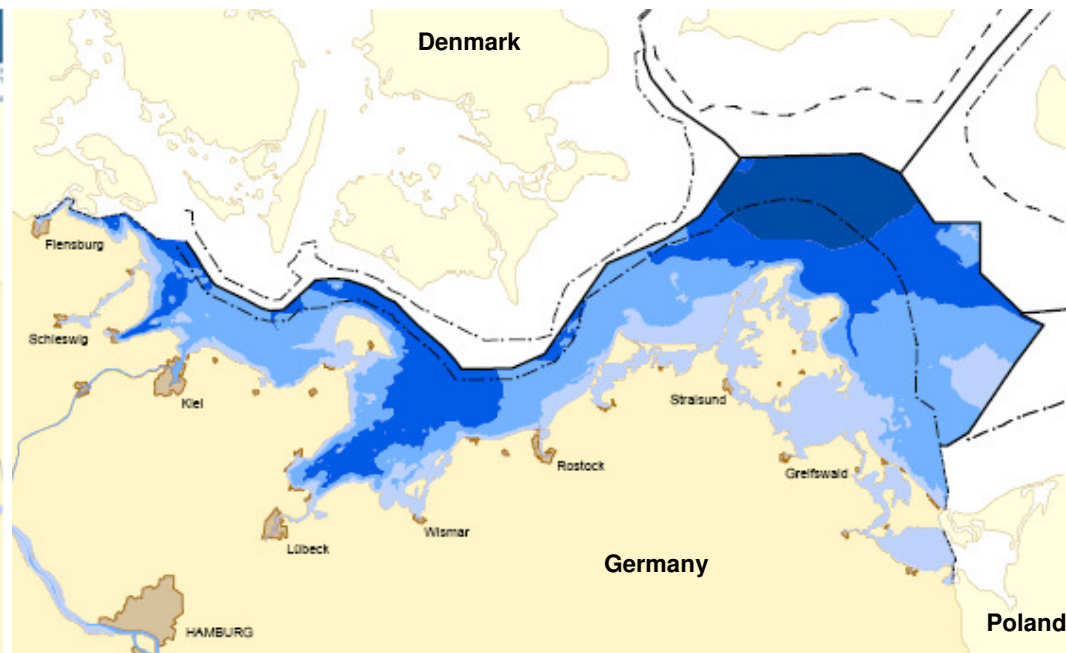
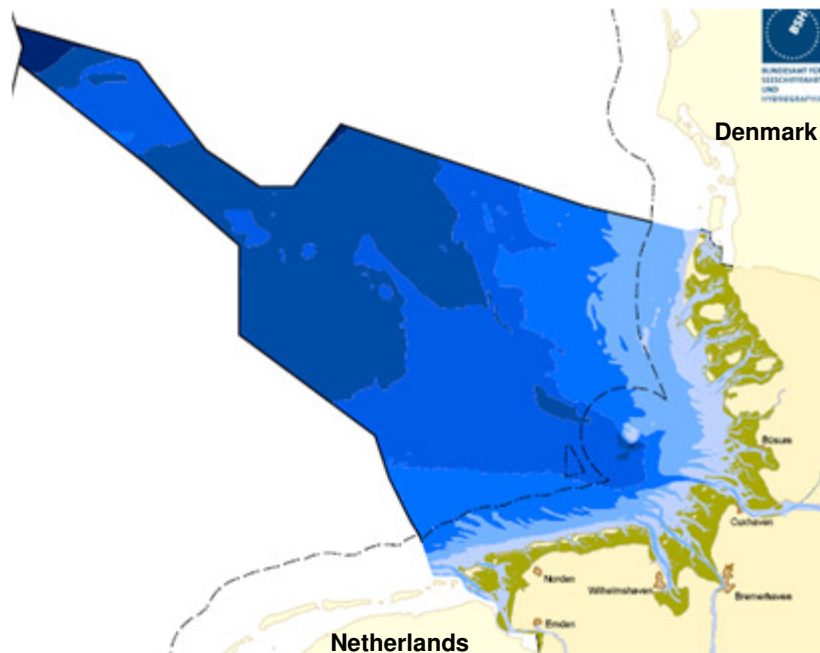
BHS: The Federal Maritime and Hydrographic Agency

/// **BHS** is the agency for the **approval of offshore wind farm development projects**

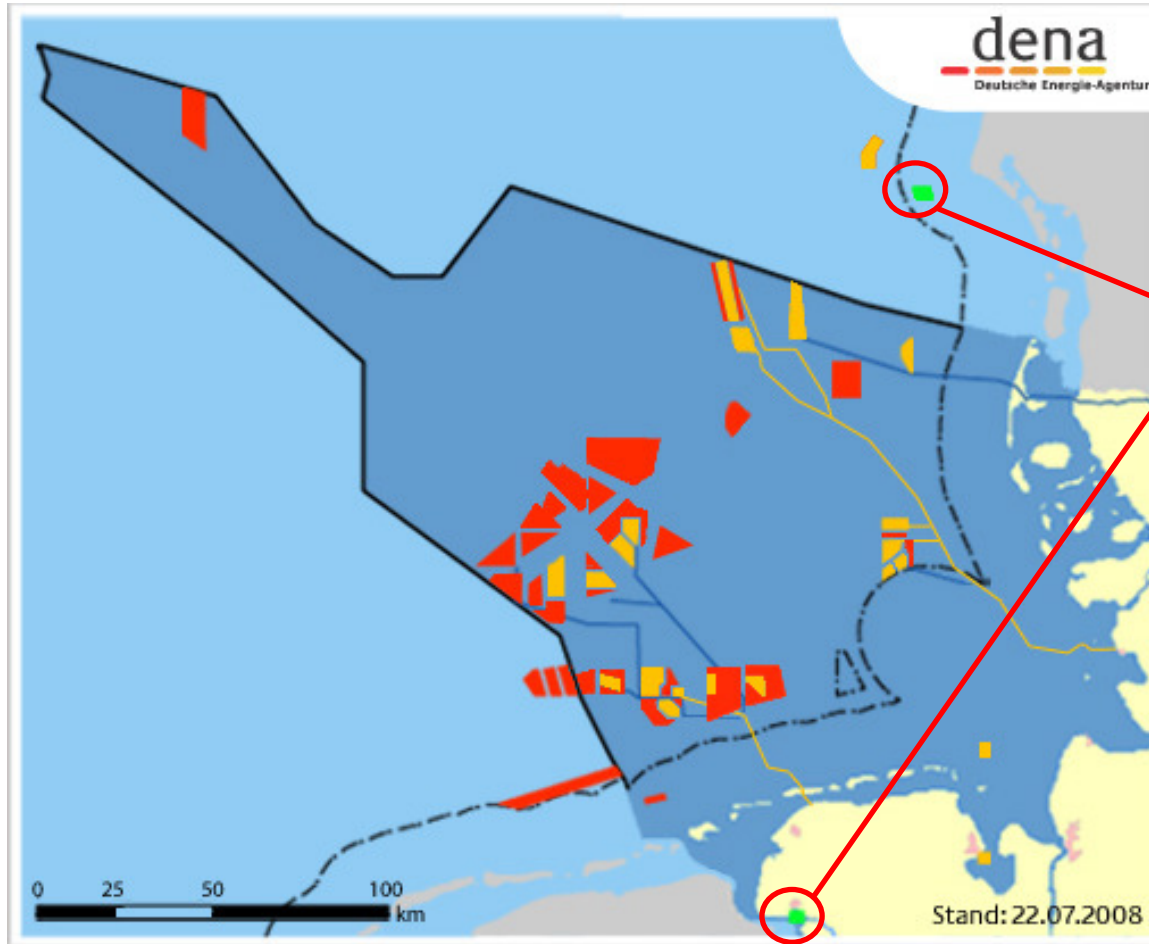


German North Sea EZZ

German Baltic Sea EZZ



The offshore wind farm projects in the North Sea



Wind energy projects

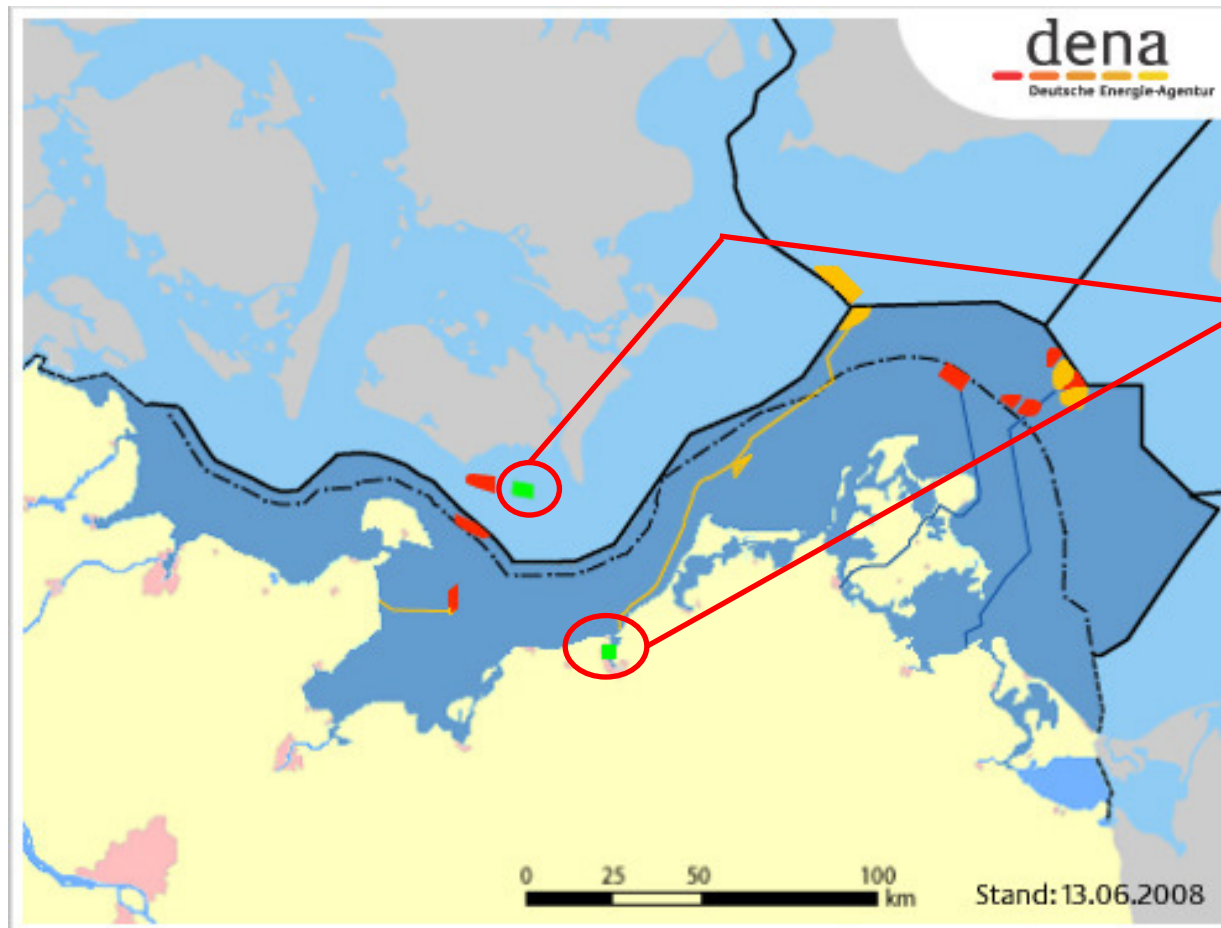
Status (Nb / Total capacity)

- Online
- Approved 19 / ~ 15 000 MW
- Under consideration 31 / ~ 17 000 MW

Approval for an offshore wind farm is limited to a **25-year period**

Source: German Energy Agency (Deutsche Energie-Agentur)

The offshore wind farm projects in the Baltic Sea



Wind energy projects

Status (Nb / Total capacity)

- Online
- Approved 5 / ~ 2 000 MW
- Under consideration 4 / ~ 1 500 MW

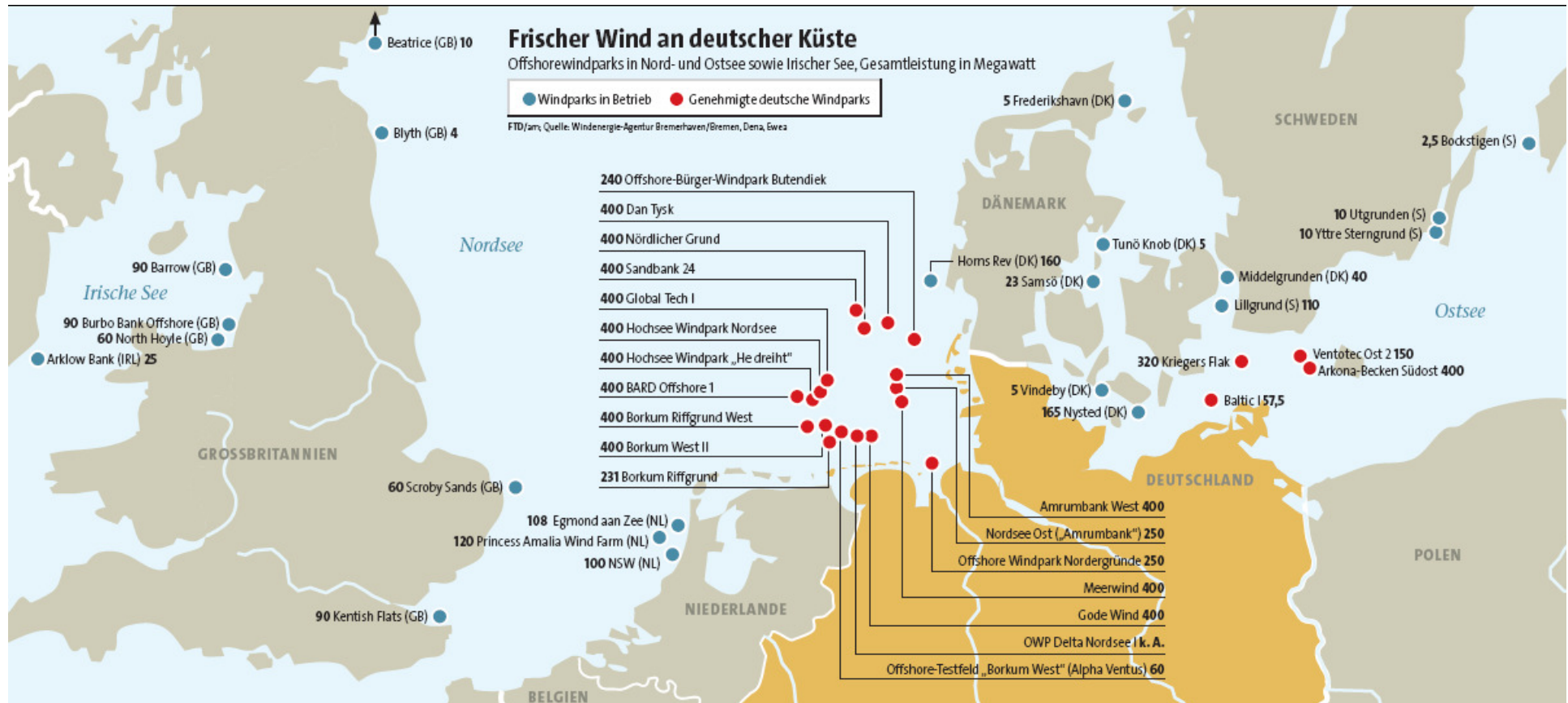
Construction of the turbines has to be started **within 2.5 years after notification of the approval**

Source: German Energy Agency (Deutsche Energie-Agentur)

Offshore wind parks in northern Europe in 2008



Offshore wind farms online or approved in North, Baltic and Irish Sea

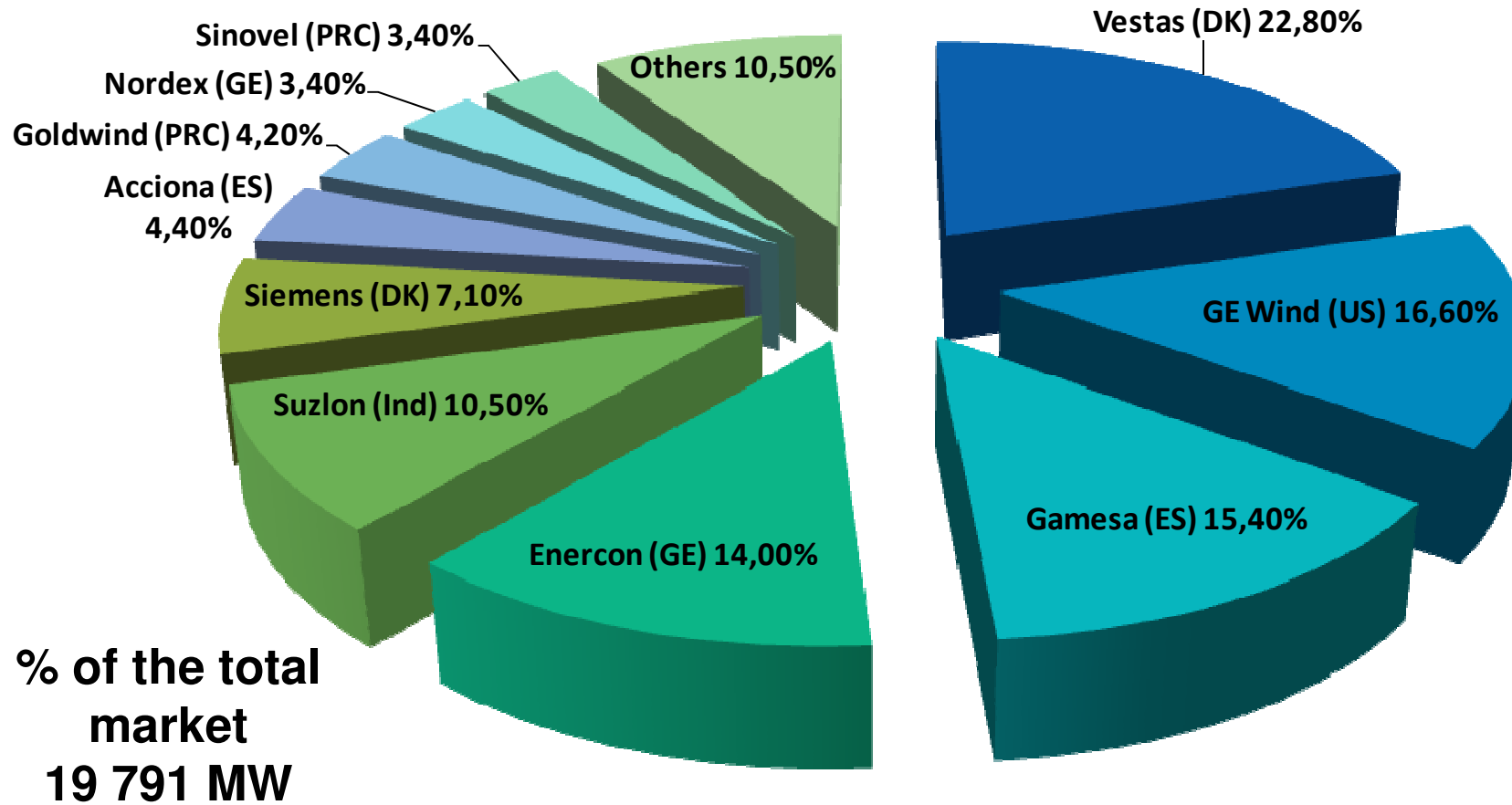


Source: *Financial Times Deutschland* - September 2008

Top Ten Wind Energy Suppliers in 2007



Market shares of top ten wind turbine manufacturers worldwide in 2007

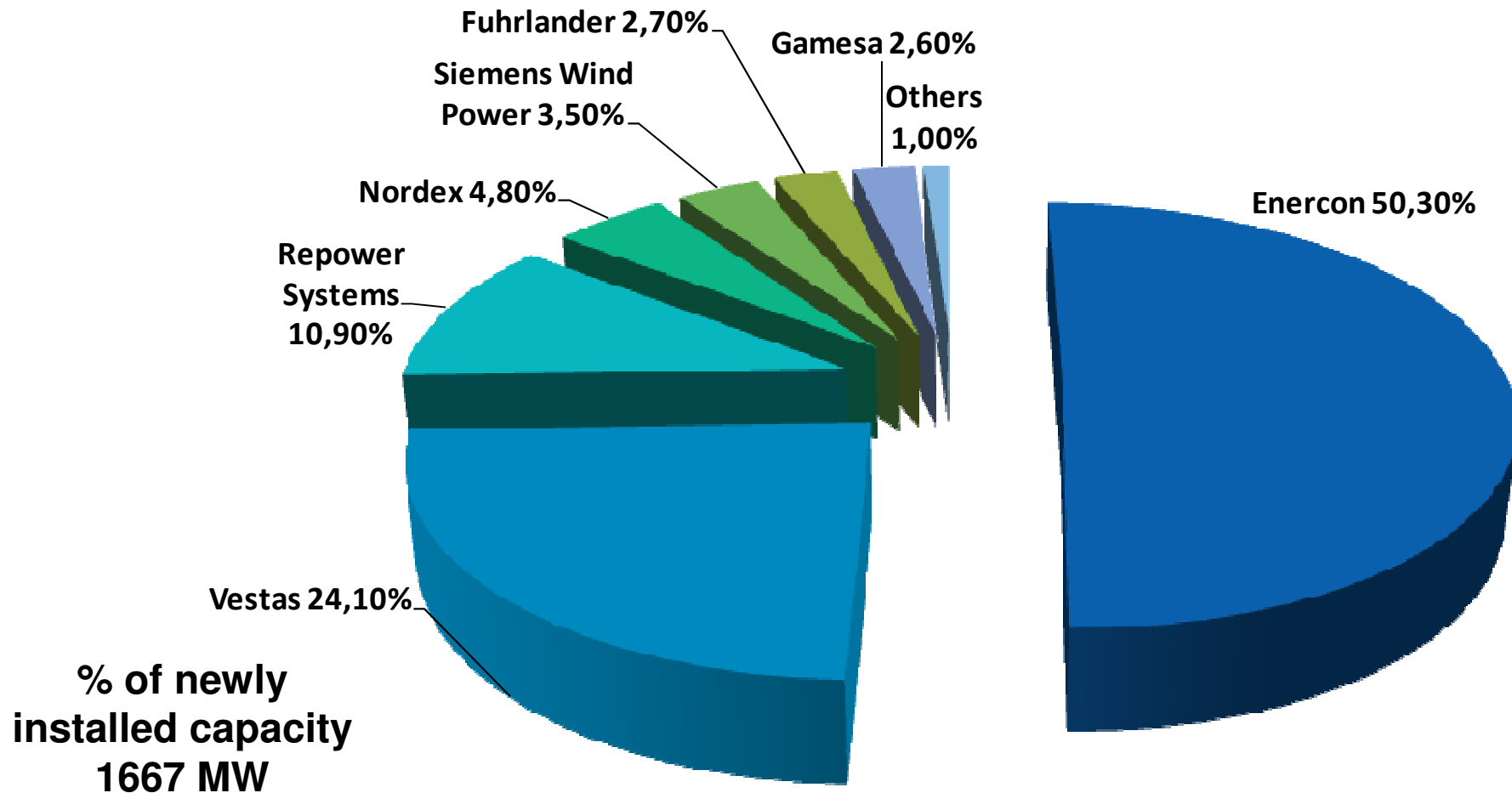


Source: BTM Consult ApS - March 2008

The German Wind Energy Industry



Market shares of Wind turbine manufacturers in Germany in 2007



Source: Deutsches Wind Energie Institut

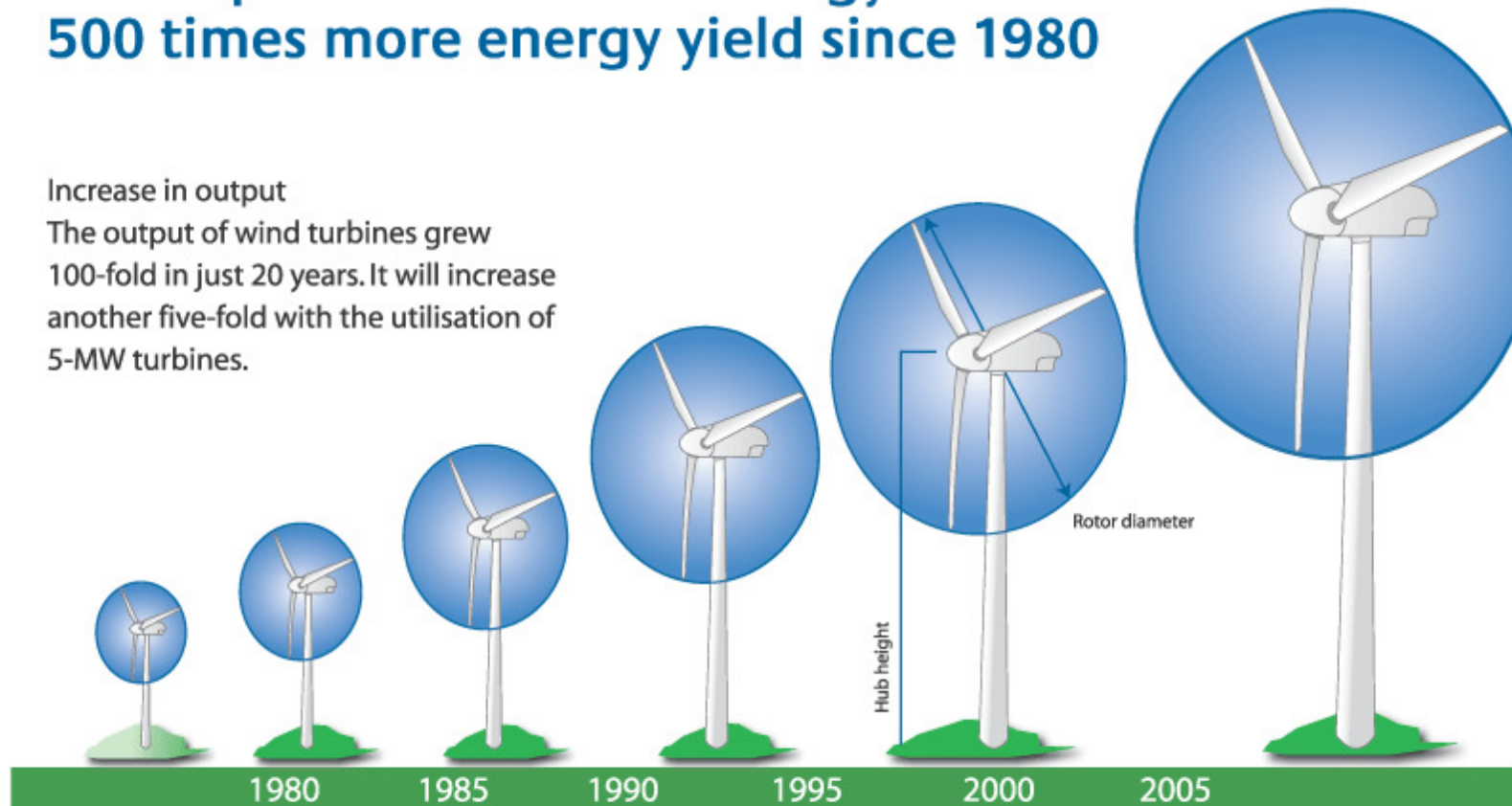
The German Wind Energy Industry



Development of the technology 500 times more energy yield since 1980

© Bundesverband
WindEnergie e.V.

Increase in output
The output of wind turbines grew 100-fold in just 20 years. It will increase another five-fold with the utilisation of 5-MW turbines.



	1980	1985	1990	1995	2000	2005
Nominal power	30 kW	80 kW	250 kW	600 kW	1,500 kW	5,000 kW
Rotor diameter	15 m	20 m	30 m	46 m	70 m	115 m
Hub height	30 m	40 m	50 m	78 m	100 m	120 m
Annual energy yield	35,000 kWh	95,000 kWh	400,000 kWh	1,250,000 kWh	3,500,000 kWh	app. 17,000,000 kWh



Potential Equity Investor in the German Wind Energy Sector

- /// Blackstone : Offshore wind farm project in the North Sea (€ 1 billion) : 80 turbines of 5 MW each
- /// Babcock & Brown Wind Partners (BBWP) : Eleven wind farms with a total installed capacity of approximately 120MW. Nordex, Vestas and Gamesa are the main partners of BBWP in Germany
- /// Allianz Specialised Investments (ASI) : In December 2007 ASI bought a 25MW offshore wind farm formerly owned by Repower Systems
- /// Funds such as : HgCapital with a £50m investment in Aufwind
Schmack Neue Energien

Conclusion



- /// **Offshore wind in Germany is a significant market :**
 - /// About **10 000 MW new name plate capacity** will be implemented
 - /// Total investment will be **about € 35 billion**
 - /// We estimated that **2/3 of this will be raised by corporate financing**
 - /// Therefore **1/3 or about €10 billion will be raised by project finance**
 - /// Dexia is already **an experienced MLA in this domain**
- /// **We should all prepare ourselves for this opportunity**

Annex



Renewable Energy Act and market status in Germany

Status of licenses (BSH)

Players in the German market

Dexia's position

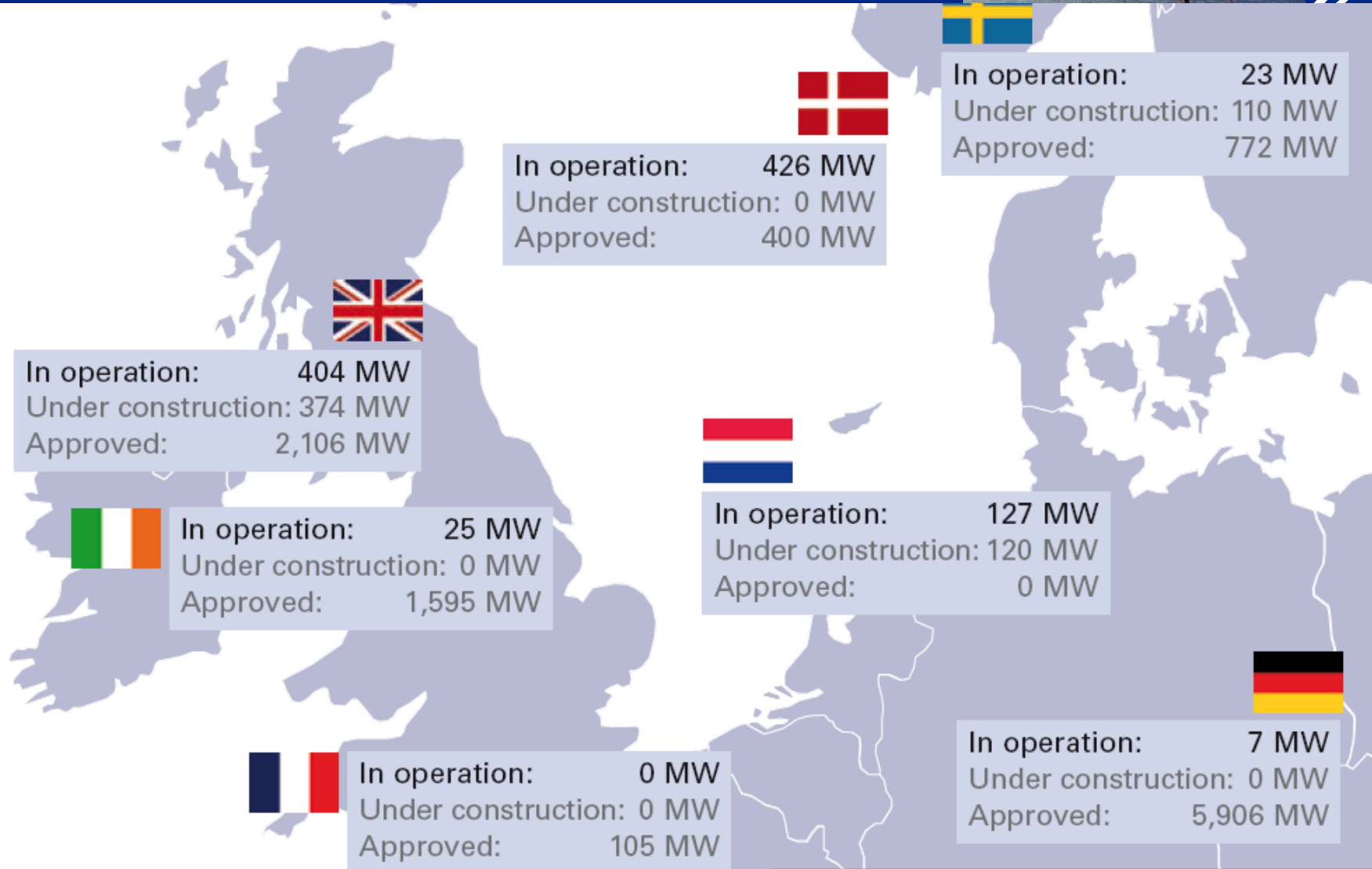
Annex





- /// German Wind Energy Association (BWE)
www.wind-energie.de
- /// Website on renewable energies from the Ministry of Environment
www.eneuerbare-energien.de
- /// Website on renewable energies from the Ministry of Economics
www.german-renewable-energy.com
- /// German Wind Energy Institute (DEWI)
www.dewi.de
- /// Website on offshore wind from the German Energy Agency (DENA)
www.offshore-wind.de

Overview of offshore wind farms in Europe 2007



Source: KPMG – Offshore Wind Farms in Europe 2007

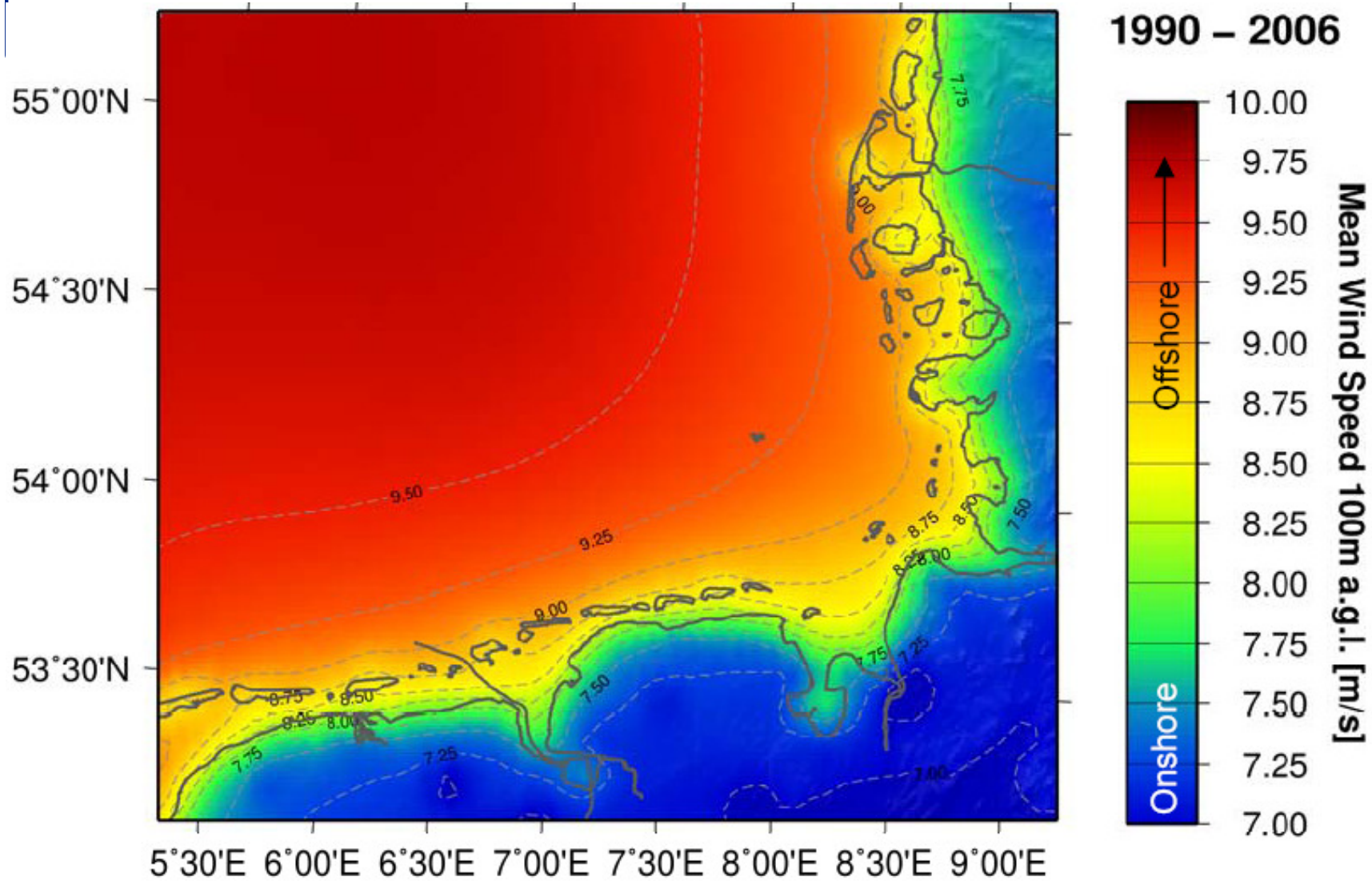
Operational Offshore Projects in the European Union



Project	Country	Year	Turbine Type	MW Turbine	Number of Turbines	Total Output	Distance to coast [km]	Water depth [m]
Dollart Emden	Germany	2004	Enercon E-112	4.5	1	4.5	0.01	3
Breitling Rostock	Germany	2004	Nordex N90	2.5	1	2.5	0.5	2
Arklow Bank	Ireland	2003	GE 3.6sl	3.6	7	25.2	10	2-5
Kentish Flats	UK	2005	Vestas V90	3.0	30	90	8.5	5
Scroby Sands	UK	2005	Vestas V80	2.0	30	60	2.5	4-8
North Hoyle	UK	2003	Vestas V80	2.0	30	60	8	12
Beatrice	UK	2006/2007	Repower 5M	5.0	2	10	25	45
Barrow	UK	2006	Vestas V90	3.0	30	90	7	15-20
Burbo Banks	UK	2007	Siemens SWT-3.6-107	3.6	25	90	10	8
Egmond aan Zee	Netherlands	2006	VESTAS V90	3.0	36	108	10	18-20
Nysted	Denmark	2003	A/N Bonus 2.3	2.3	72	165.6	10	6-9
Horns Rev I	Denmark	2002	Vestas V80	2.0	80	160	14	6-14
Samsø	Denmark	2002	A/N Bonus 2.3	2.3	10	23	3.5	11-18
Middelgrunden	Denmark	2001	A/N Bonus 2.0	2.0	20	40	2	4-8
Utgrunden	Sweden	2000	Enron EW 1.5	1.5	7	10.5	12	7-10
Yttre Stengrund	Sweden	2001	NEG-Micon	2.0	5	10	5	6-10
Lillgrund	Sweden	2007	Siemens SWT-2.3-82	2.3	48	110.4	7	10

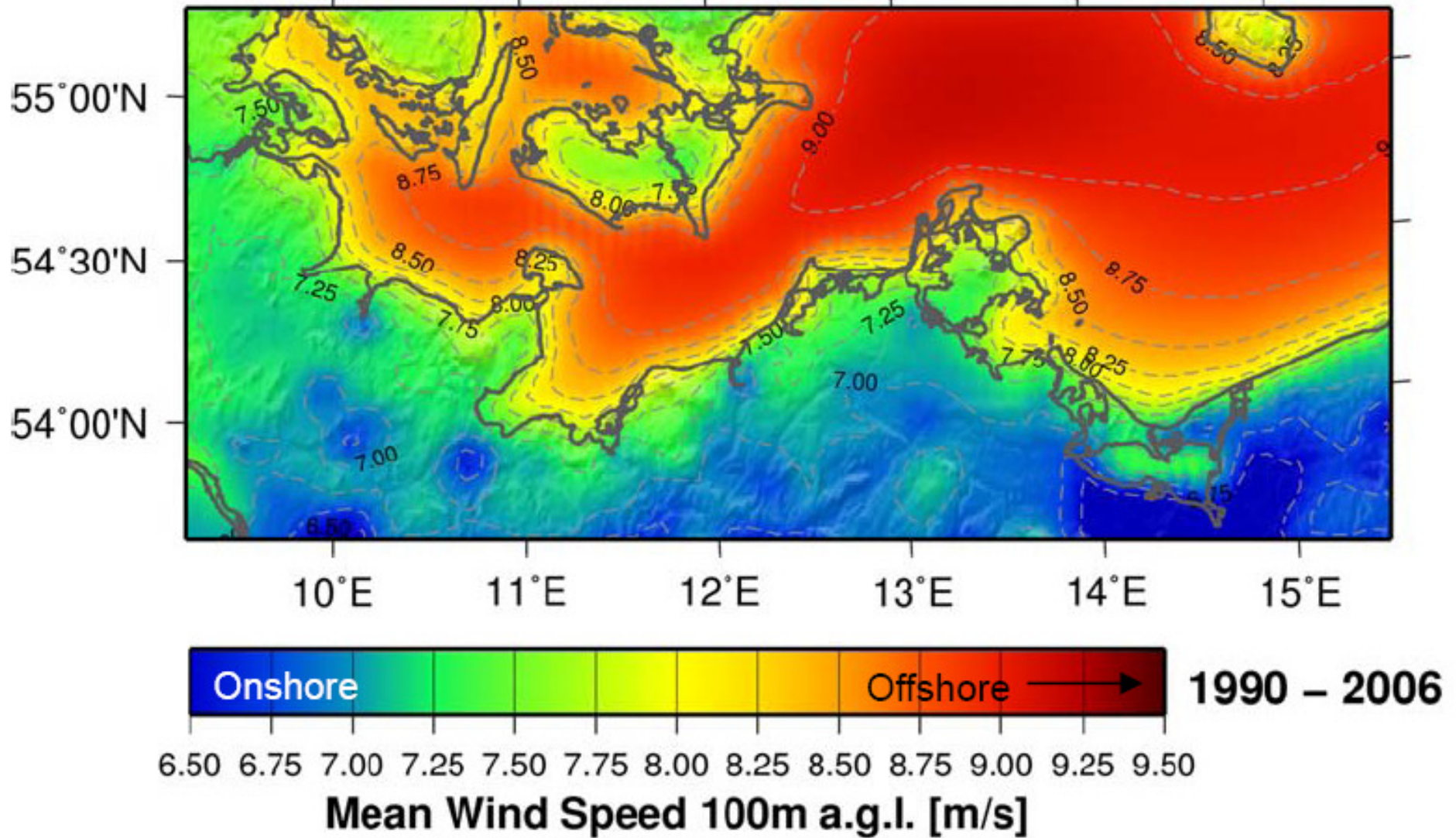
Source: Windenergie Agentur Bremerhaven

Wind Map North Sea, Germany



Source: Anemos, Gesellschaft für Umweltmeteorologie mbH

Wind Map Baltic Sea, Germany



Source: Anemos, Gesellschaft für Umweltmeteorologie mbH

Offshore Turbine Types



MANUFACTURER	MULTIBRID	REPOWER	BARD	VESTAS (DK)	SIEMENS (DK)
Type	M 5000	5M	VM	V 90 3.0 MW	SWT 3.6
Capacity	5 MW	5 MW	5 MW	3 MW	3.6 MW
Rotor diameter	116 m	126 m	122 m	90 m	107 m
Weight of nacelle/rotor (without blades)	260 t	380 t	362 t	160 t - 285 t (depending on hub height)	125t
Weight of three blades	49,5 t	54 t	78 t	25 t	75 t
Number of turbines by the end of 2007 onshore/offshore	2	10	2	300 end of 2006	17
Additional turbines mounted offshore by the end of 2008	6 alpha ventus test field/2 Bremerhaven	1 onshore jacket Bremerhaven	4 onshore Emden 1 offshore	60 in the UK with E.ON	23 Burbo Banks/54 Lynn and Inner Dowsing
Offshore planned in 2008/2009	6 alpha ventus test field/21 Côte d'Albâtre	6 test field/6 Thornton Bank, Belgium	up to 40 in the Ocean Breeze Wind Farm	[-]	54 Lynn and Inner Dowsing 30 Gunfleet Sands
Use	offshore	offshore and onshore	offshore	offshore and onshore	offshore and onshore

The German Wind Energy Industry



ENERCON / Energy for the World

Enercon was founded more than 20 years ago.

Number of directly or indirectly employees : over 2000 people worldwide

Installed capacity in over 30 countries: more than 13,000 wind turbines

Export share : more than 60% gradually increasing over the years to come

Production facilities in Germany (Aurich and Magdeburg), Sweden, Brazil, India, Turkey and Portugal

Wind turbines with a rated power between 300 kW and 2300 kW

The German Wind Energy Industry



VESTAS / Believe in the wind

Vestas was founded more than 30 years ago.

World leader with a global market share of about 27% in 2007

Number of directly or indirectly employees : over 15000 people worldwide

Installed capacity in over 63 countries: more than 33,500 wind turbines

Production facilities in China, Denmark, Germany, Italy, UK, USA, Spain

Wind turbines with a rated power between 850 kW and 3000 kW

The German Wind Energy Industry



REpower Systems / Renewable Energy for the future

REpower was founded in 2001

Number of directly or indirectly employees : over 1100 people

Installed capacity in over 10 countries: more than 1,400 wind turbines

Export share : more than 66% gradually increasing over the years to come

Production facilities only in Germany : Husum, Trampe and Bremerhaven

Wind turbines with a rated power between 600 kW and 5000 kW

The German Wind Energy Industry



Nordex / We've got the power

Nordex was founded more than 20 years ago

Number of directly or indirectly employees : over 1700 people

Installed capacity in over 34 countries: more than 3,400 wind turbines

Export share : more than 89% gradually increasing over the years

Production facilities in Germany (Rostock) and China

Wind turbines with a rated power between 1,5 MW and 2,5 MW

Contacts



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