

Offshore Wind in Germany

One important (and challenging)
element of the *Energy Transition*
(*Energiewende*)

Discussion on September 28th, 2015

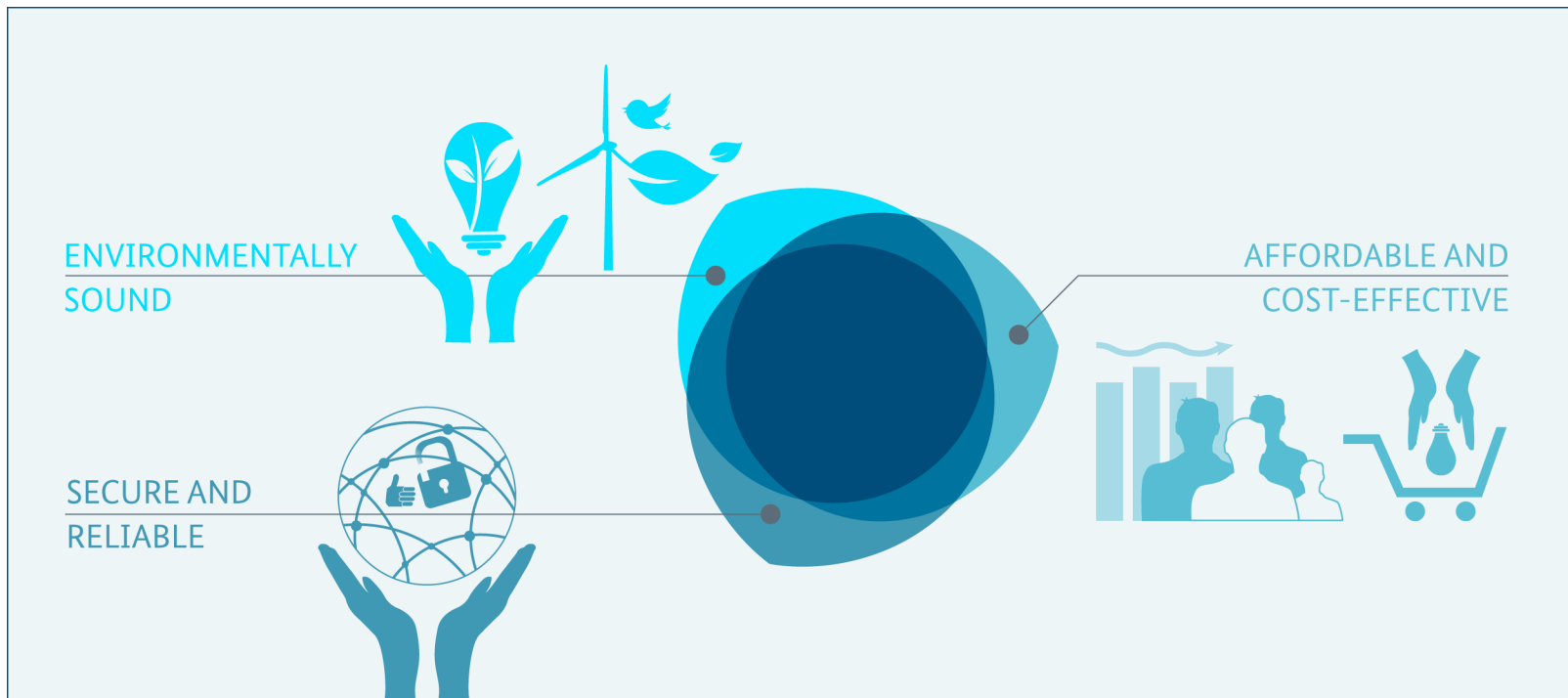
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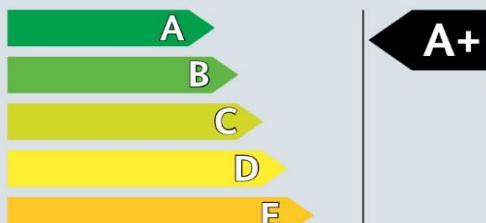
Motivation for the German Energy Transition (Energiewende):
Previous energy business as usual was not sustainable, would cause huge economic and ecologic damage, therefore:

Three target areas of the *Energiewende*



Affordability, reliability and environmental protection are interlinked.

Two pillars of the *Energiewende*




Energy Efficiency

Key legislation:
Energy Saving Ordinance
Heating Cost Ordinance

- Reduce energy consumption
- Cost-efficient

Supporting fields of action



Renewable Energy

Key legislation:
Renewable Energy Sources Act
Renewable Energy Heat Act

- Steady growth
- Environmentally friendly

The energy transition's foundation are renewables and reduced energy consumption.

Integrated policy package for the *Energiewende*

Electricity



- Priority access for renewable energies
- Nuclear phase-out
- Support scheme for renewable energies

Heating



- Renewable Energies Heat Act
- Market Incentive Programme (MAP)

Transport



- Emission reduction quota for biofuels in transport
- Governmental plan on e-mobility

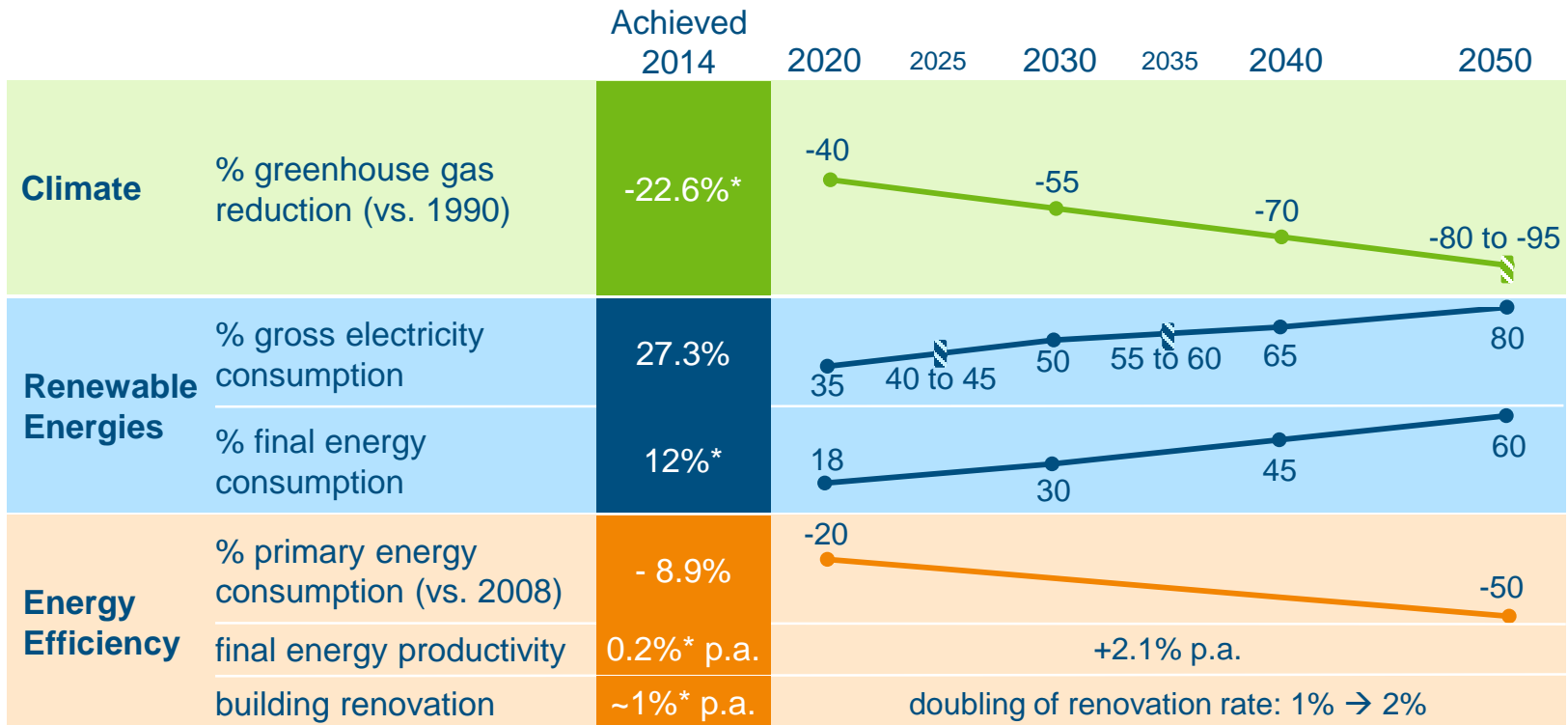
Research & Development



- (Sixth) Energy Research Programme (Federal Government)
- Public research funding > €150 million in 2012

The German energy system is being transformed in all sectors.

2050 *Energiewende* targets

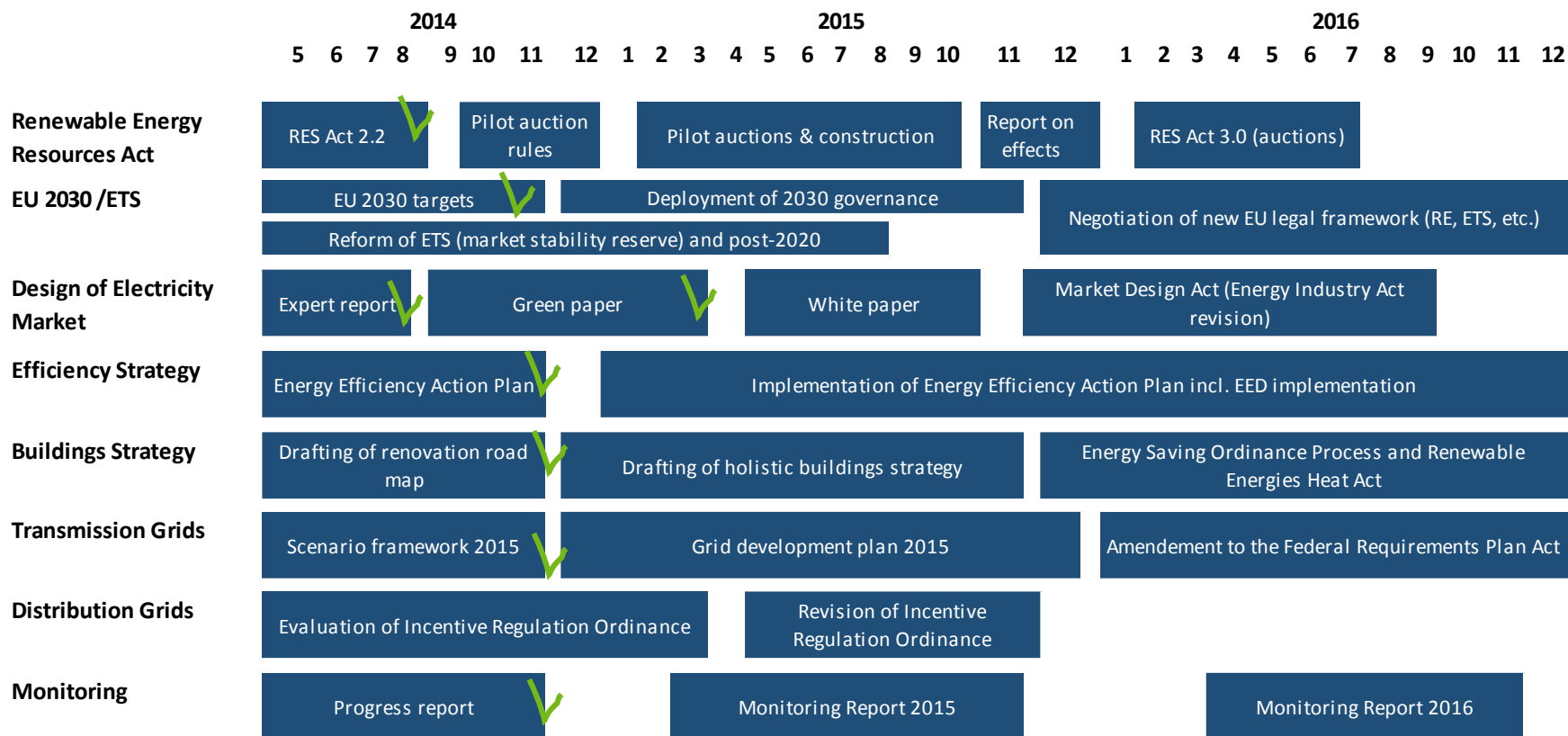


Renewables are on track. Additional measures will bring climate and energy efficiency on track.

* 2013

Source: Federal Government 2010, BMU/BMWi 2014, AGEE-Stat 2014, AGE 2015

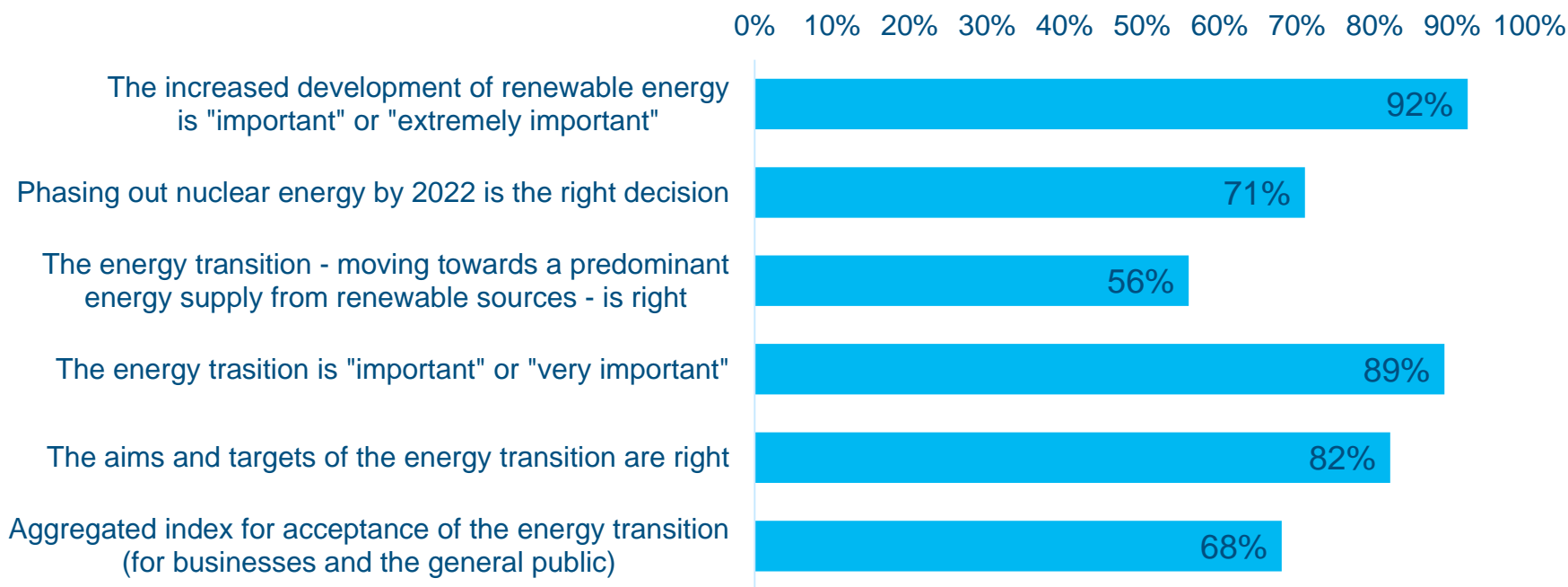
Implementation of the most important projects



Source: BMWi 2014

Energiewende is planned and implementation is on track.

Public acceptance of the *Energiewende*



■ Percentage of people that agree or strongly agree with the given statement

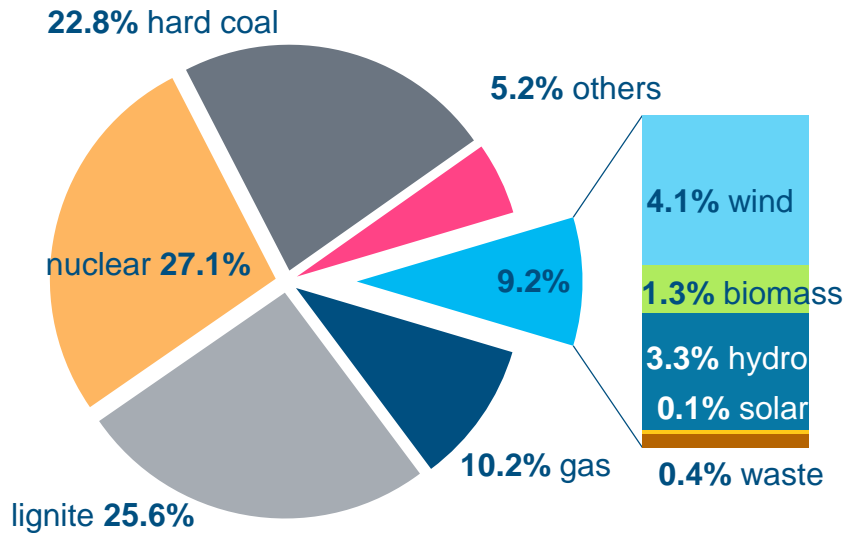
The energy transition enjoys a high level of approval among the German public.

Sources: BMWi 2014, TNS Emnid 2014, Institut für Demoskopie 2014, BMUB 2014, BDEW 2014, Forsa 2013, BDI 2013

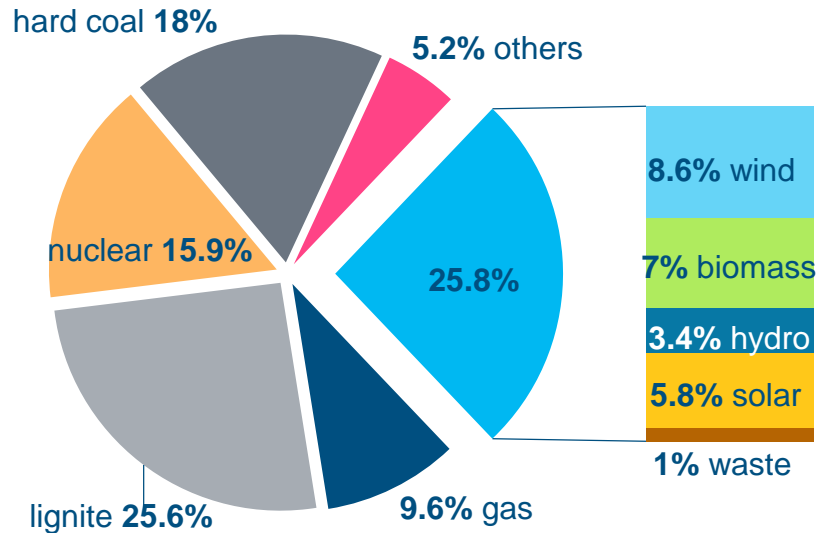


German gross electricity production

2004 total: 617.5 TWh
renewables share: 56.6 TWh



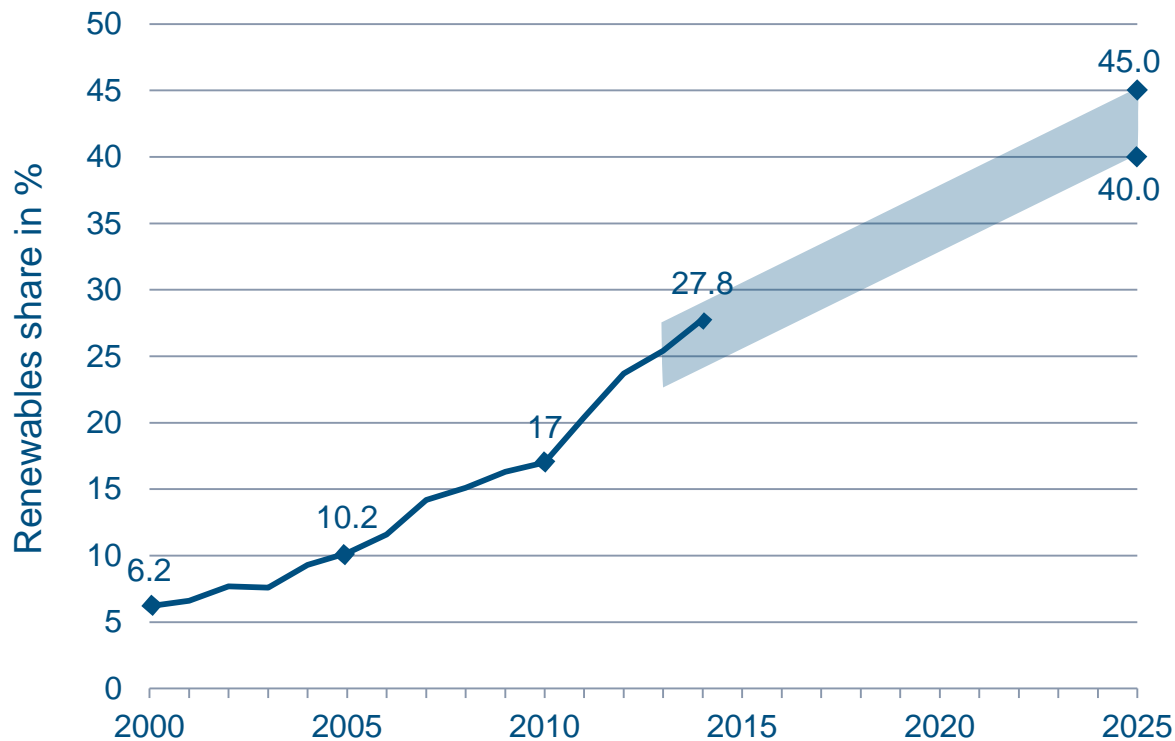
2014 total: 610 TWh
renewables share: ~157.4 TWh



Renewables have become the second biggest electricity source in just ten years.



(1) Renewables share in gross electricity consumption



Overall target corridor

- In 2025: between 40% and 45% RES-E
- In 2035: between 55% and 60% RES-E

Capacity additions

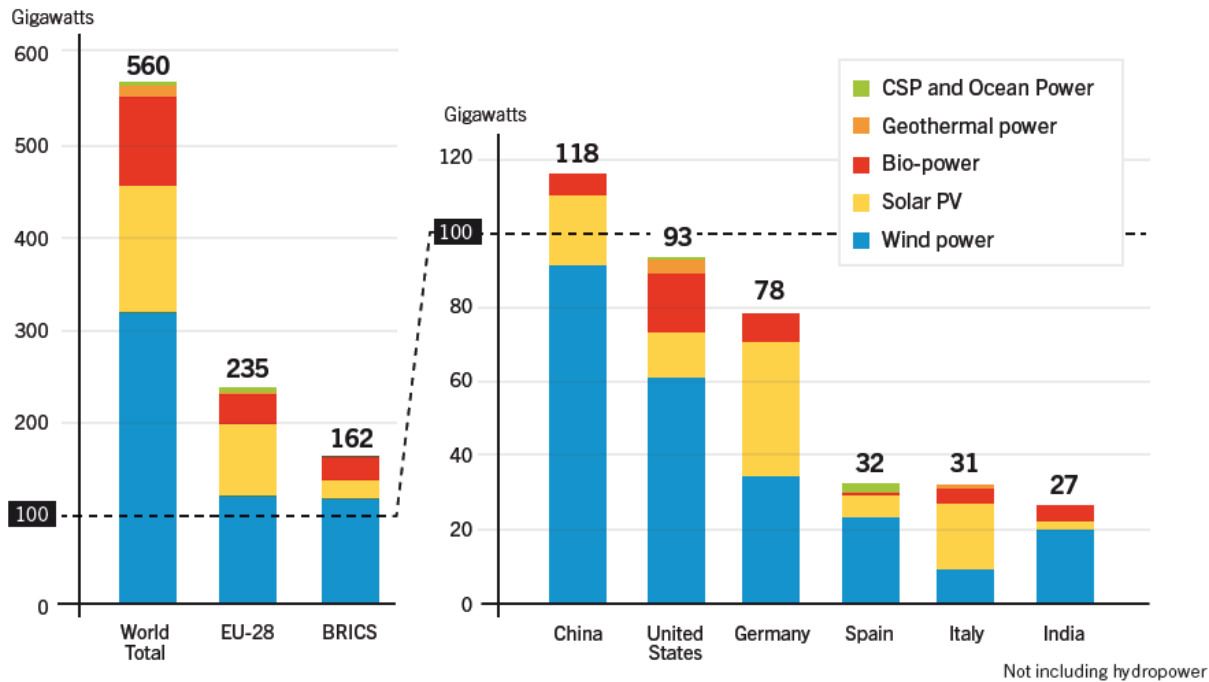
- **Onshore wind and PV**
2 500 MW (2.5 GW) per year each
- **Bioenergy** 100 MW per year
- **Offshore wind** 6.5 GW by 2020, 15 GW by 2030

Focus on Wind and PV as most cost-effective solutions



Renewable power capacities worldwide

Renewable Power Capacities in World, EU-28, BRICS, and Top Six Countries, 2013

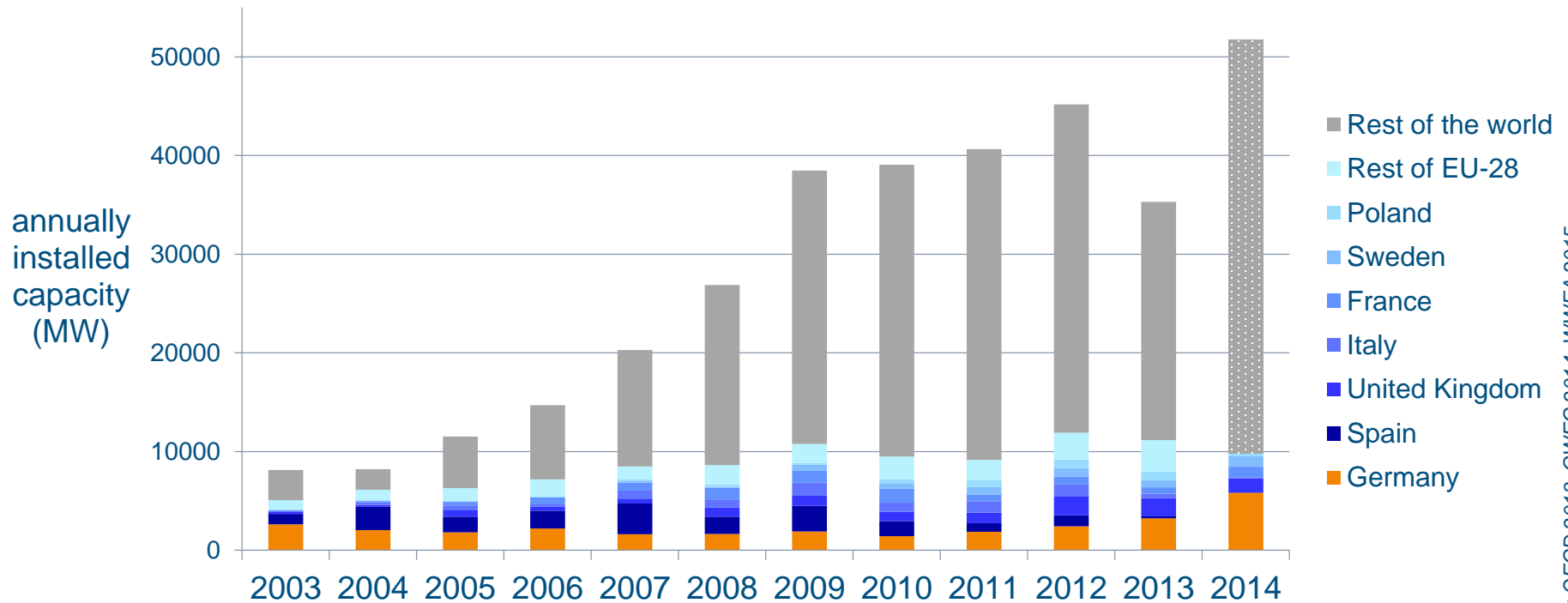


Source: REN 21 2014

After hydropower, wind is the leading renewable source. Its main market is China.

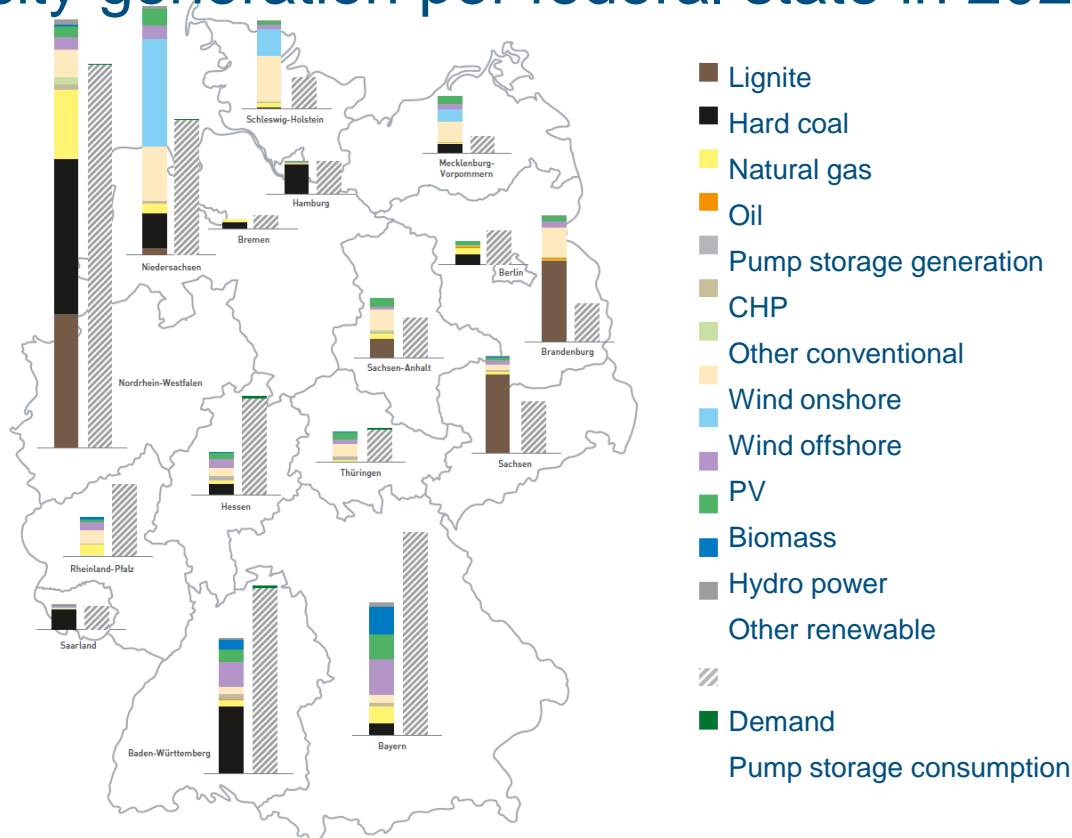


Wind market development worldwide



The German wind market has grown steadily, while other European markets have experienced highs and lows.

Electricity generation per federal state in 2023



Generation capacity in the North will cover demand in the South.



Offshore wind potential



Figures for Germany	Capacity (MW)
In operation (as of June 2014)	628.3
Under construction	approx. 2,300
Electricity generation offshore wind	2012: 675 MWh (June 2014 estimate: 2.5 TWh)
Target	6.5 GW by 2020, 15 GW by 2030

Large offshore wind will support the system as baseload power plants.



Main Support Instrument: Feed-In Tarif

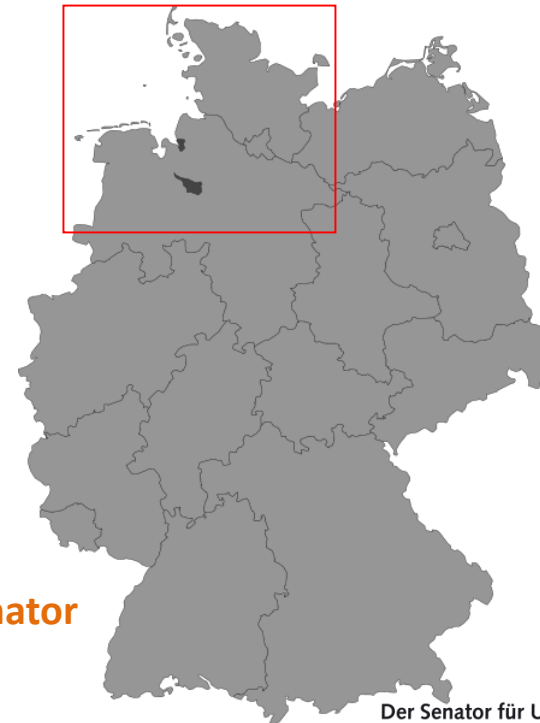
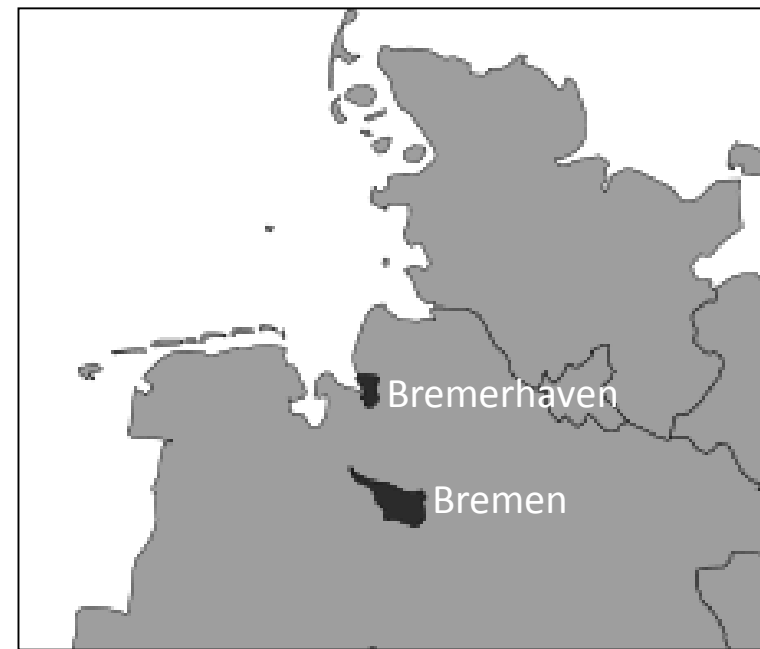
Technology specific support levels EEG 2014

	Corridor	Remuneration in ct/kWh	Degression
Hydropower	-	3,50 – 12,52	-0.5 %/a from 2016
Landfill, sewage and mine gas	-	3.80 – 8.42	-1.5 %/a from 2016
Biomass	100 MW (gross)	5.85 – 23.73 (dependent on fuel and size)	-0.5 % every three months from 2016
Geothermal		25.20	- 5.0 %/a from 2018
Wind energy onshore	2,400 – 2,600 MW (net)	Standard tariff: 8.90, for at least 5 years; Minimum 4.95	-0.4% every quarter from 2016
Wind energy offshore	-	Initial tariff: 15.40 for min.12 years; Option: 19.40 for min. 8 years if installed before 2020 Minimum 3.90	Standard tariff: - 0, 5 ct/kWh in 2018, 1 ct/kWh in 2020 - 0,5 ct/kWh/a 2021; Option: - 1 ct/kWh in 2018
Solar energy (PV)	2400 – 2600 MW (gross)	9.05 – 12.89 (and tenders for ground-mounted PV)	-0.5 % per month from 09/2014

Source: Renewable Energy Act 2014 (Draft, 26.06.2014)

Seaport City Bremerhaven

- Largest city on the German North Sea coast – population: 112,982.
- Situated at the Weser River estuary and is part of the Federal State of Bremen.
- Port and maritime industry (shipbuilding, engineering, steel and plant construction). Germany's leading fish processing location.
- 5.92 Mio. TEU containers processed in 2011.
- Europe's biggest shipment center for cars: 2.13 Mio. in 2011.
- A nucleus for renewable energy sources with a focus on offshore wind, marine science and industry logistics.
- Tourism.



Slides on Bremerhafen provided by Dr. Joachim Lohse, Senator for Environment, Urban Development and Mobility, Free Hanseatic City of Bremen

A brief history...

- 1945: Ports of Bremen and Bremerhaven in American zone of occupation
- During the Cold War, Bremerhaven served as key supply harbor for the U.S. Army stationed in Western Europe.
- With growing competition from other Asian and Eastern European ports, the region experienced a severe economic downturn.
 - Structural change in the fisheries industry,
 - Loss of purchasing power due to withdrawal of American troops
 - downclosure of shipyards leading to a sharp rise in unemployment and a dramatic population decrease (from 147,000 to 113,000).
- In 1998: unemployment at 22.3% (i.e. highest peak in West Germany).



Development of Industrial Real Estate



Südlicher Fischereihafen, Labradorhafen 1999

Development of Industrial Real Estate



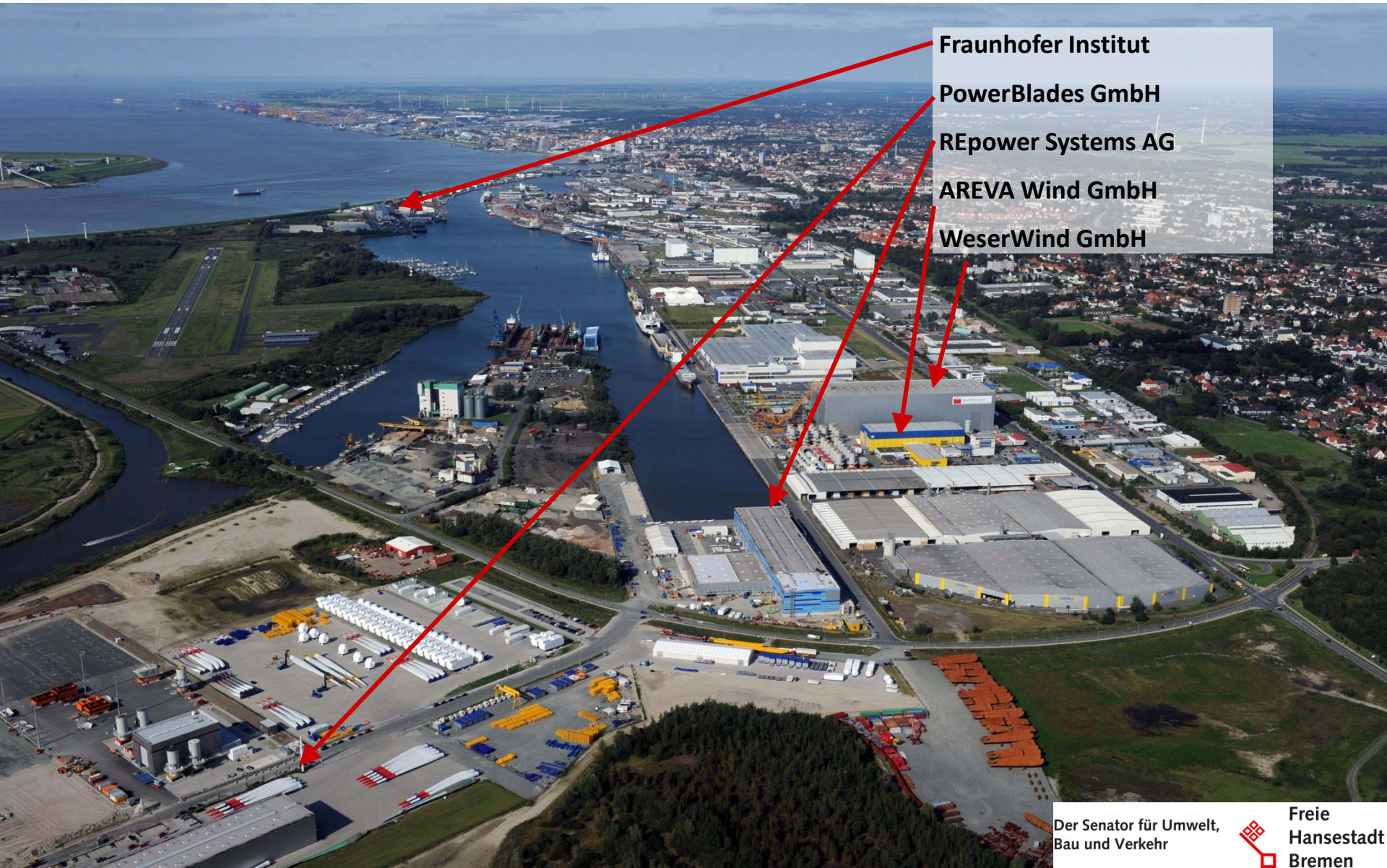
Südlicher Fischereihafen, Industriegebiet Lüneort 2012

Der Senator für Umwelt,
Bau und Verkehr



Freie
Hansestadt
Bremen

Offshore-wind industry in the south of Bremerhaven in 2012



Fraunhofer Institut

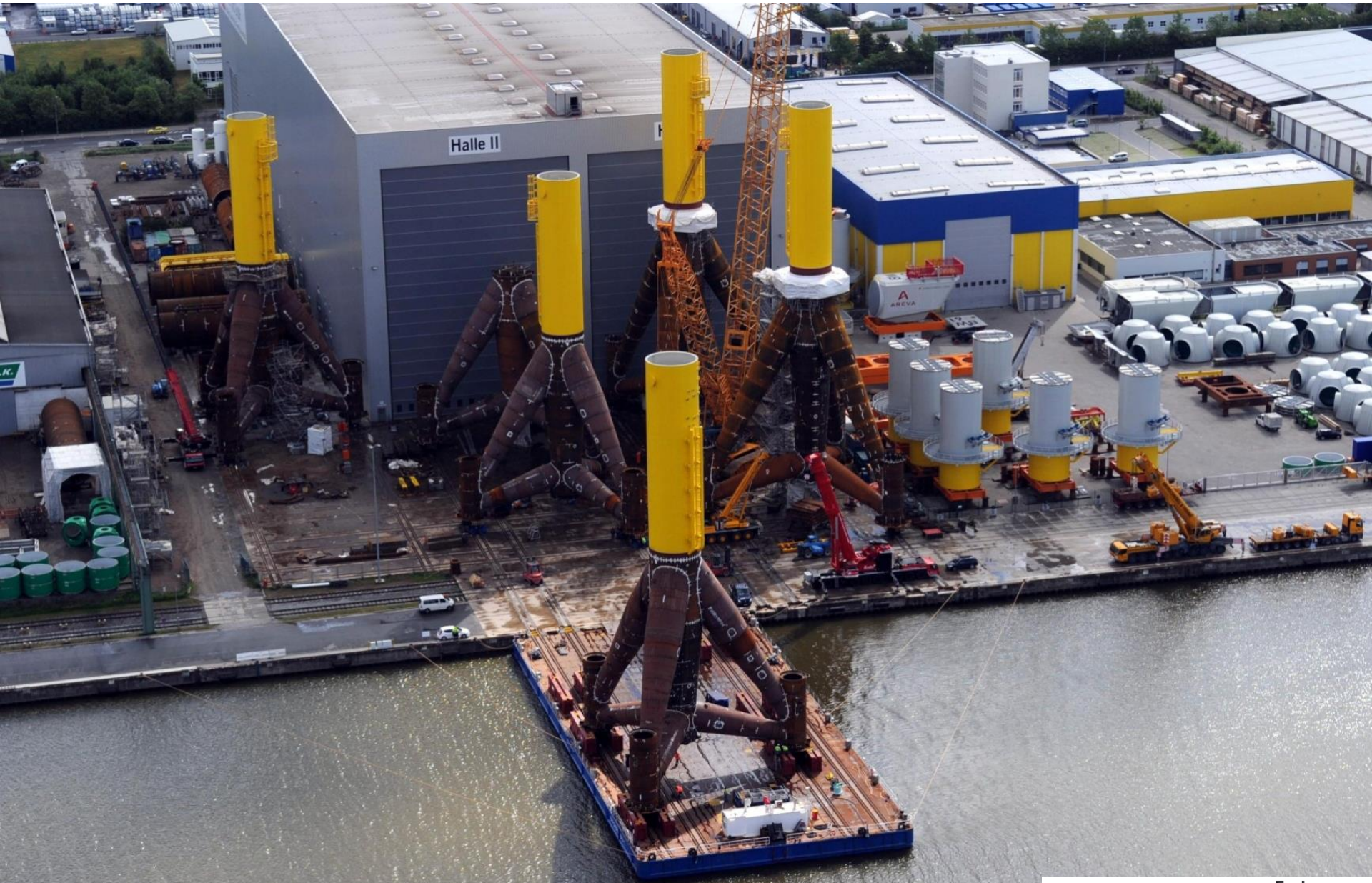
PowerBlades GmbH

REpower Systems AG

AREVA Wind GmbH

WeserWind GmbH

Heavy Load Terminal Labradorhafen



Offshore Transition Kaiserhafen – ABC-Halbinsel

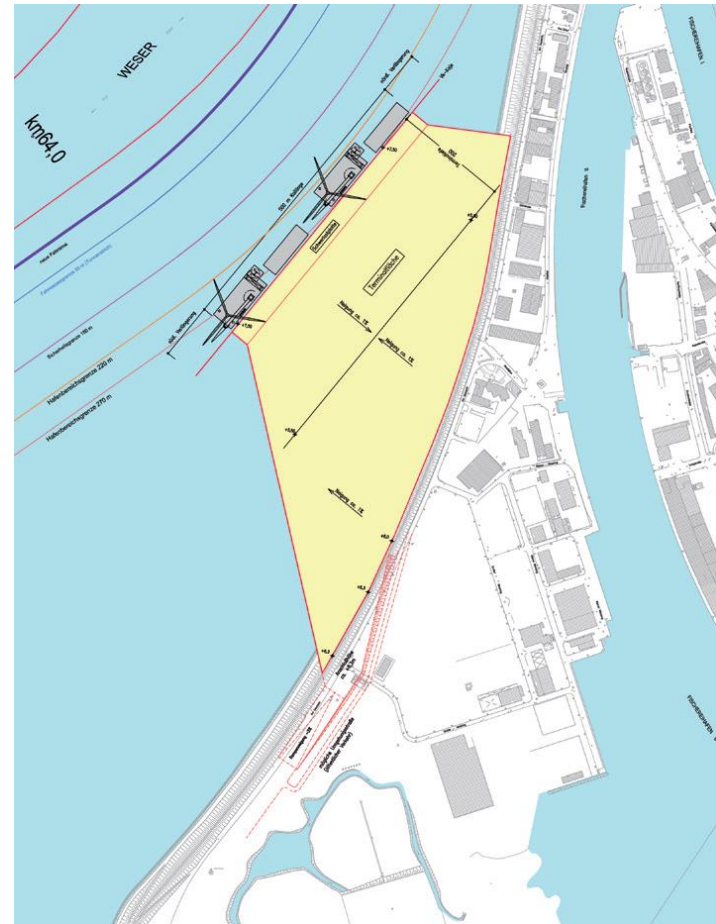






Offshore Terminal: Technical Data

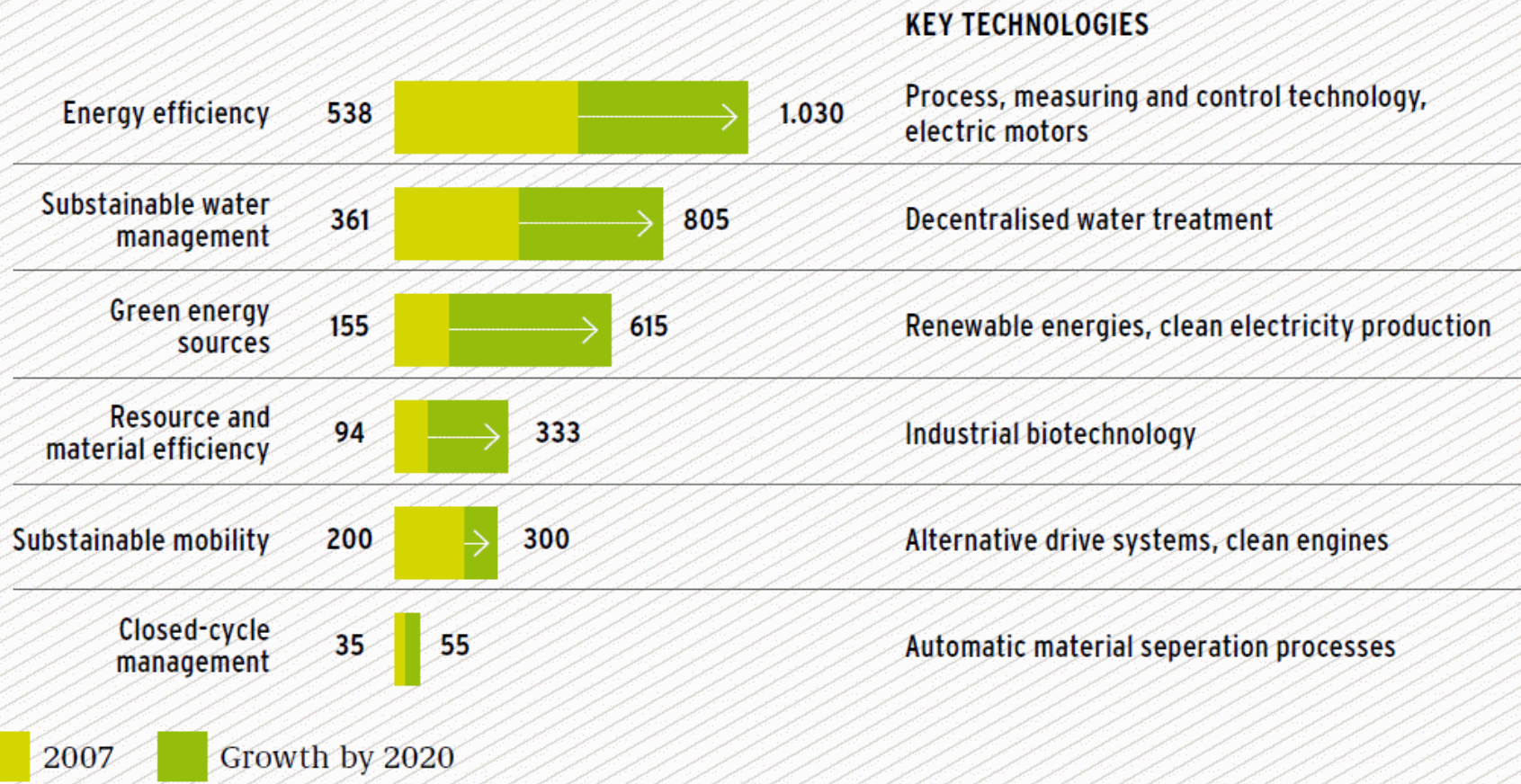
- **PURPOSE**
 - Handling, pre-assembly, and storage of offshore wind turbines, exporting of components
 - Logistics center for the transportation/shipment of large industrial components
- **OPERATING TIME**
 - 24 hours a day, 365 days a year
- **QUAY LENGTH**
 - 500 m
- **BERTHS**
 - 2 to 3
- **NAVIGABLE DEPTH**
 - 14,10 m NN (-11,50m LAT)
- **HEAVY-DUTY SLAB AT THE QUAY**
 - 70 m wide, 500 m long
- **TERMINAL DEPTH**
 - 498 m
- **AREA**
 - Approx. 25 ha
- **CAPACITY**
 - 160 units per season



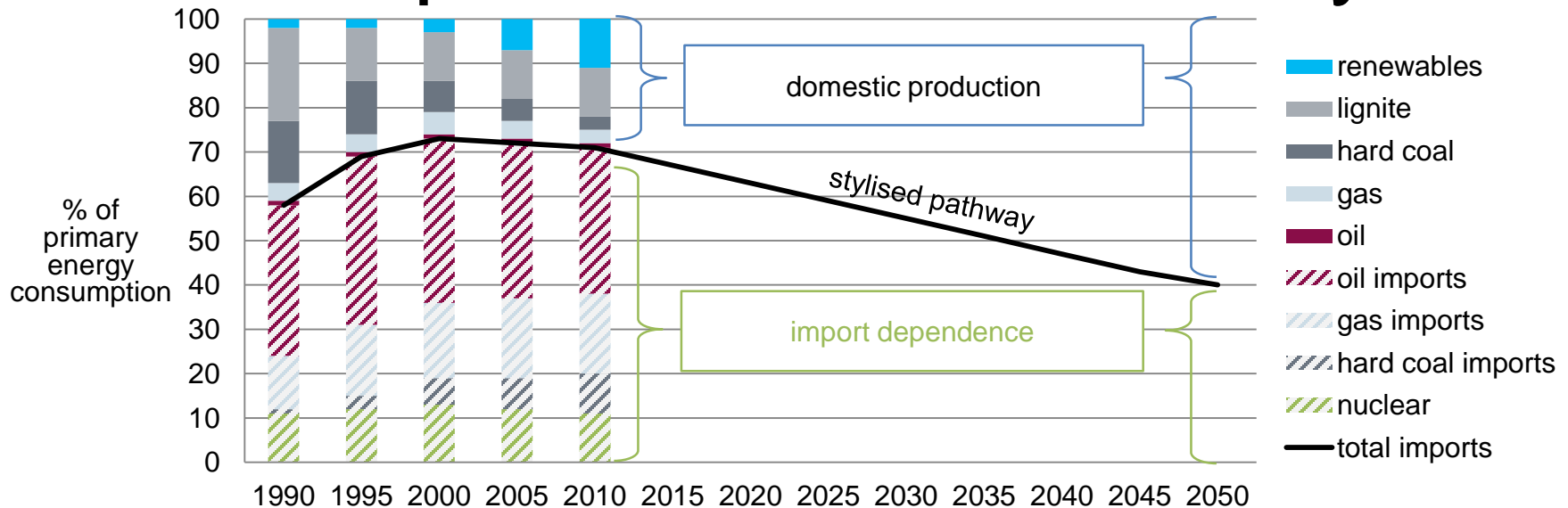
Thank you for
your interest!



Growth of market volume in the green markets of the future (in billion EUR)



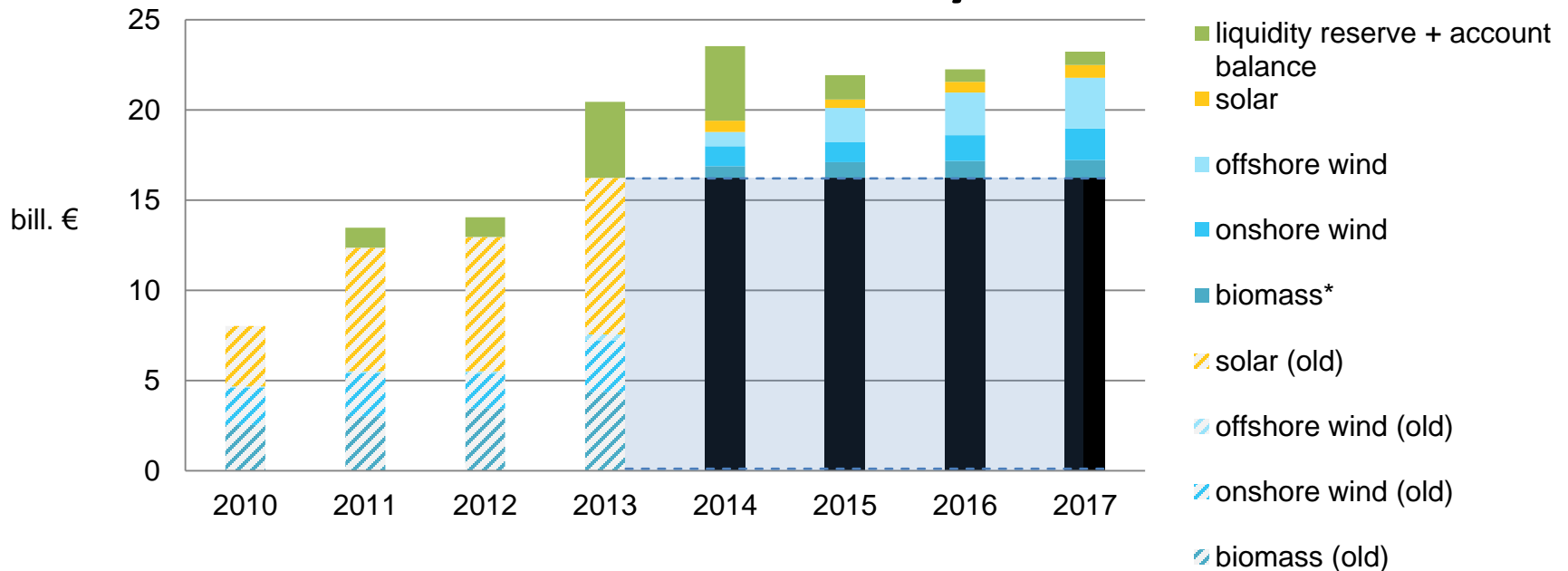
Energy imports and domestic production in Germany



Source: BMWi 2013

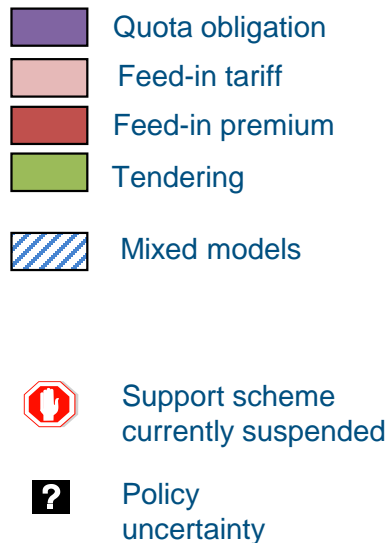
Renewables reduce Germany's energy dependence.

Net feed-in payment trends in Germany

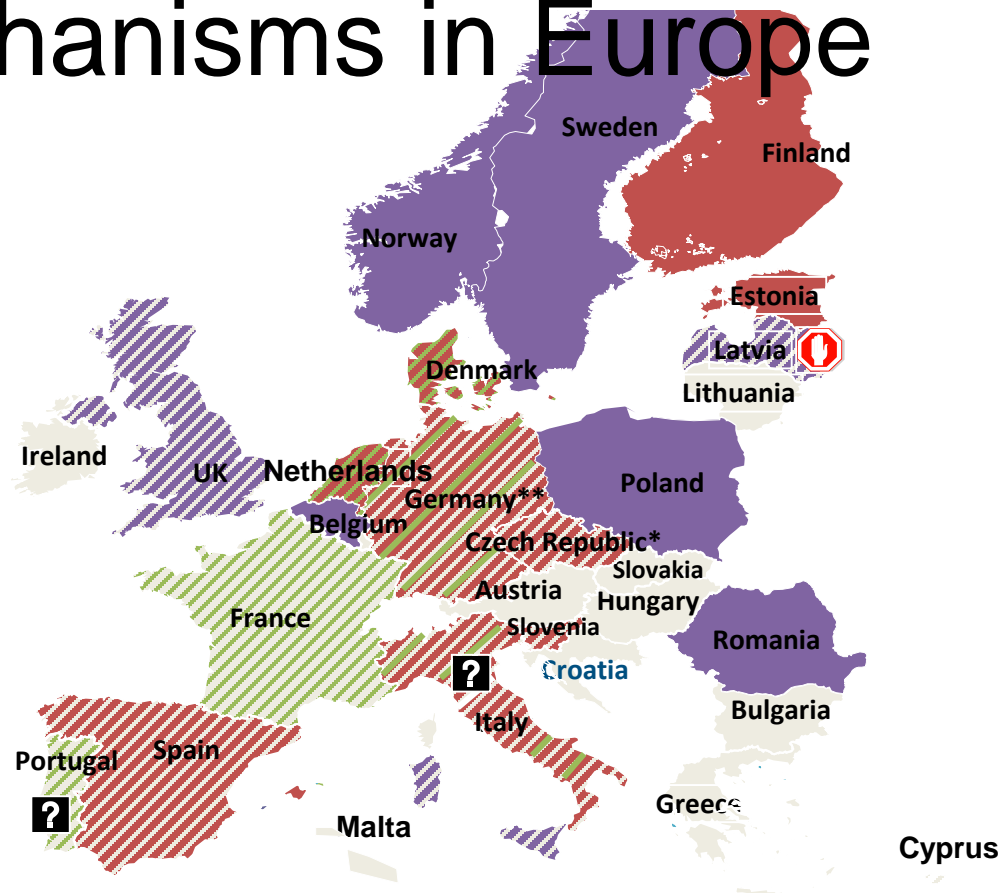


The main share of payments for renewable electricity goes to existing plants. New installations account for a much smaller share.

Renewable electricity support mechanisms in Europe



* support scheme was cut significantly
 ** Germany will start tendering ground-mounted PV in 2015



Source: Ecofys 2014, based on Ragwitz et al. (2012)

Free Hanseatic City of Bremen

- One of 16 Federal States of Germany
- Area: 158 sq. mi (408 km²)
- Population: 661,301
- Main industries:
 - Maritime and trade economies
 - Automotive industry (Daimler AG)
 - Aerospace
 - Food and beverage industry
 - Logistics
- Consists of two cities: Bremen & Bremerhaven

