The German energy transition

Volker Stehmann
RWE AG

VORWEG GEHEN

Rotterdam
25 June 2013

Energy concept of the federal government has set the guidelines for the energy transition

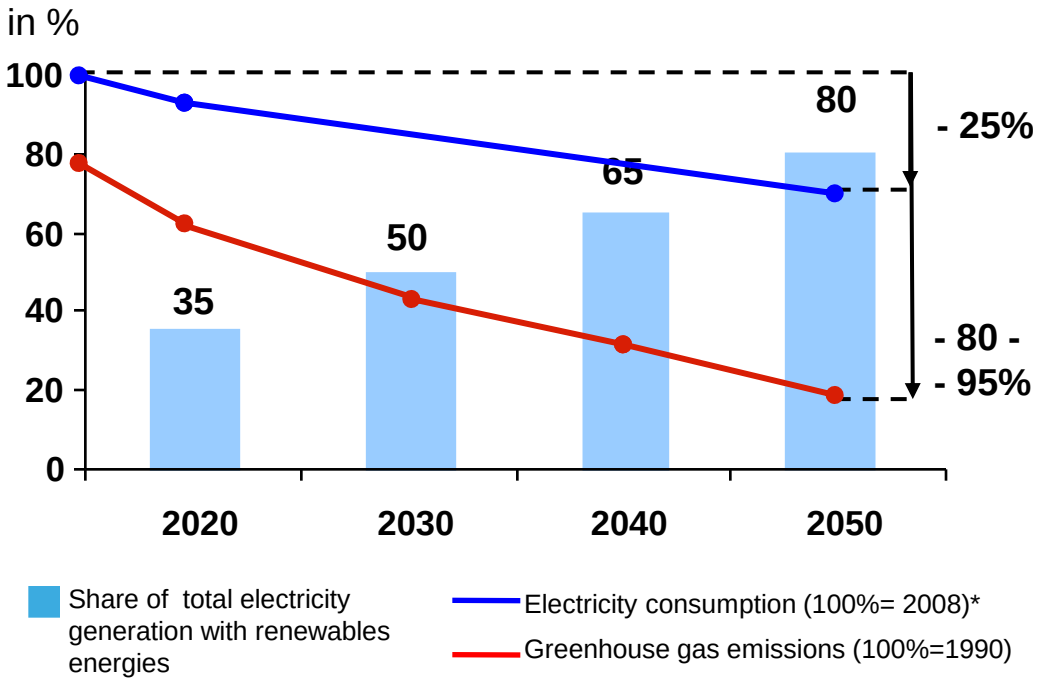
Reduce greenhouse gas emissions by at least 80% against 1990

Increase share of renewable energies to 80% of electricity generation

Reduce electricity consumption by 25% against 2008 until 2050

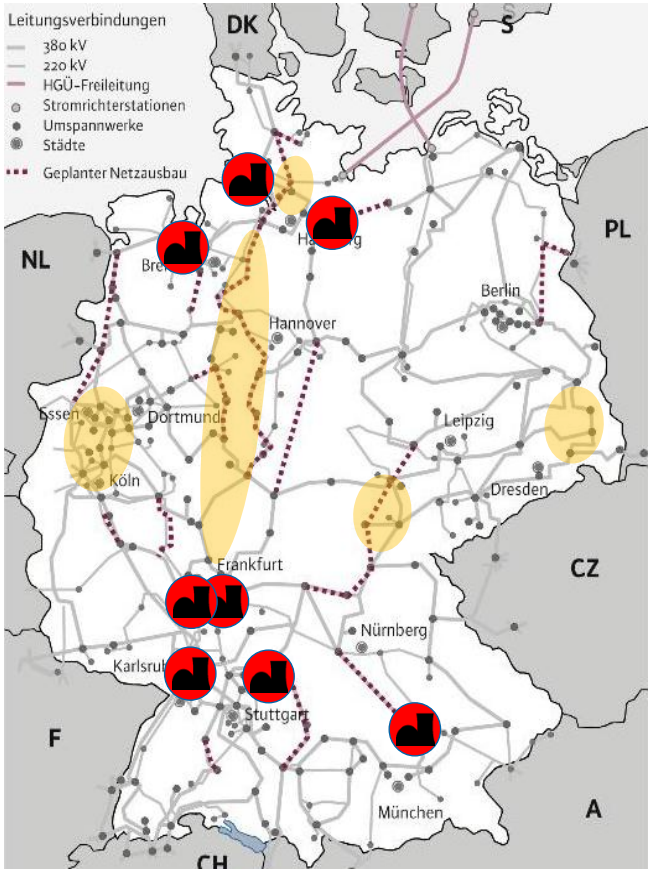
Reduce primary energy consumption by 50% against 2008 until 2050

More reneweables, less emissions



* : concrete numbers are only given for 2020 and 2050 .

All German nuclear power plants will be cut off step by step until 2022

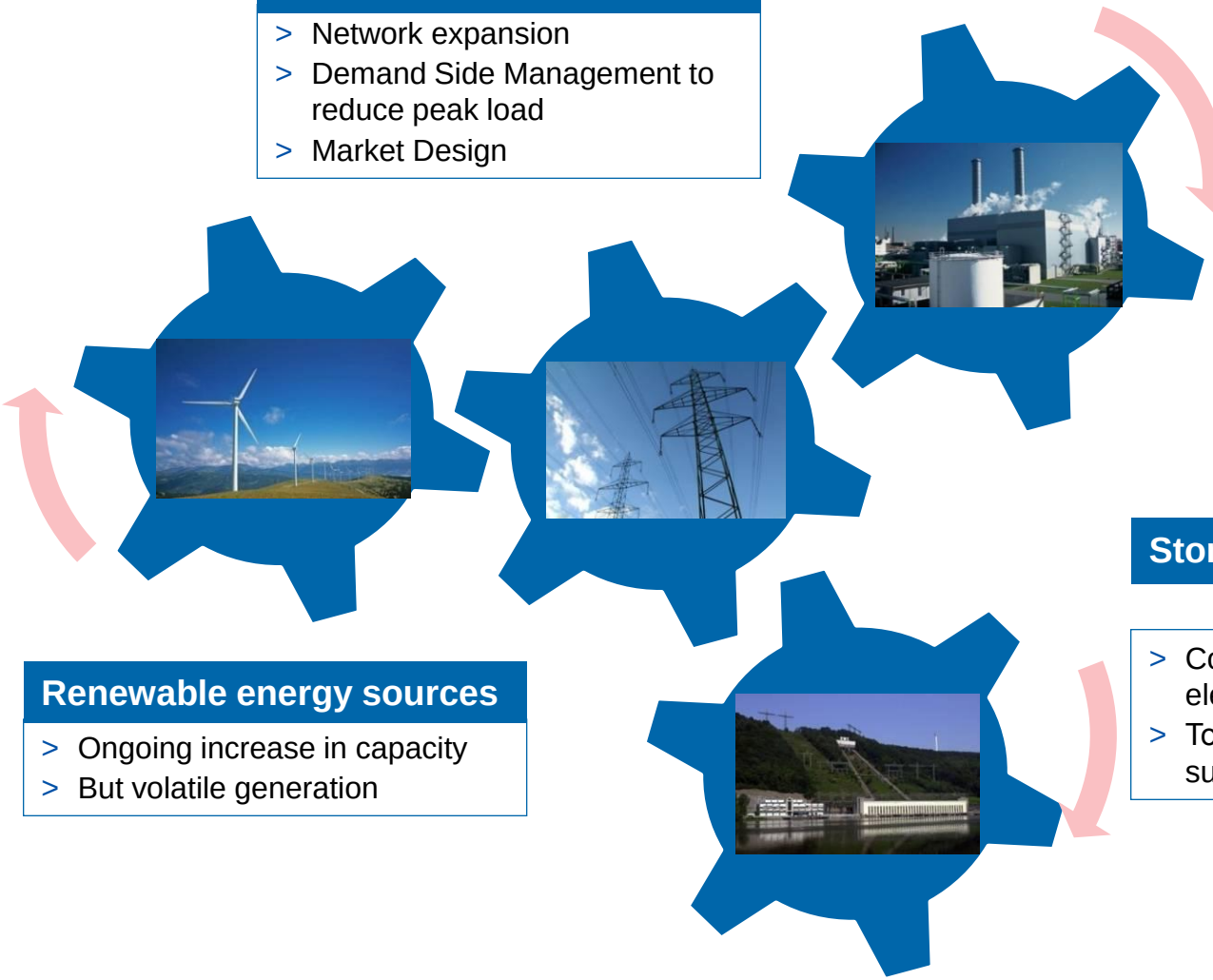


	Year of cut off
Biblis A, Neckarwestheim 1, Biblis B, Brunsbüttel, Isar 1, Unterweser, Philippsburg, Krümmel	2011
Grafenrheinfeld	2015
Gundremmingen B	2017
Phillipsburg 2	2019
Grohnde, Brokdorf, Gundremmingen C	2021
Isar 2, Neckarwestheim 2, Emsland	2022

The energy transition is based on a complex interplay of the entire energy market

Infrastructure / Regulation

> Network expansion
> Demand Side Management to reduce peak load
> Market Design



Flexible conventional generation

> Generates electricity when needed

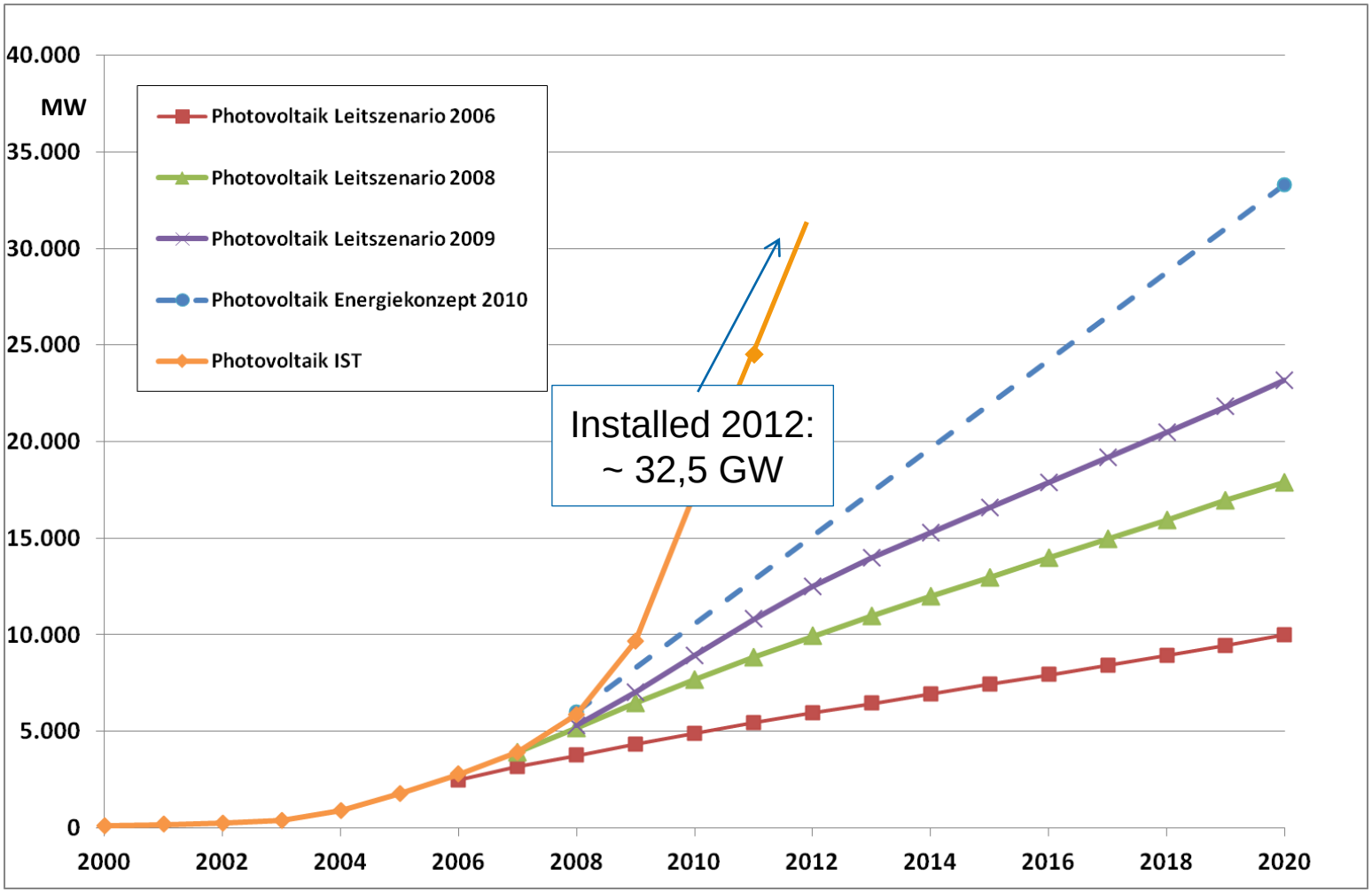
Renewable energy sources

> Ongoing increase in capacity
> But volatile generation

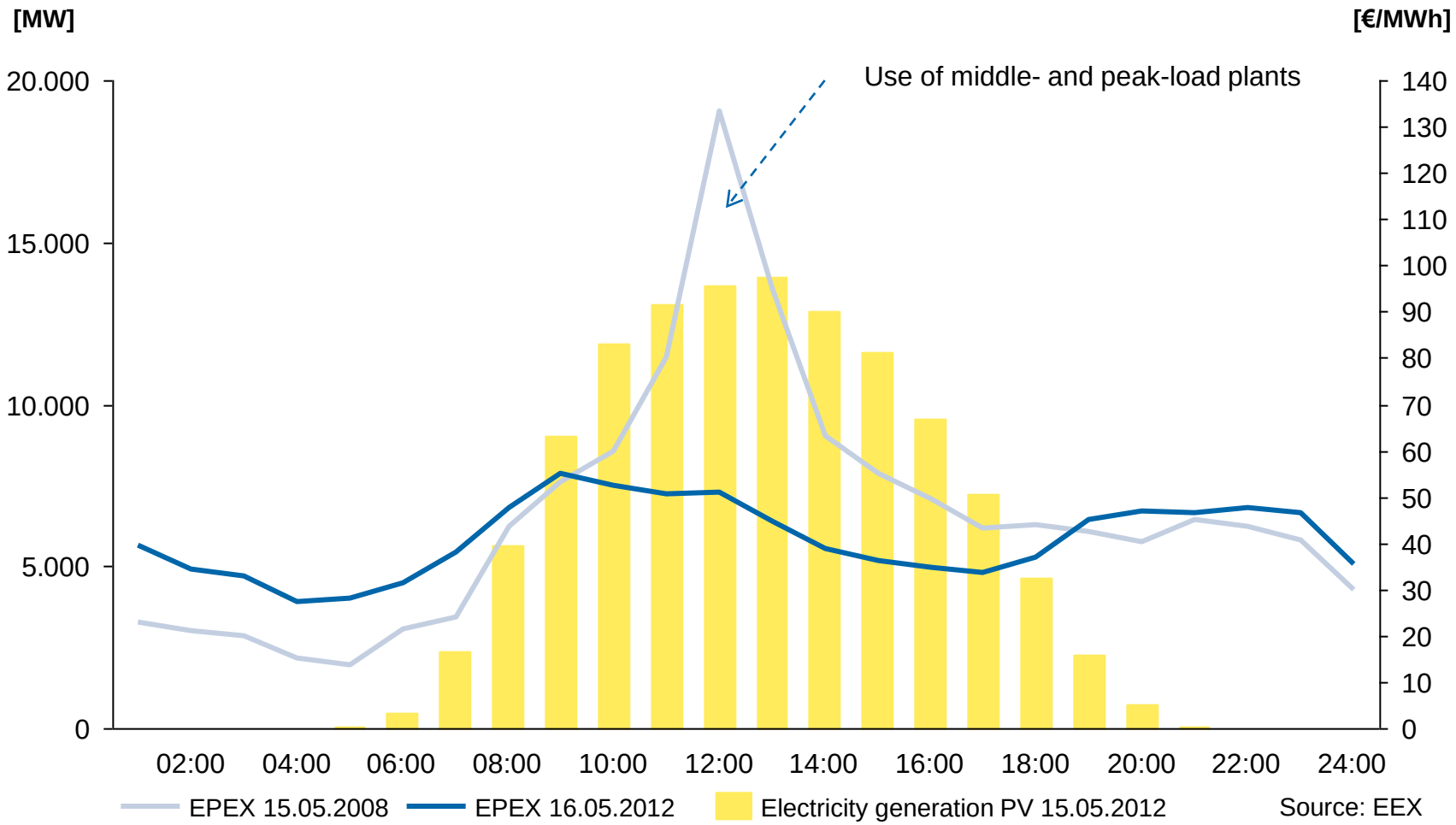
Storage / Reserve capacity

> Compensates peak load, stores electricity
> Today‘s storage capacity not sufficient

The development of photovoltaics has been clearly under-estimated.

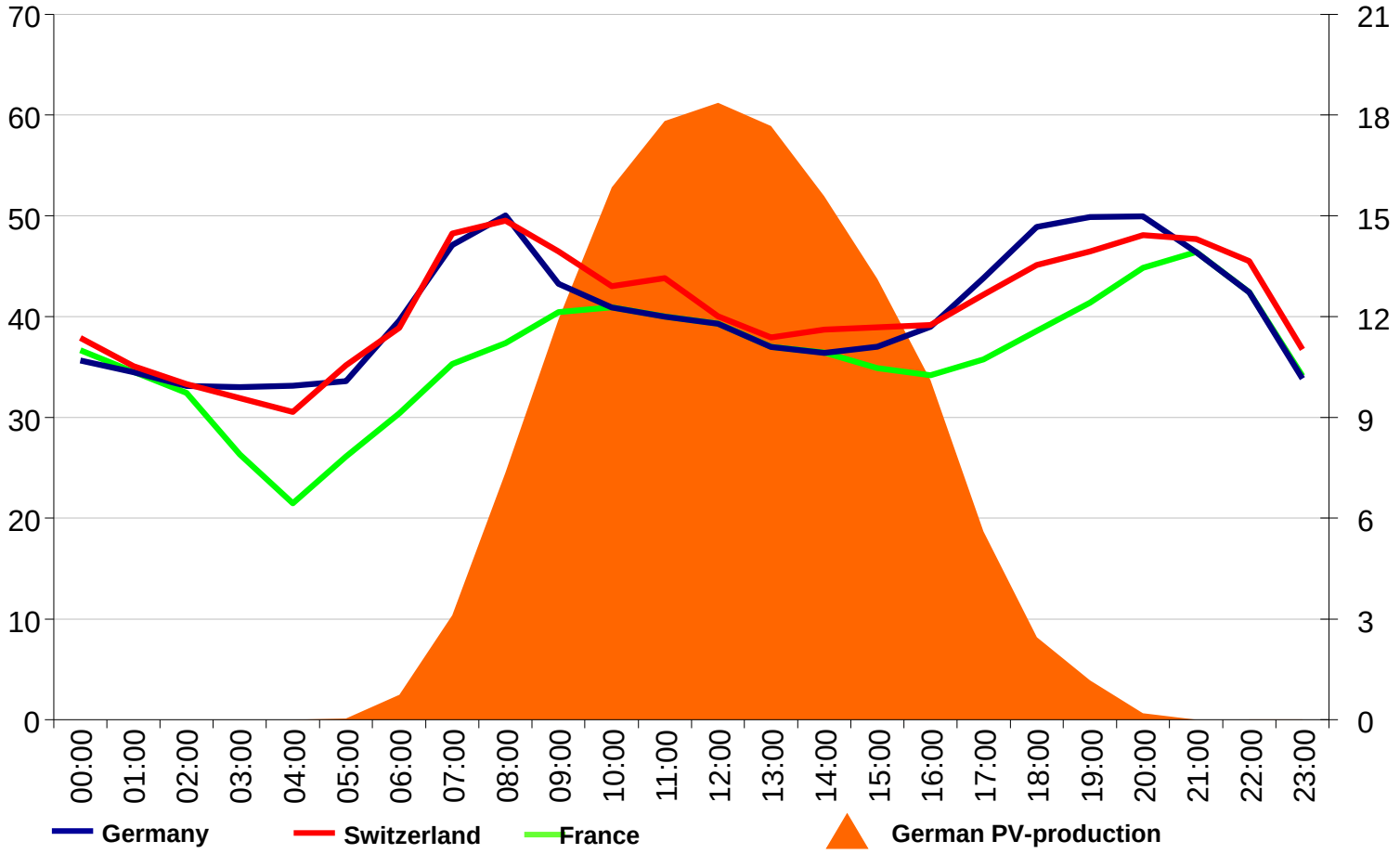


Increasing photovoltaics feed-in strongly impacts the daily energy price…



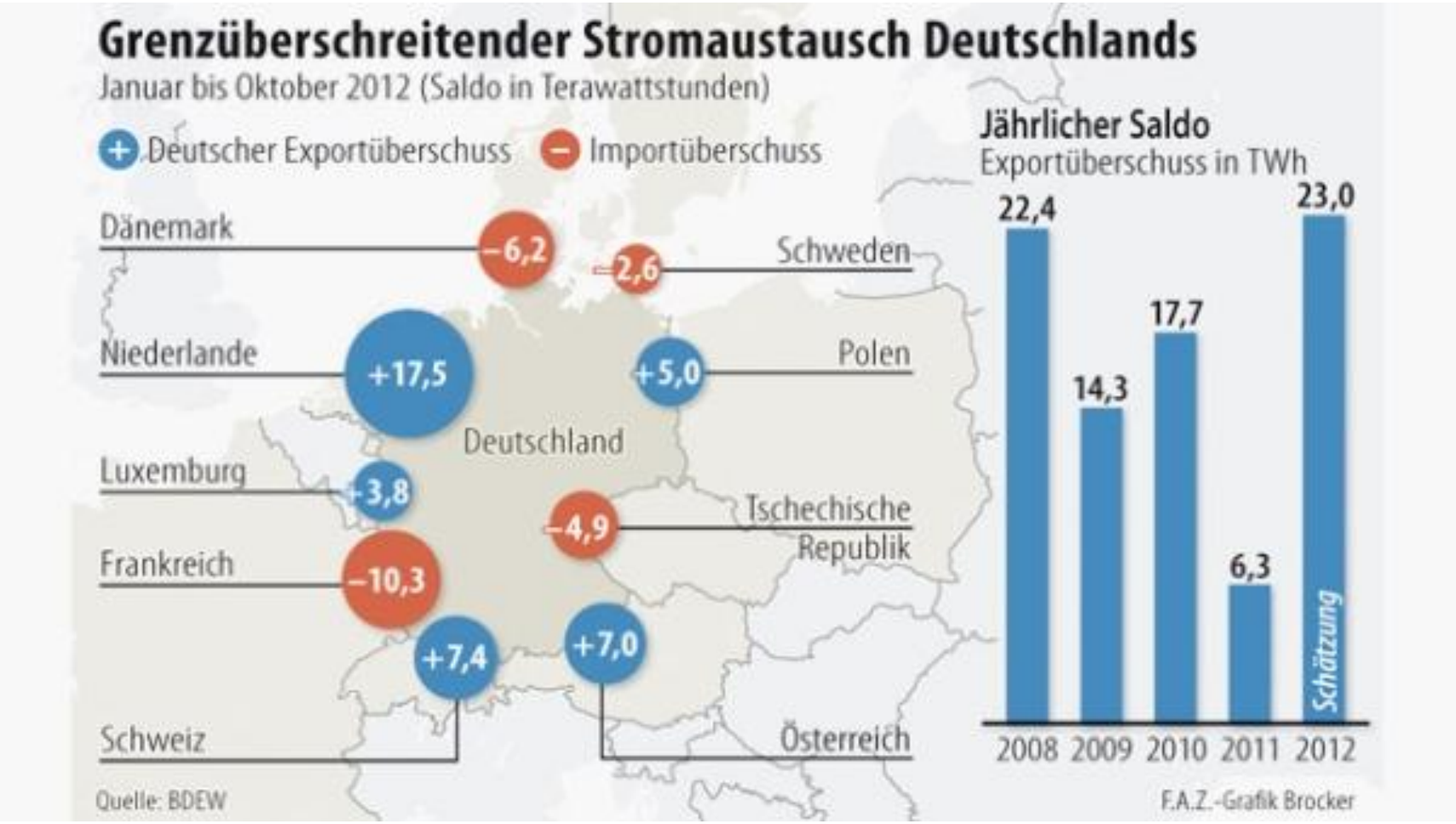
…not only in Germany, but also in Central / Western Europe…

Electricity prices for one hour at european stock exchanges (in €/MWh (left axis)) and Germand PV-electricity-poduction (in GW (right axis)); 8th May 2012[1)]



1) Source: EEX; RWE Supply&Trading.

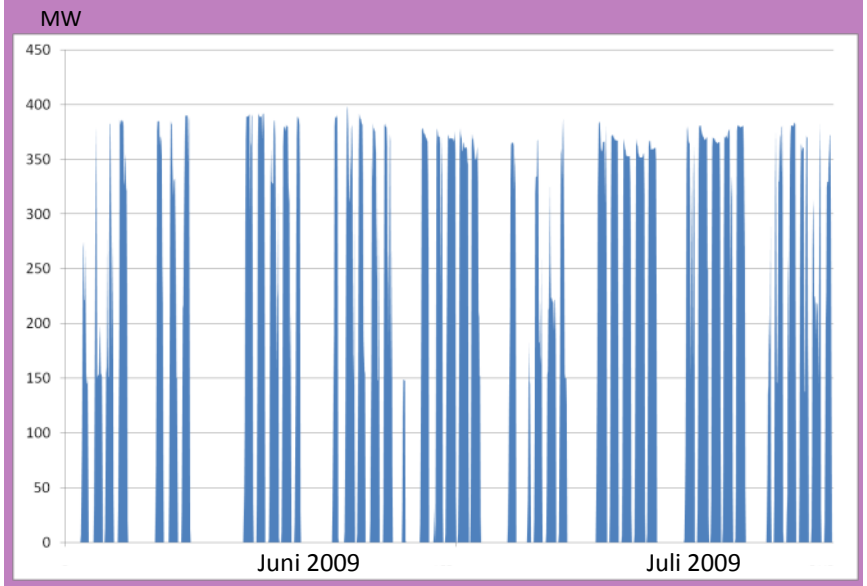
…and boosts German electricity exports.



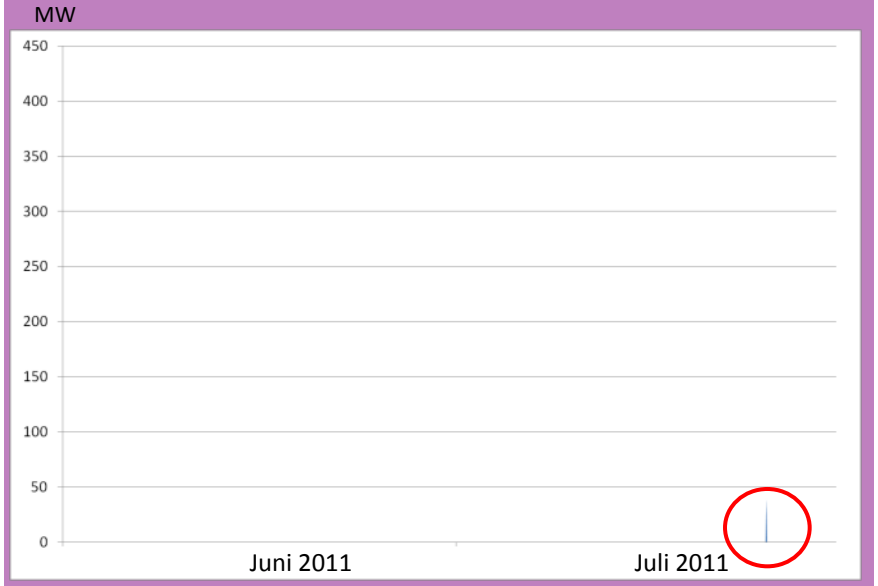
An example of conventional power plants: massive decrease of working hours

Usage of the gas CHP unit in Gersteinwerk F (427 MW) 2009 compared to 2011

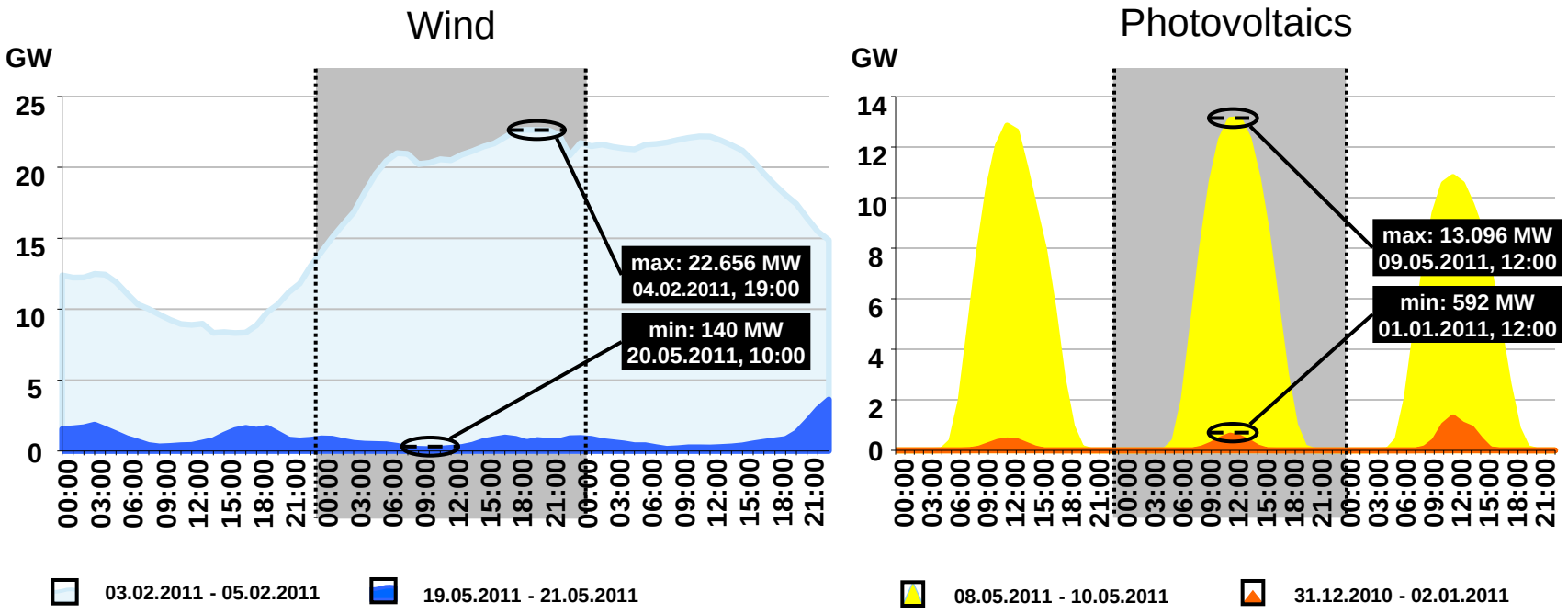
Production in June and July **2009**



Production in June and July **2011**



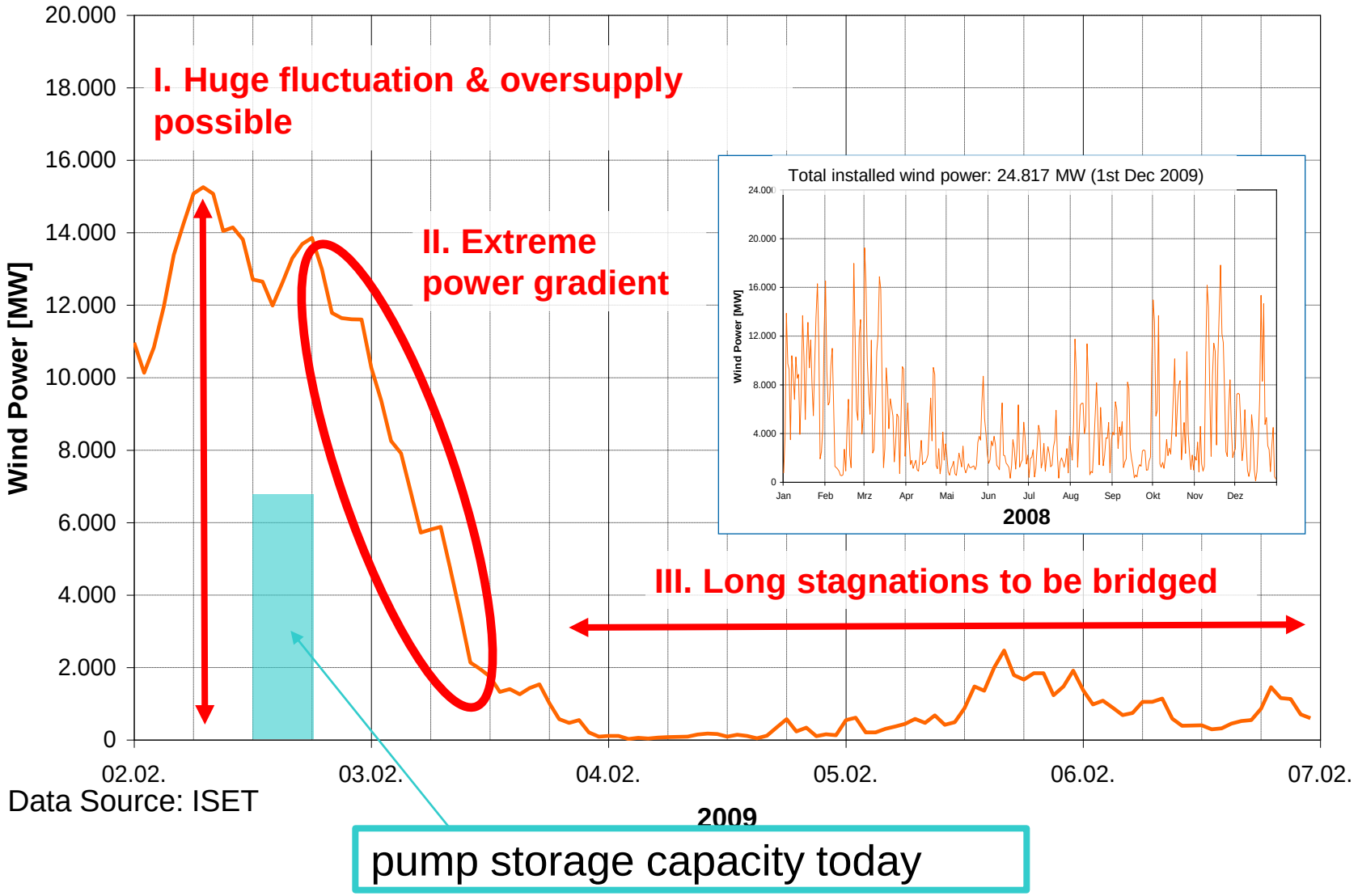
Integration of renewables and challenges to security of supply



In the first half-year of 2011 alone, there were variations of 23 GW in wind feed-in and 13 GW in photovoltaics feed-in.

Quelle: RWE Supply&Trading, MLT-VW

Long stagnations have to be bridged

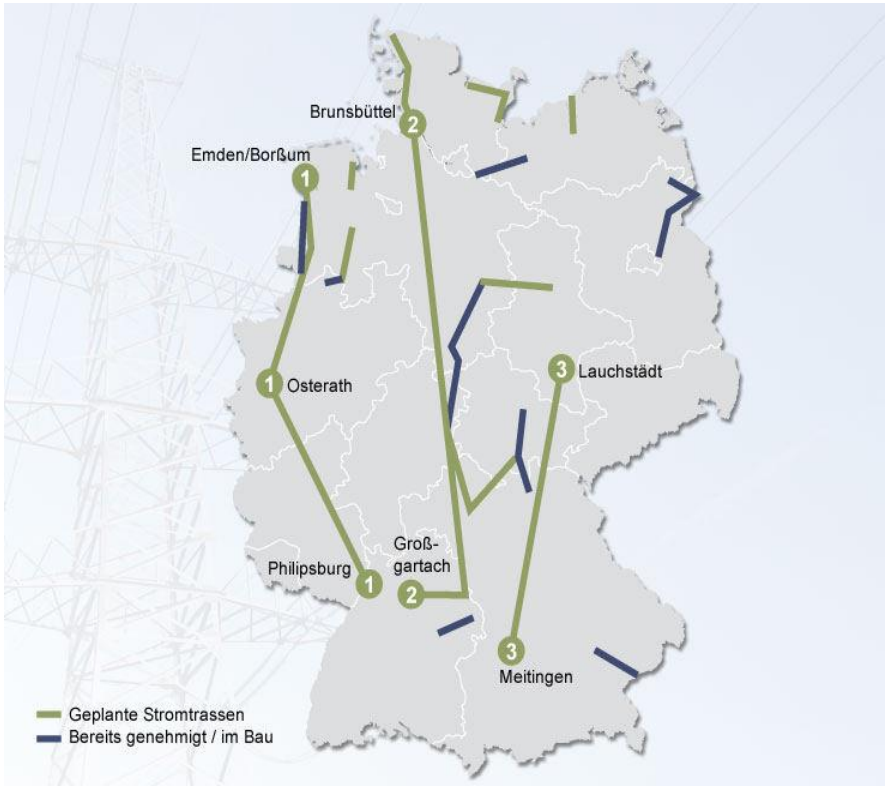


Data Source: ISET

Power supply remains critical in winter

- Grids are at their limits
- 2000 MW had to be sourced from reserve power plants in the German south and Austria during winter 2011/2012
- Reserves around 2.500 MW were contracted during winter 2012/2013
- Shutdown of more conventional power plants prohibited
- Help only via grid expansion

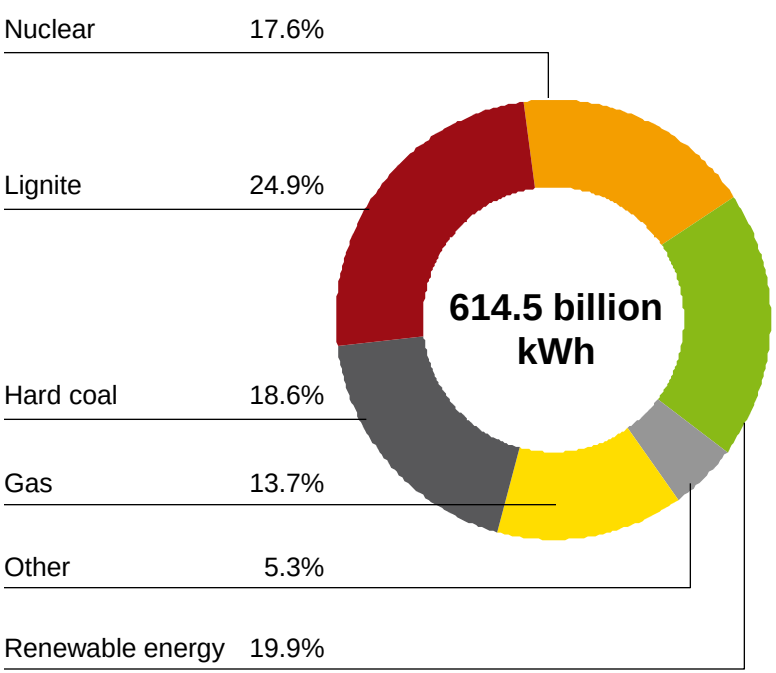
Grid expansion due to more renewables and less nuclear. Grid Development Plan November 2012



- 2.800 km of new Very High Voltage Lines (including around 1.700 km of DC links)
- 2.800 km modernization of existing Very High Voltage Lines
- € 20 bn costs excluding ground cable
- In addition, DSOs are expecting investment needs of € 27 - 42 bn until 2030

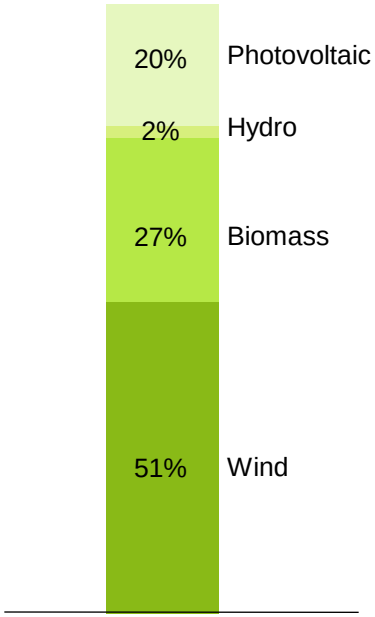
Renewable energy's share of total electricity generation in Germany

Gross generation in Germany (2011)



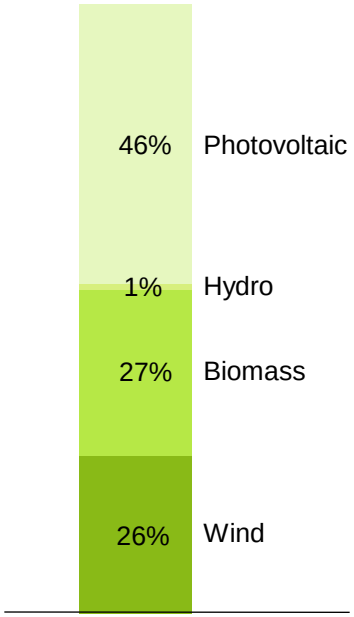
Generation subsidized by REA[1]

92 billion kWh[2]



REA[1] compensation

€ 16 bn[3]



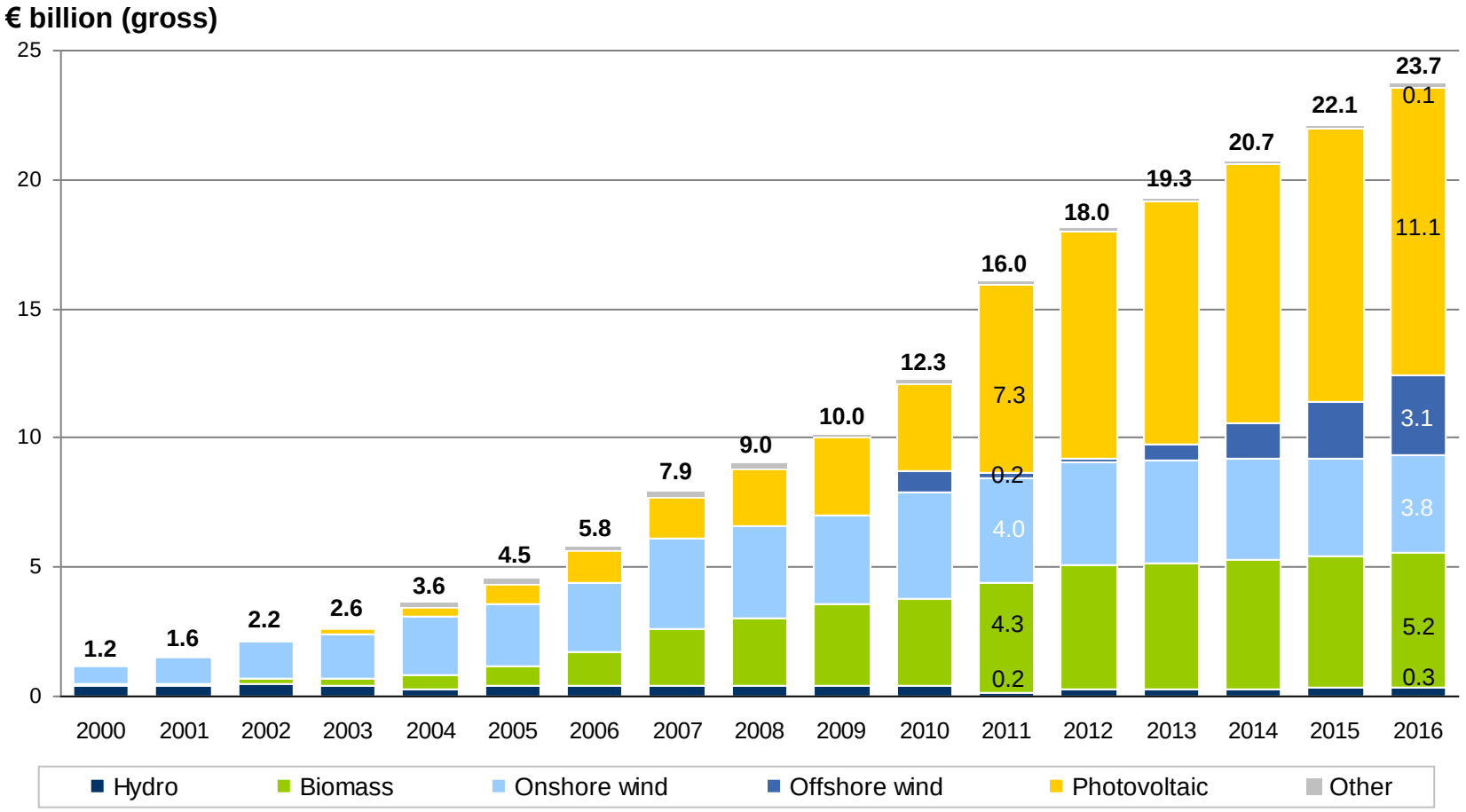
1 REA = German Renewable Energy Act.

2 Next to the power generation subsidised by the German REA of 92,266 GWh in 2011, another 12,332 GWh of power from renewable sources (REA electricity) was sold on the free market (direct marketing in accordance with §17 REA).

3 Including avoided network fees.

Sources: Gross generation: BDEW, BMWI; REA generation + REA compensation: German transmission system operators (www.eeg-kwk.net) as of November 2010 (provisional data).

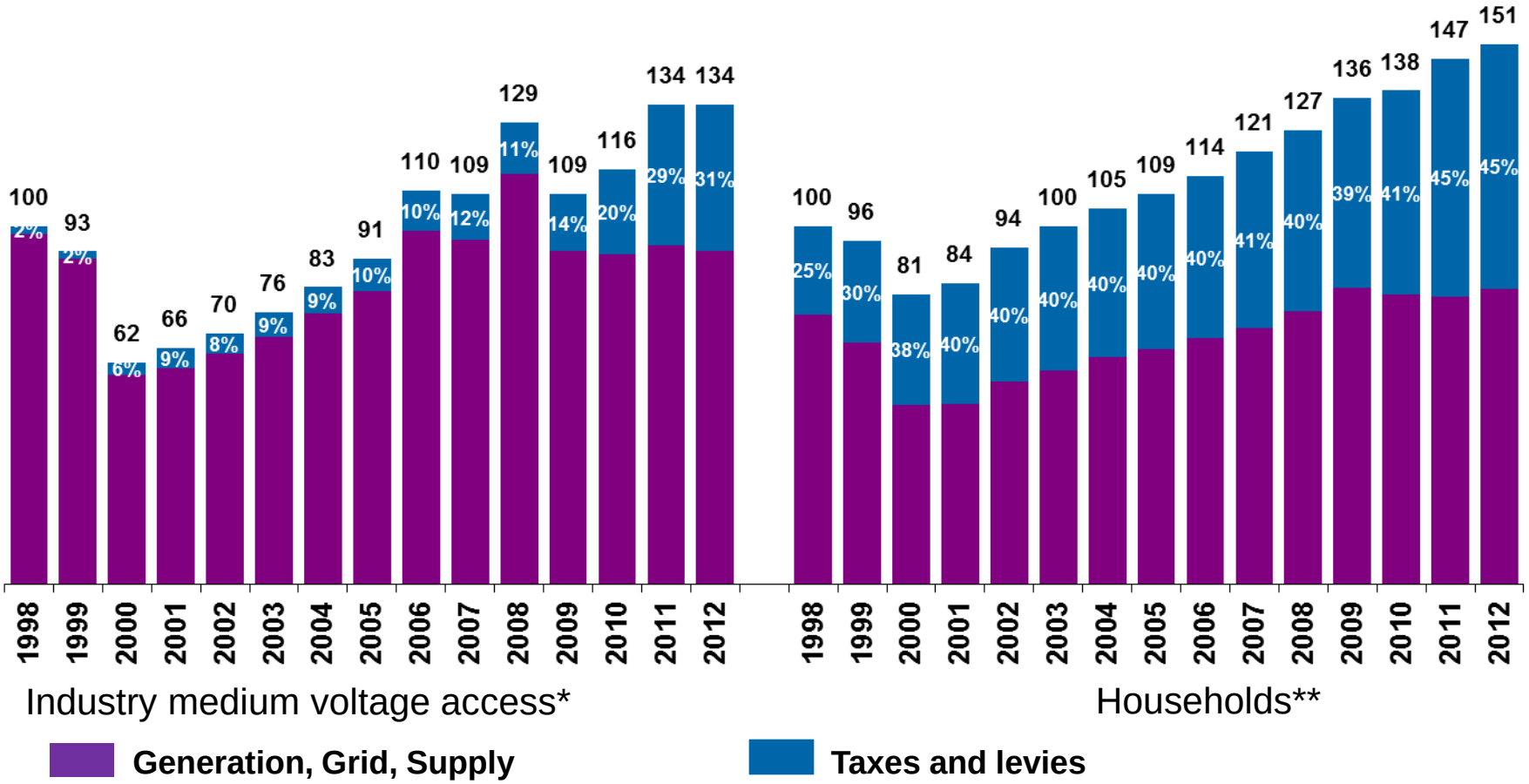
German Renewable Energy Act compensation and forecast through 2016



Source: Renewable Energy Act medium-term forecast of electricity transmission system operators. Data until 2010 as of May 2009, data for 2011 as of November 2010, data for 2012 onwards as of November 2011 (from 2012 onwards fees for market premium, direct marketing and photovoltaic self consumption included).

Electricity prices for households and industry - including taxes and levies

1998 = 100



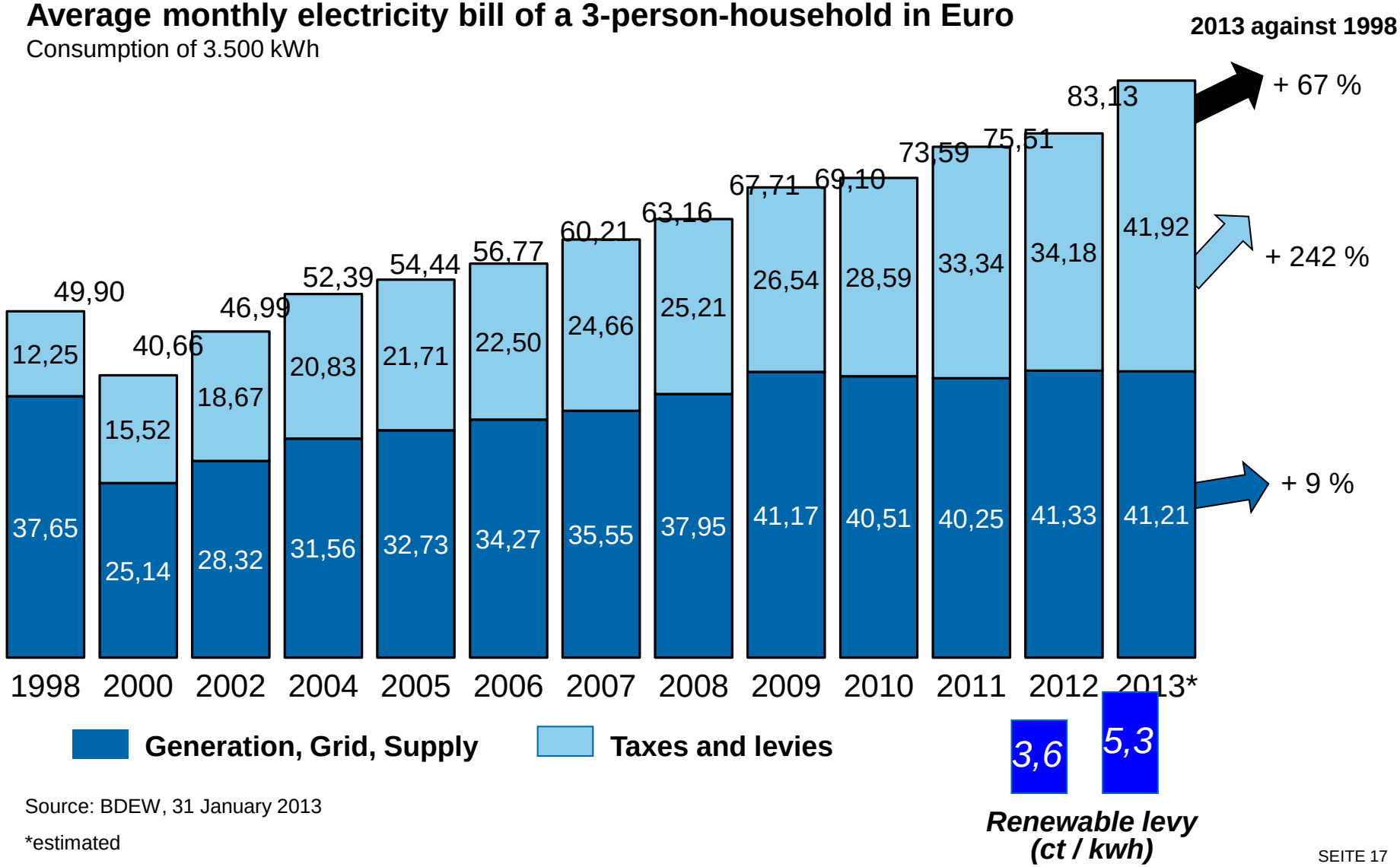
* Without electricity tax ** average 3-person household; 3500 kWh/a

Sources: VEA, BDEW; Prices as of 10/2012

Monthly bill for households

Average monthly electricity bill of a 3-person-household in Euro

Consumption of 3.500 kWh



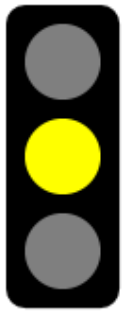
Source: BDEW, 31 January 2013

*estimated

Systematic approach for a new market design

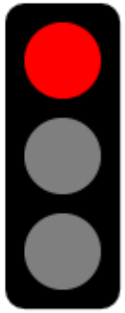
Climate Change: Emission Trading Scheme

The ETS is working. Climate change goals are being met, as the emissions are capped. But conflicting national regulation and potential floor prices are undermining the ETS and investment signals. 2030 targets are needed.



Security of Supply: Capacity Market

In the longer run, firm capacity needs to have a value. Due to support schemes and privileged RES access to the grid, conventional plants can hardly earn their fixed costs.



Overall cost efficiency: Renewable Support Scheme

The German renewable support scheme needs modifications. Renewable energies need to be integrated into the market framework and take balancing responsibility. Energy must remain affordable.

Thank you for your attention.

VORWEG GEHEN