Panel ñThe European frameworkò
Conference ñEnergy transitions in France and Germanyò
Convergences, divergences & impact on Europe
Paris, May 31, 2013

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Contents

- The German Energiewende in short
- About energy security and costs
- Energiewende and its neighbours and within the EU internal market

Some notes upfront é

- **EU MS have different starting points and historic experiences**
- **In some ways, they face similar challenges**
- **é but are acting within different framework conditions**
- **Yet our energy systems are interlinked → need for common steps, cooperation and coordination**

é *in short*

- **phase out of nuclear until 2022**
- **decision to base energy system on Renewables and Efficiency**
  - Å **very ambitious targets**
  - Å **minus 80-95% THG-emissions in 2050 cp to 1990**
  - Å **80% RES-E in 2050**
  - Å **minus 50% of primary energy demand in 2050 (cp to 2008)**
- **concrete and very comprehensive set of measures (166 P&Mês)**
- **Transparent Monitoring Scheme**
- **constant adaption needed: a learning system**

The Energy Concept includes all sectorsï it is not only power related!

- **2/3 of German Energy balance is heat and transport**
- **1/3 of German Energy balance is electricity**
- **8 ï 10 % of the German Energy Balance is nuclear power**

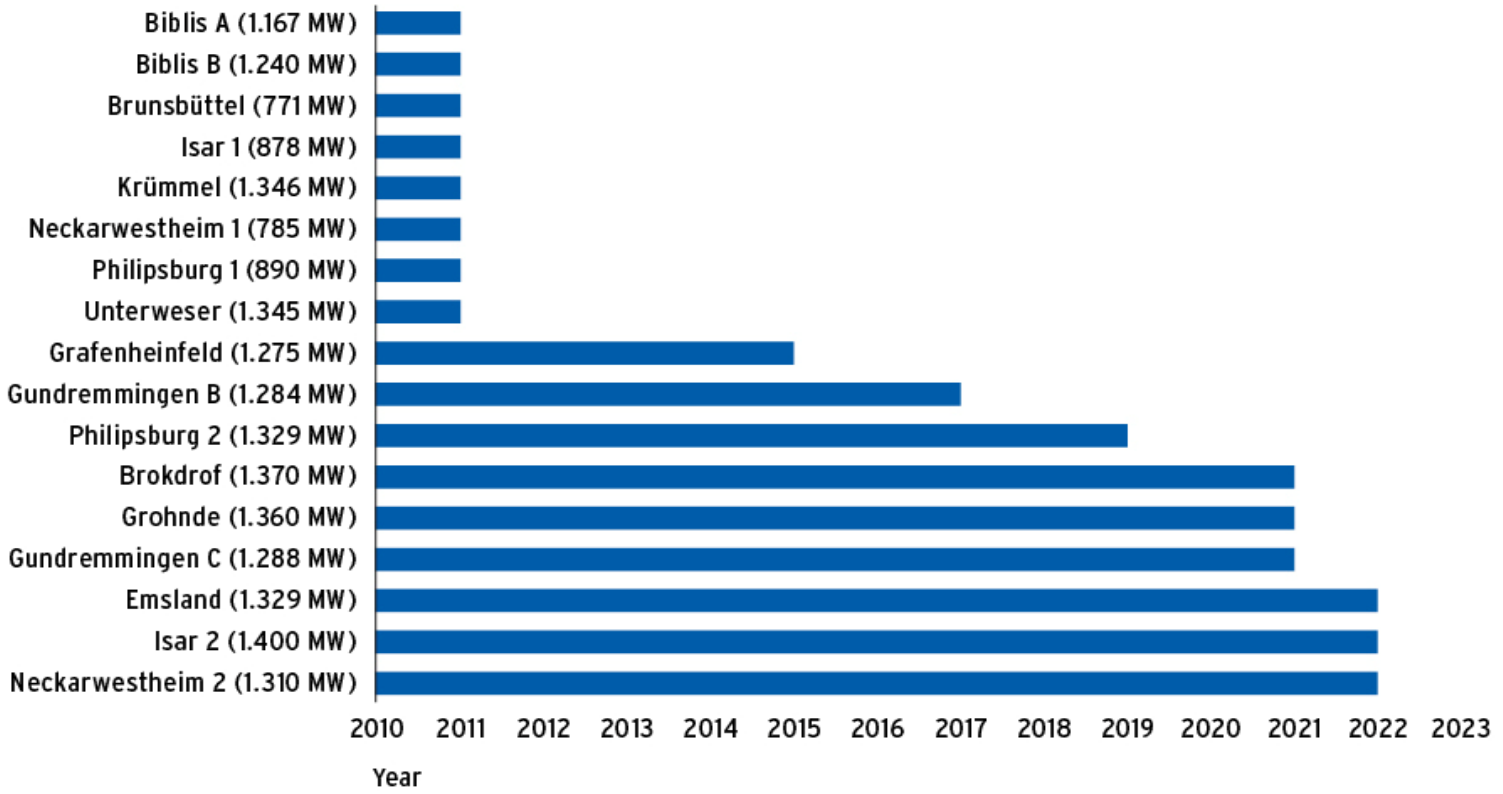
The *Energiewende: Targets*

	Climate	Renewables		Efficiency				
	Green house gases (vs. 1990)	power	Primary energy consumption	Primary energy	power	Energy productivity	transport	buildings
2020	- 40 %	35%	18%	- 20%	-10%	increase to 2,1%/a	-10 %	Double 1 ---2 % Refurbis-ment p.a.
2030	- 55 %	50%	30%					
2040	- 70 %	65%	45%				- 40 %	
2050	- 80-95%	80%	60%	- 50%	-25%			

The rationaleé

- **Climate friendly energy future**
- **Driving innovation: achieving Ăsystem competenceñ**
- **RES and energy efficiency are the future lead markets**
- **Acting now: Avoids lock-in effects (!) and drives growth**
- **The future competetiveness will be decided by efficiency**
  - **The cheapest unit of electricity is the one avoided**
  - **in 2050 we want to use ½ of energy for one unit of our GDP**
- **Reducing dependence on energy imports: already in 2011, Germany saved 25 bn ú/pa of fossil fuel imports**
- **Long term: cost efficient energy system (e:g. PV costs cut by half)**

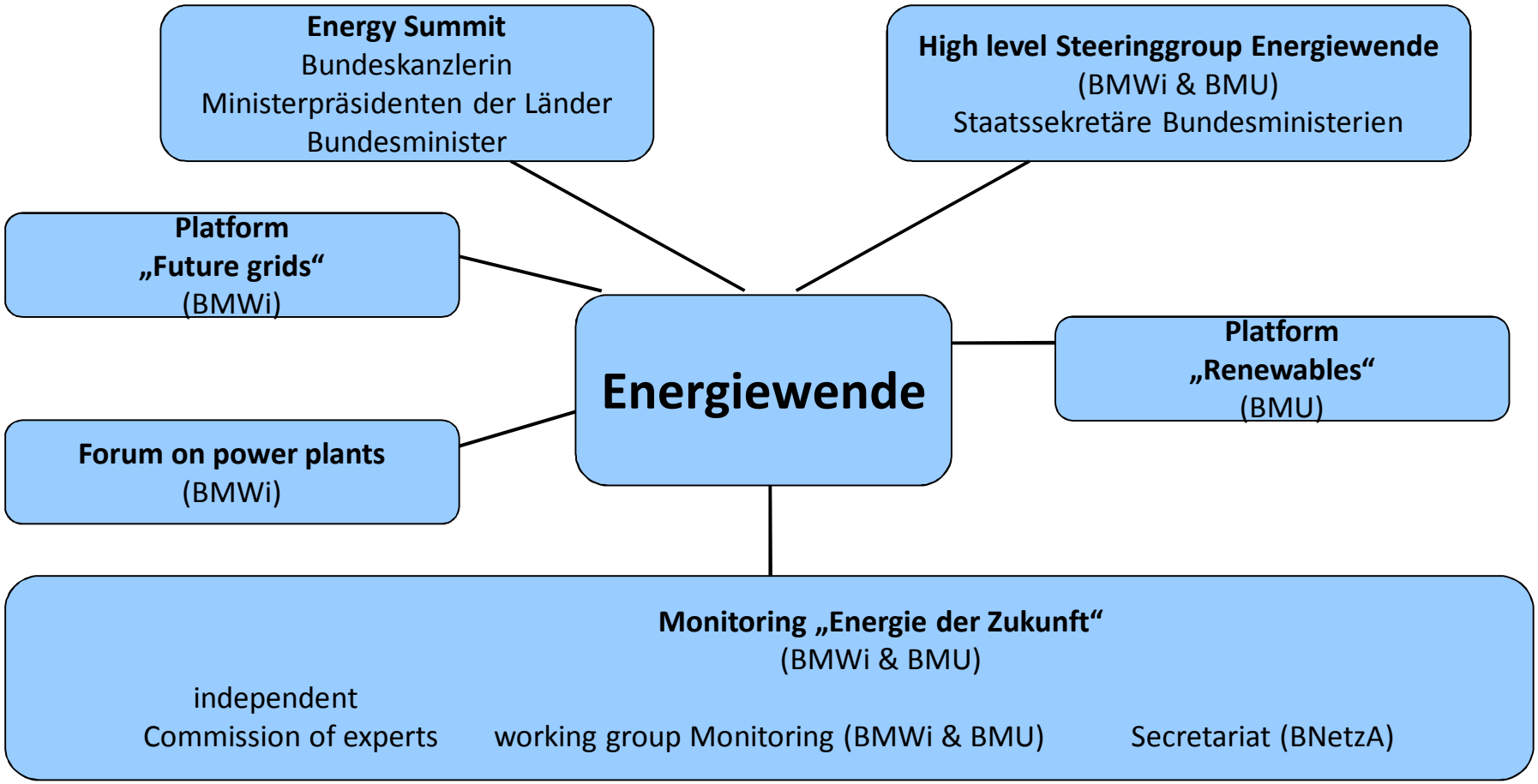
Phase-out data and remaining nuclear capacities

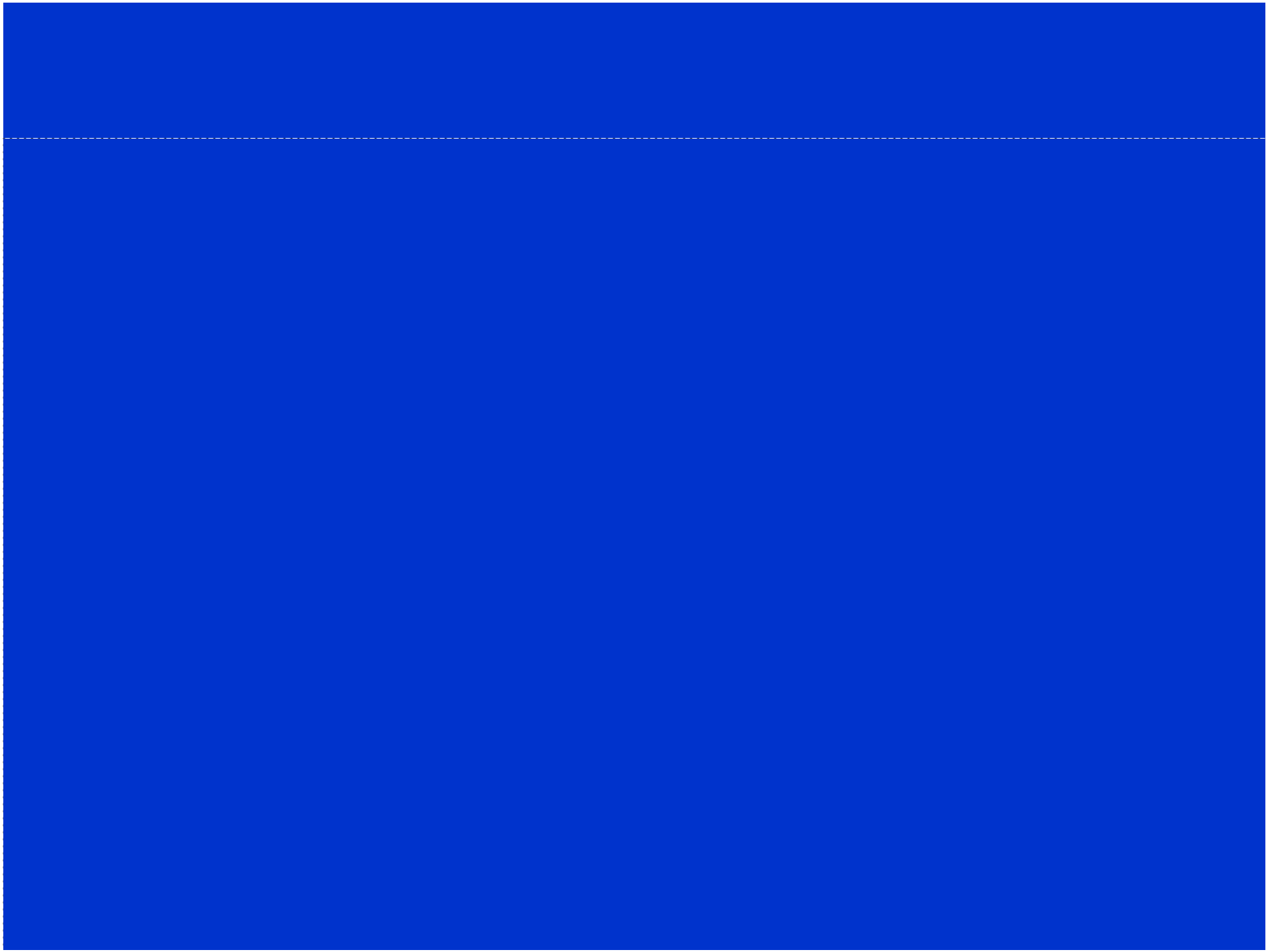


	2011	2015	2017	2019	2021	2022	total
Capacity taken off grid in MW	8.422 *	1.275	1.284	1.329	4.018	4.039	20.367

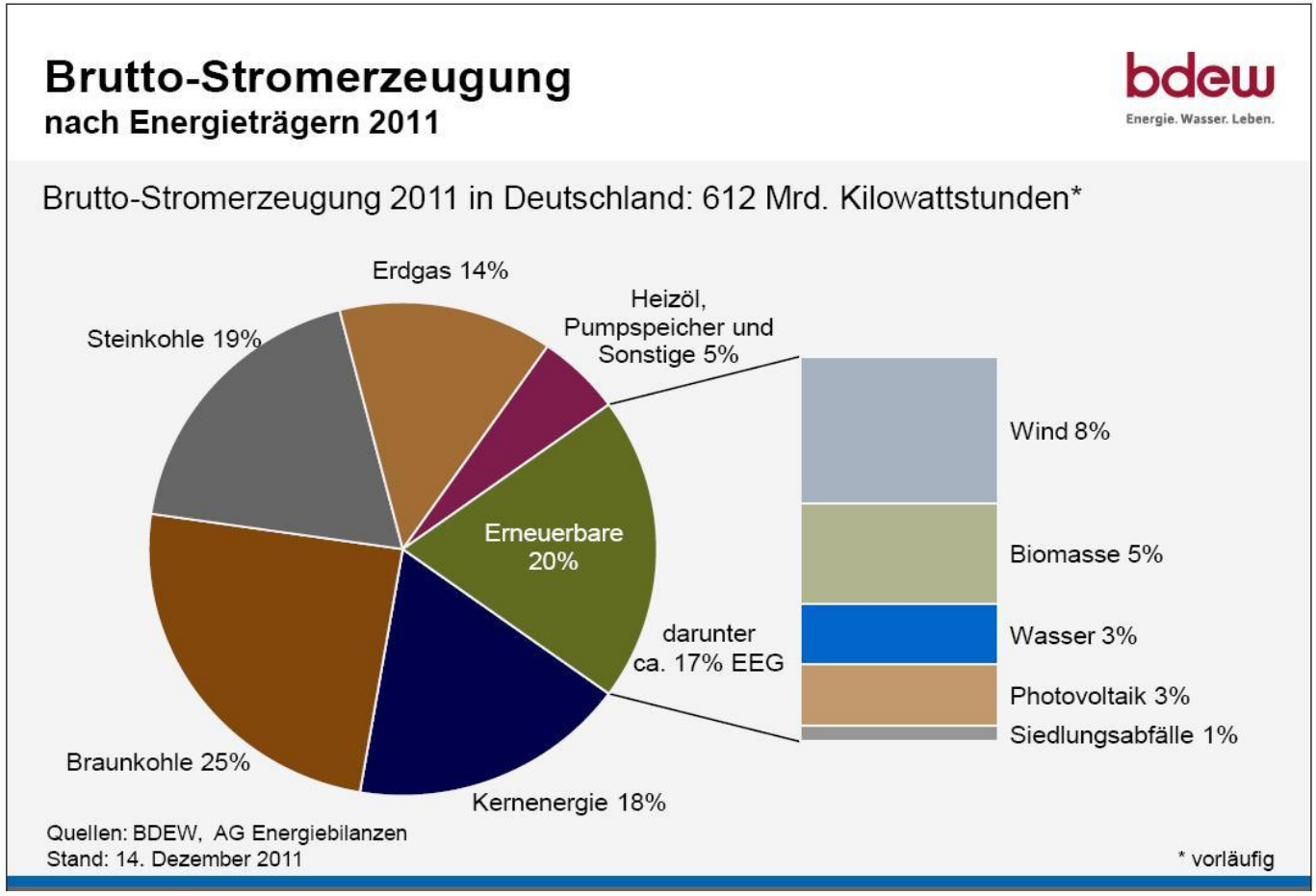
* 2.1 GW already removed from the grid since 2008

Management Structures of the ÄEnergiewendeñ

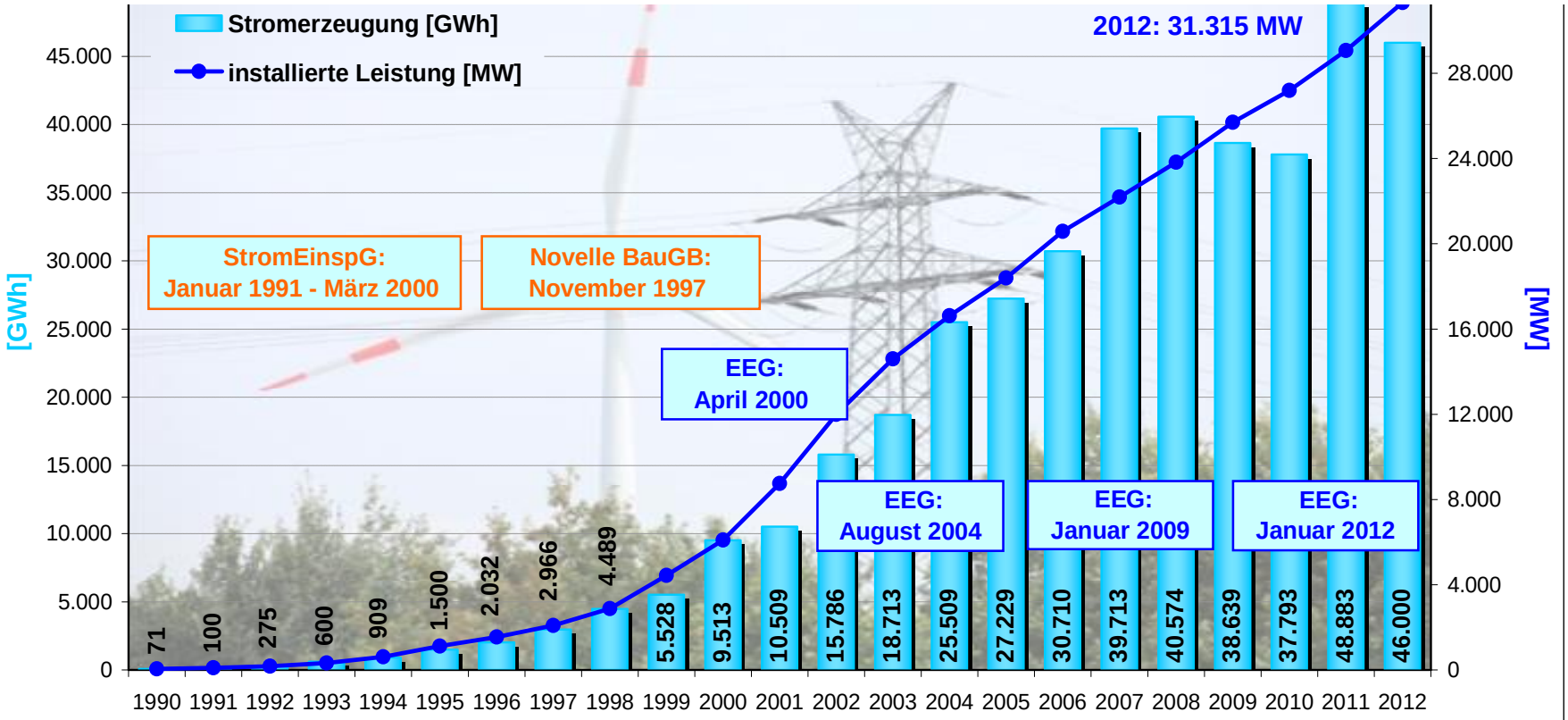




2011: RES surpassed nuclear and became second largest energy source for electricity

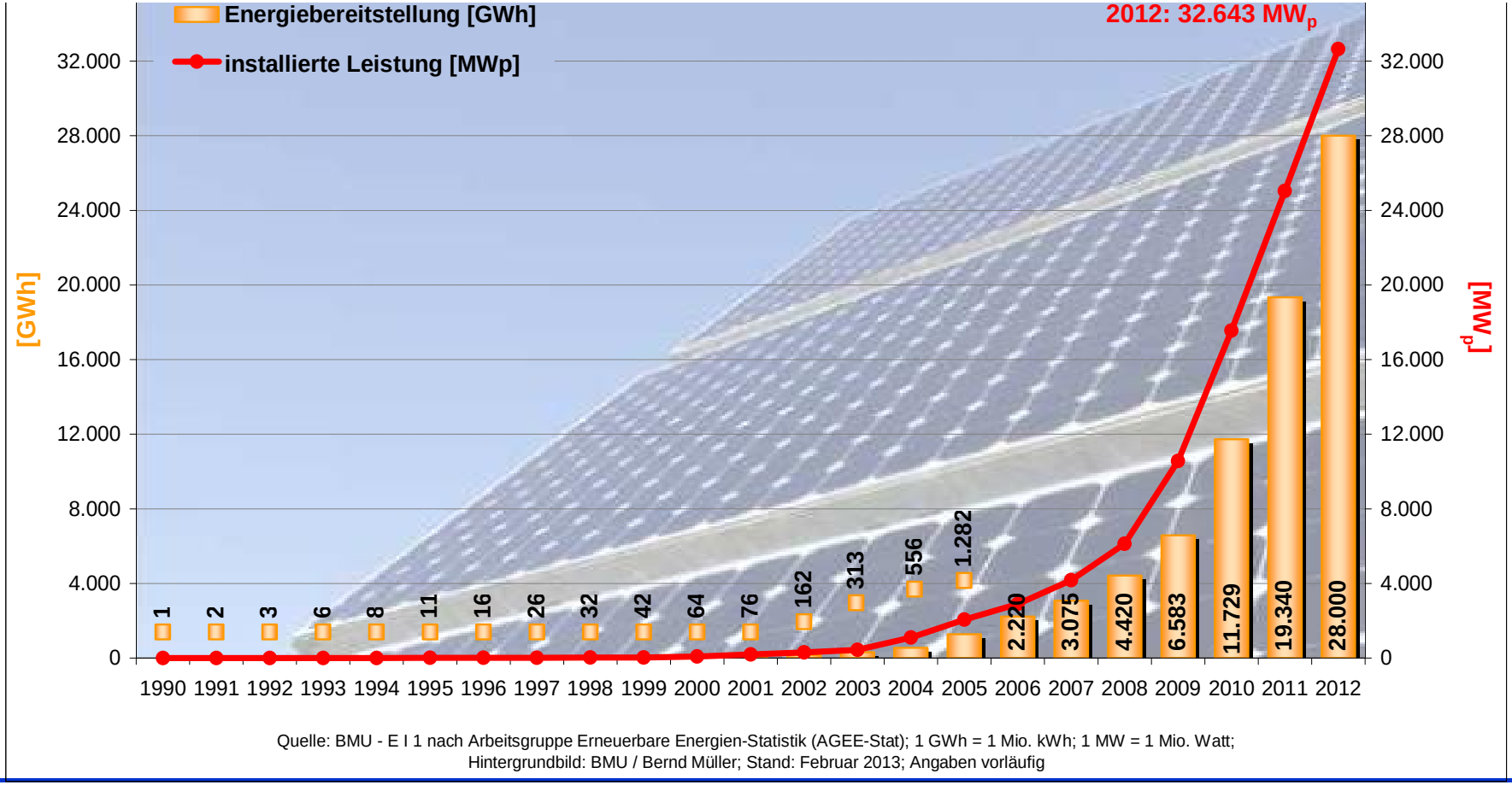


Installed wind capacity in 2012: 32 GW



Quellen: C. Ender, Internetauftritt Deutsches Windenergie-Institut (DEWI): "Windenergienutzung in Deutschland - Stand: 31.12.2012";
StromEinspG: Stromeinspeisungsgesetz; EEG: Erneuerbare-Energien-Gesetz; BauGB: Baugesetzbuch; 1 MW = 1 Mio. Watt; 1 GWh = 1 Mio. kWh;
BMU - E I 1 nach Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat); Hintergrundbild: BMU / Christoph Edelhoff; Stand: Februar 2013; Angaben vorläufig

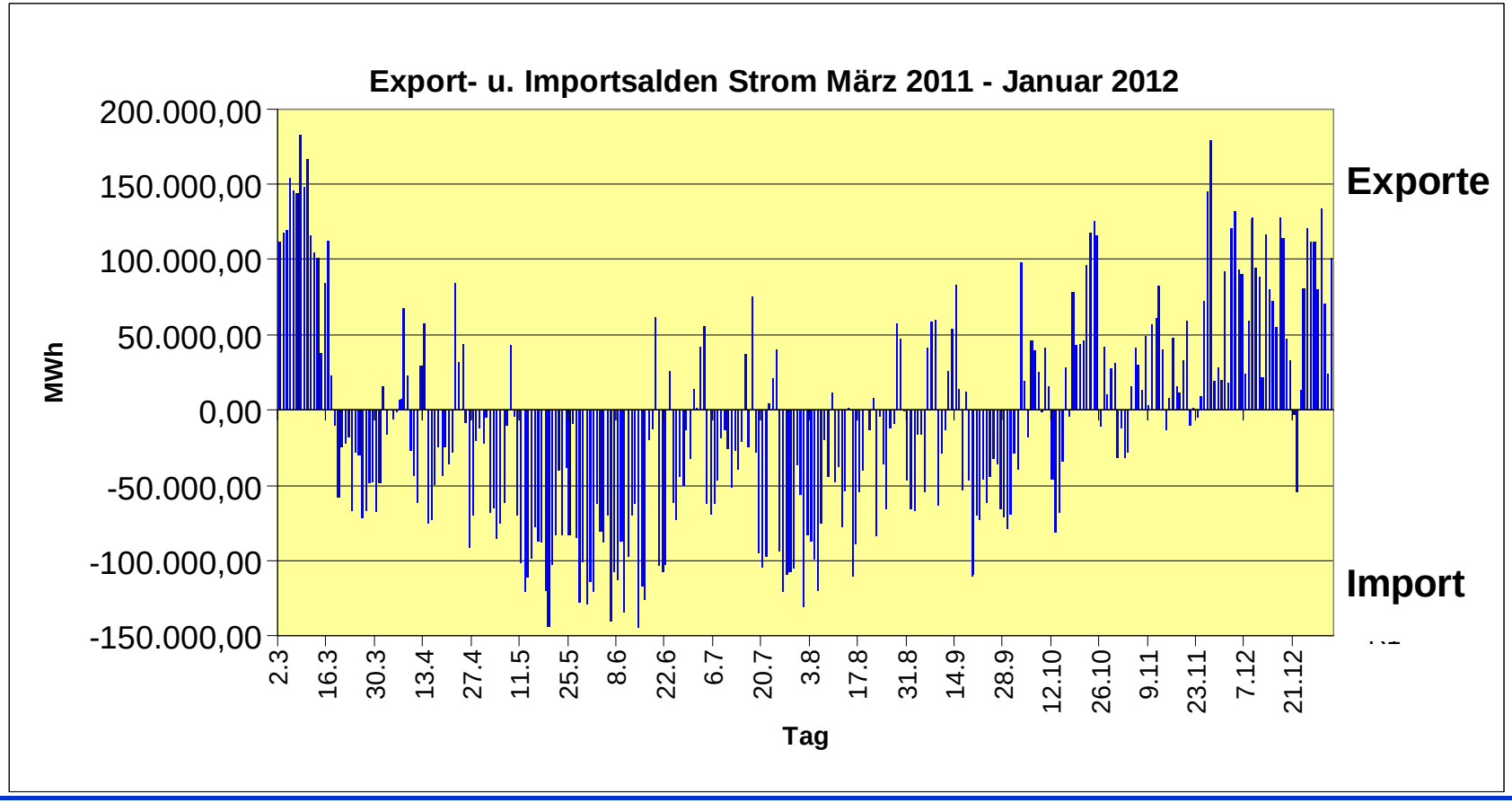
Installed PV capacity in 2012: 32 GW



Quelle: BMU - E I 1 nach Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat); 1 GWh = 1 Mio. kWh; 1 MW = 1 Mio. Watt;
Hintergrundbild: BMU / Bernd Müller; Stand: Februar 2013; Angaben vorläufig

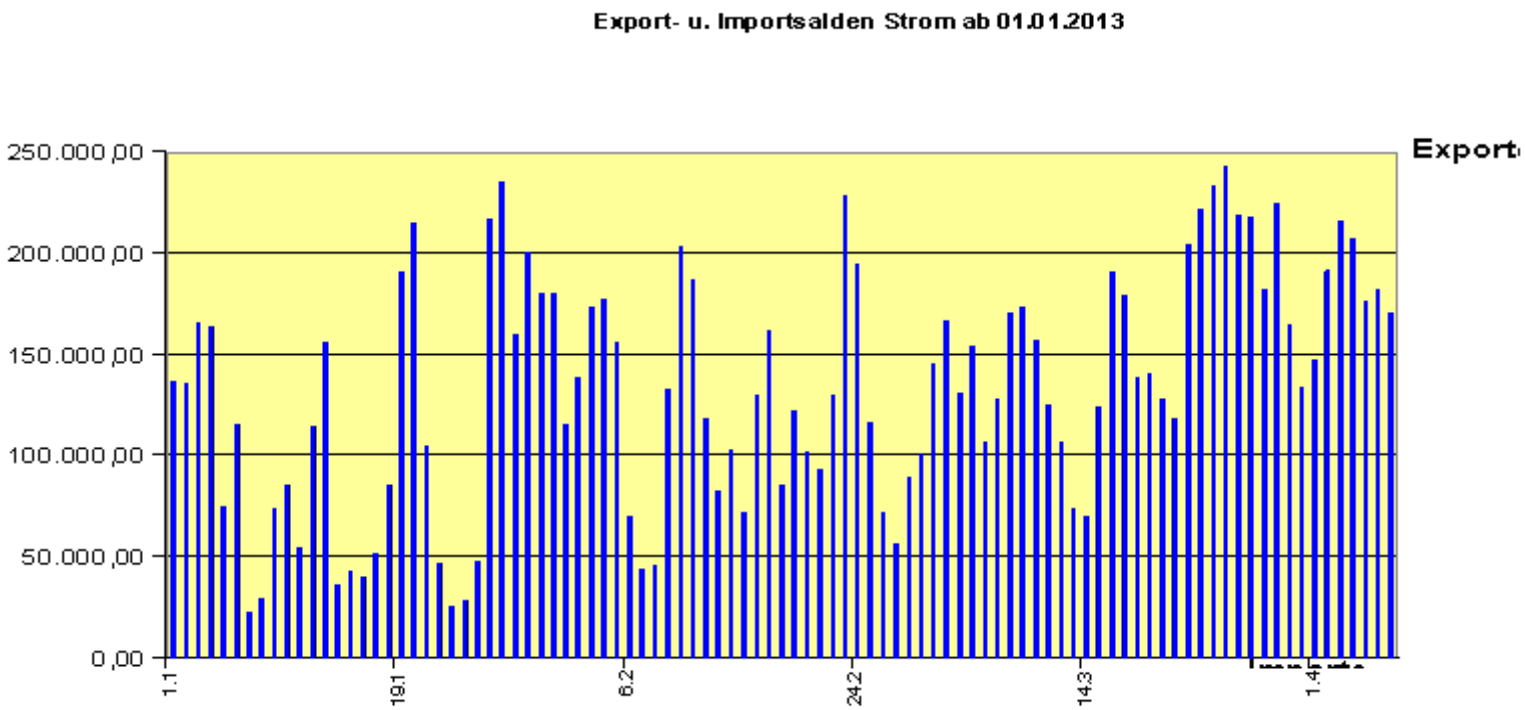
After phase decision: Germany was importer for a short time

- Imports / exports 2011



Today: Germany stays net exporter

- Exports 2013

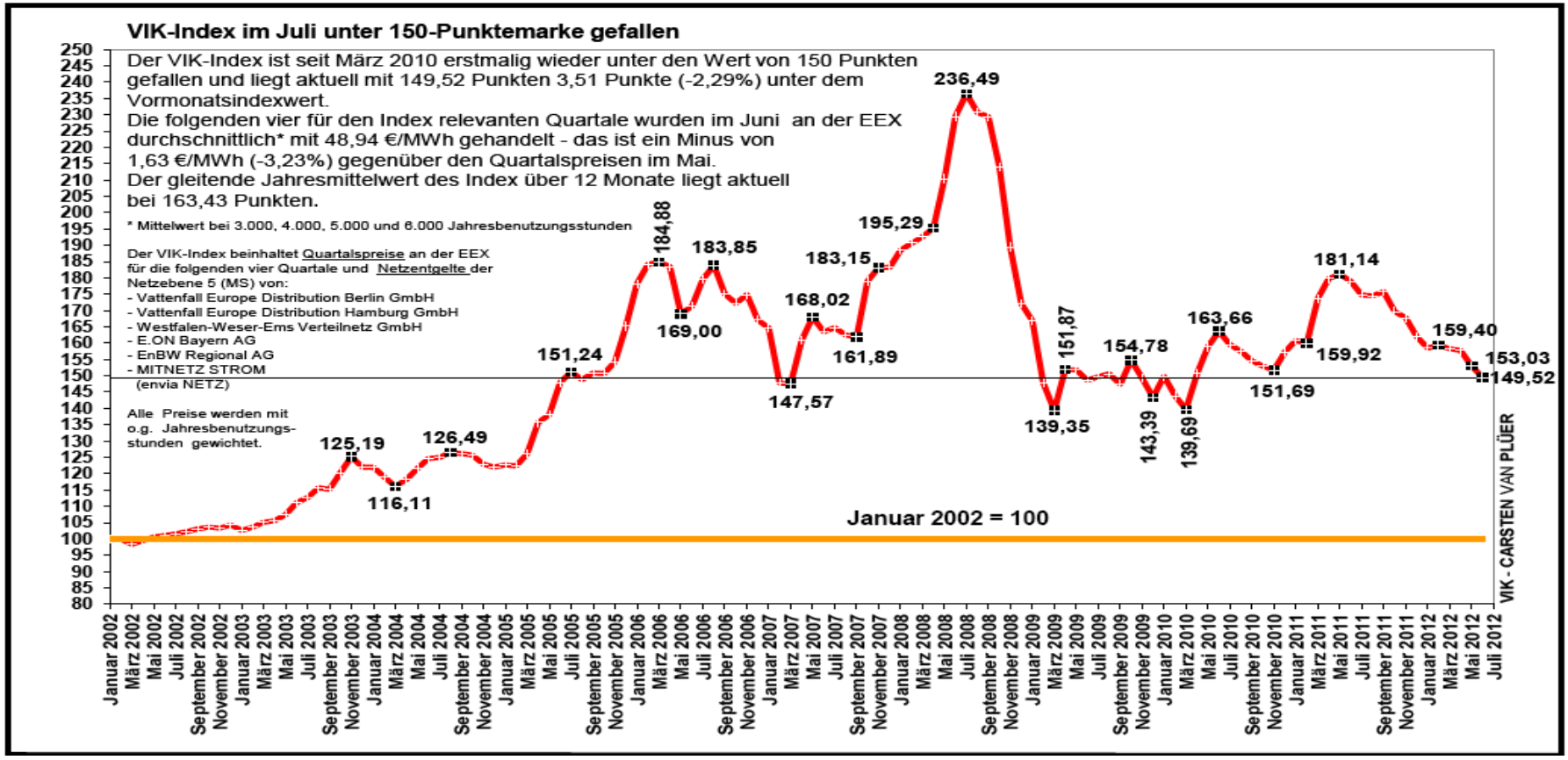


Average spot market price has remained stable; higher amplitudes mainly in time of surplus of wind

Average electricity price on spot market in Germany

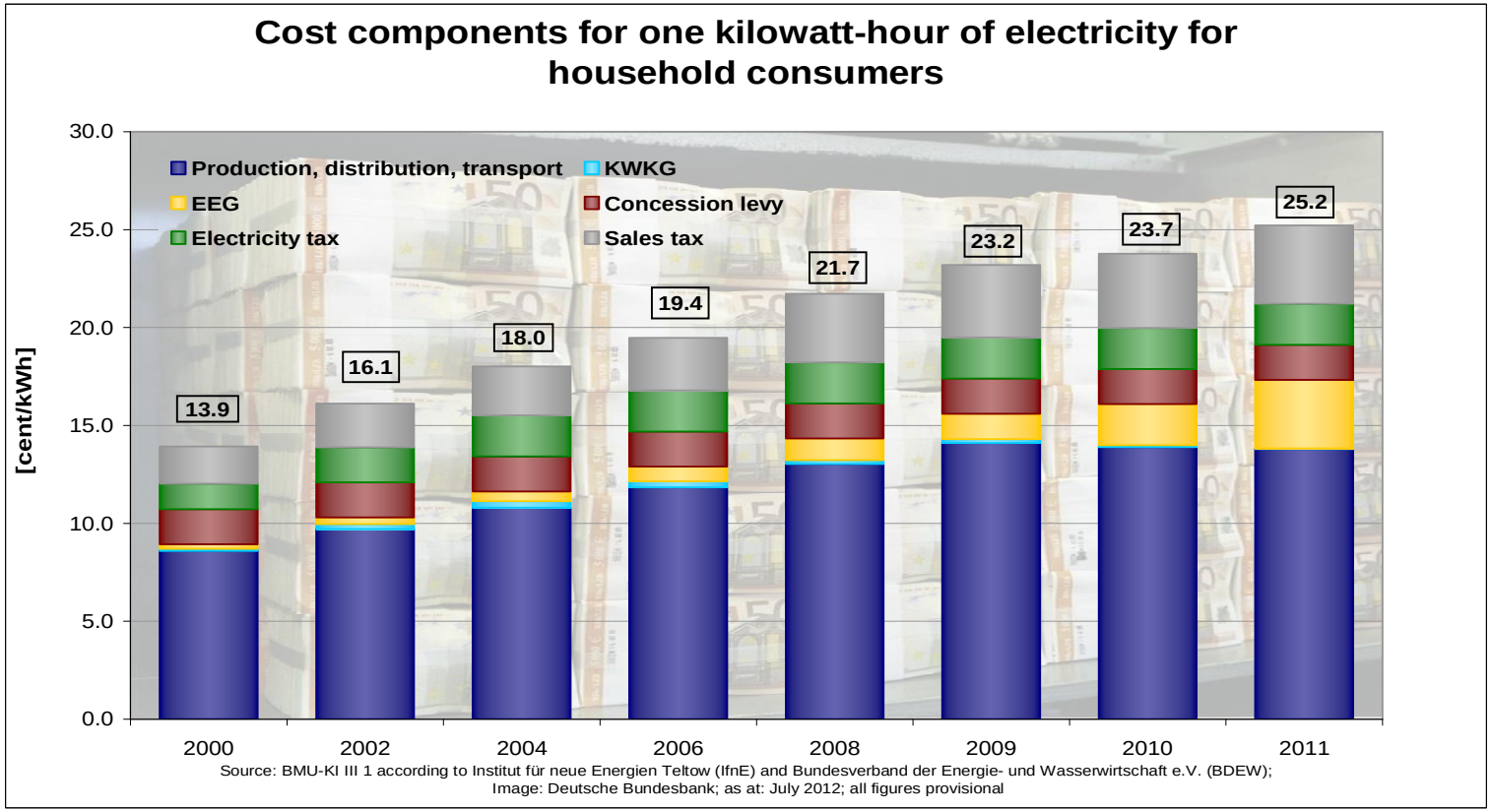
- **before phase out: around 55 ú/MWh (average base) and around 57 ú/MWh (average peak)**
- **now: around 58 ú/MWh (average base) and around 65 MWh (average peak)**

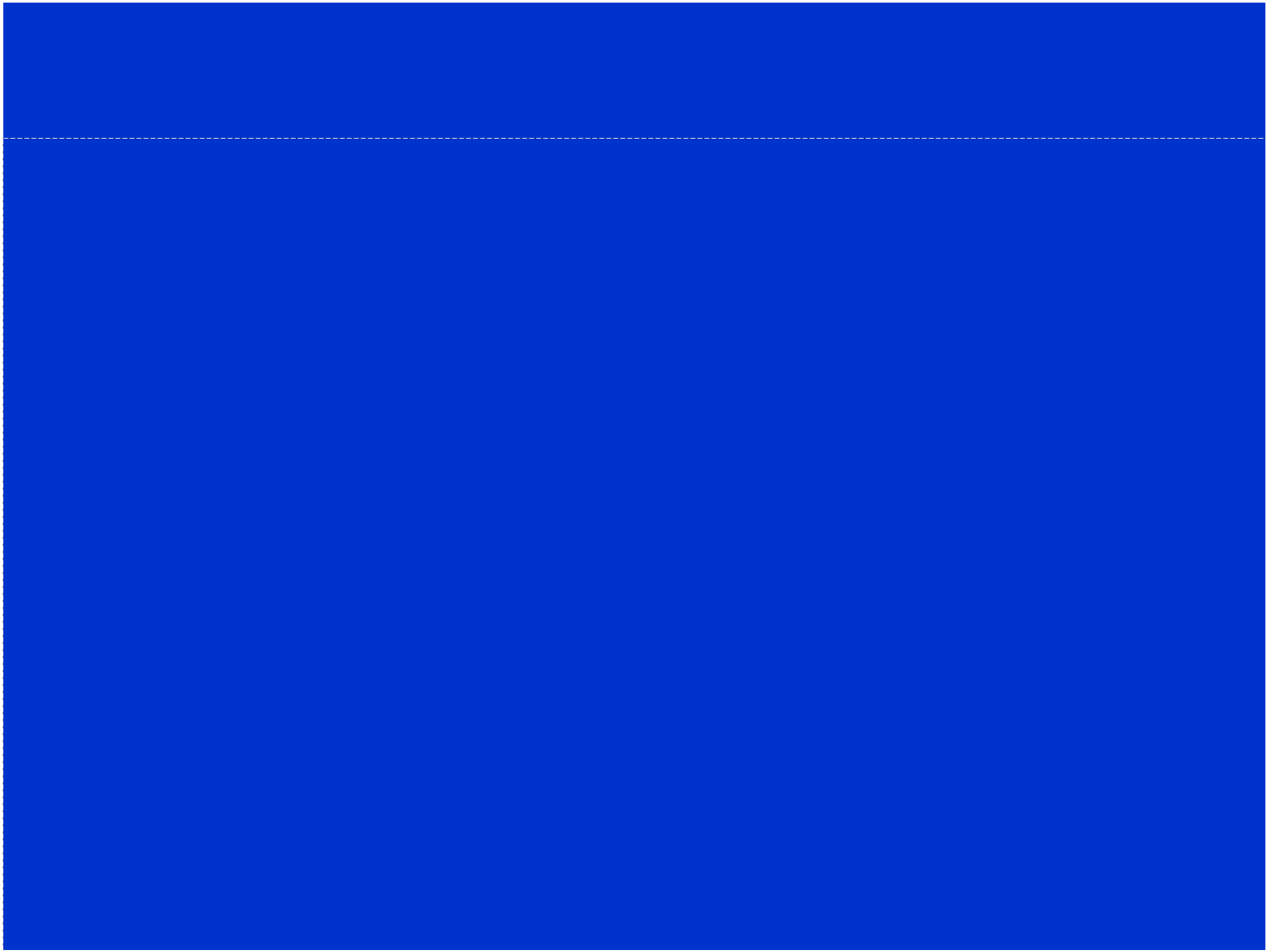
Power prices for German Industries



German RE Policies - Electricity

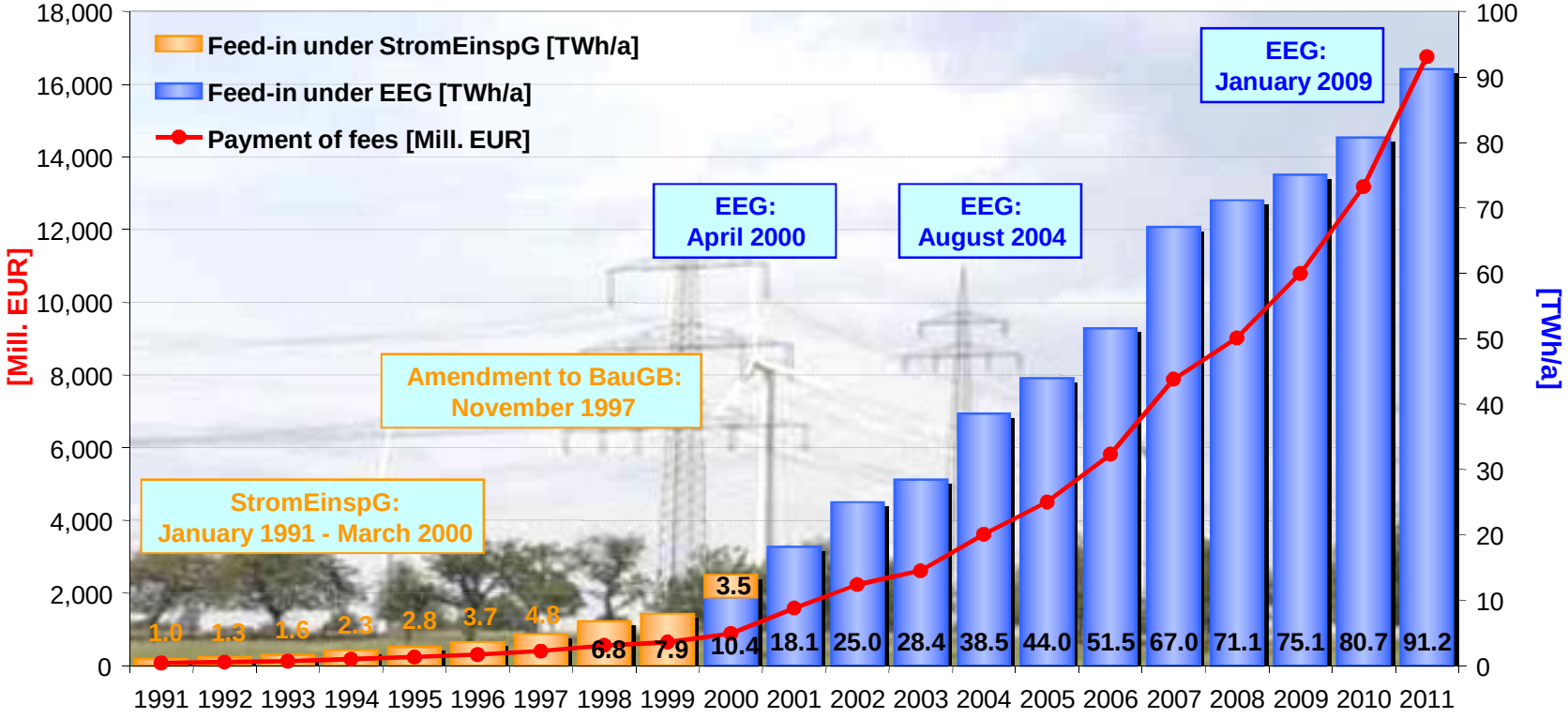
EEG costs in 2012: 5,277 ct/kWh





Germany has paid a lot for RES technology progress

ÅOverall support costs in 2012: 17 bn ú/a
Åcosts must be kept under control

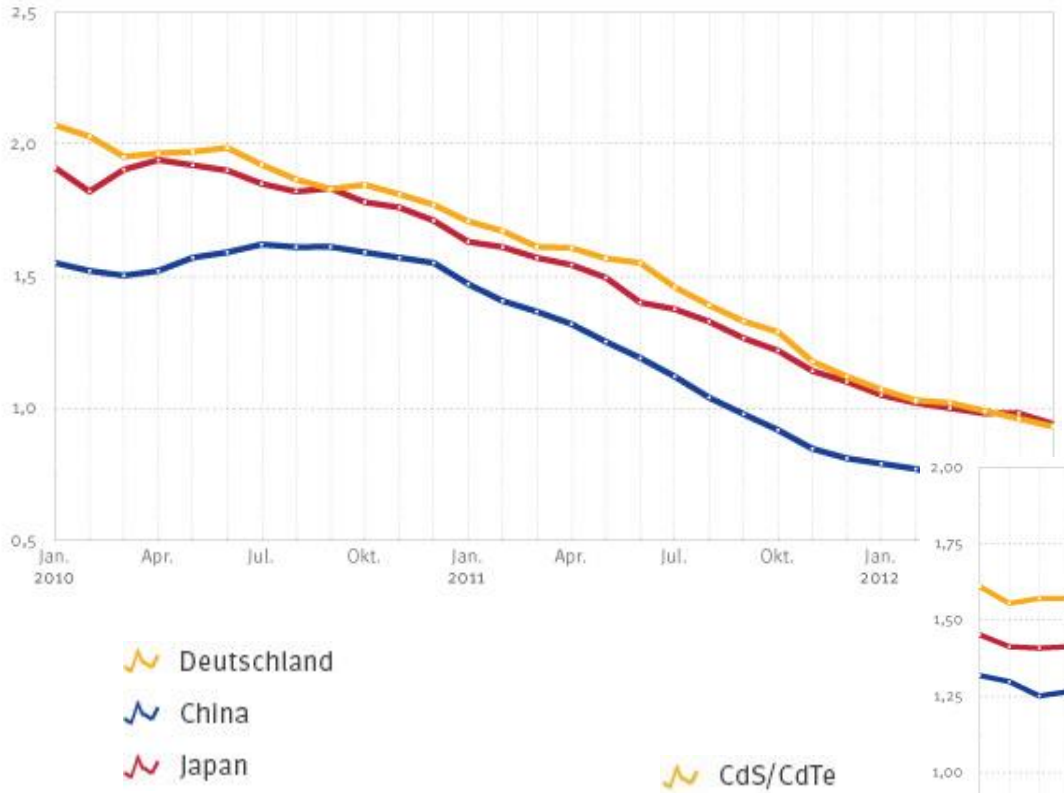


StromEinspG: Act on the Sale of Electricity to the Grid; BauGB: Construction Code; EEG: Renewable Energy Sources Act; 1 TWh = 1 Bill. kWh;
Source: BMU-KI III 1 according to Working Group on Renewable Energy-Statistics (AGEE-Stat); image: BMU / Bernd Müller; as at: July 2012; all figures provisional

But also true…

Investments paid off: PV costs came down more than 50% since 2006

Since of 1 April of 2013 Germany pays only between 0,11 and 0,16 ú/kWh for PV



Dünnschicht

Source PVexchange

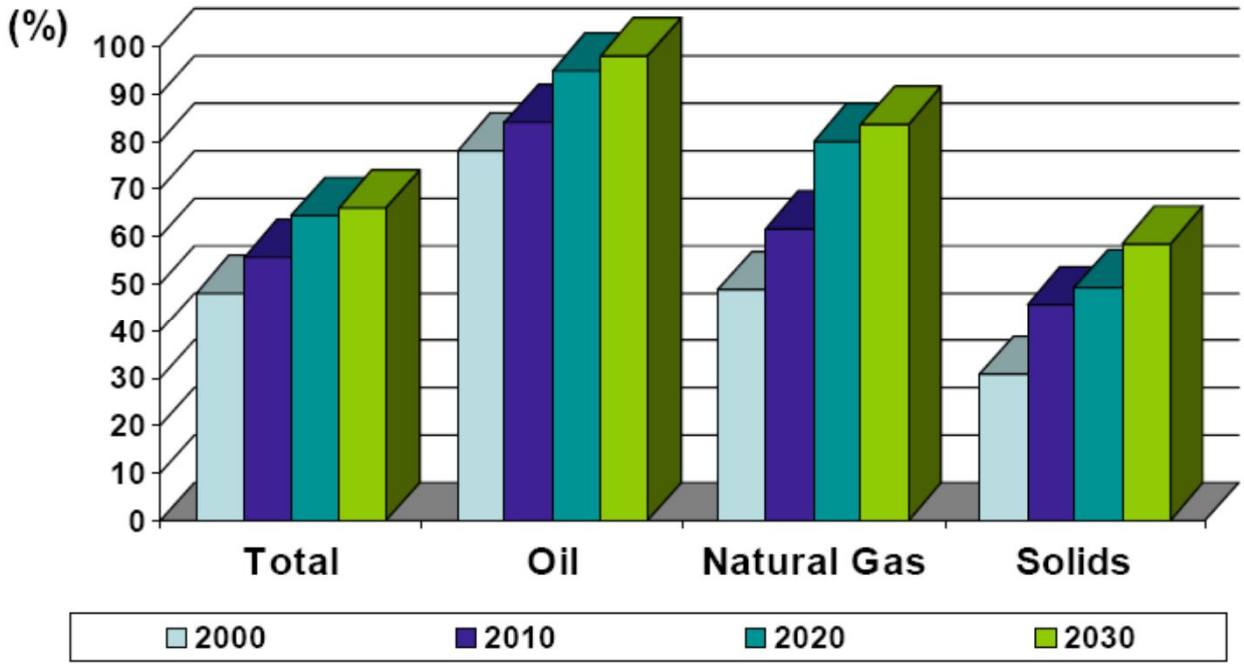
Wholesale power market price will further decline

- **Future price before nuclear phase out decision: 53 ú/MWh (Base) and 65 ú/MWh (Peak)**
- **Future price today: ca. 42 ú/MWh (Base) and ca. 52 ú/MWh (Peak)**

25 bn ú saved costs for energy imports per year

- **With 20% RES and 6% reduced electricity consumption in 2011 Germany saved 25 bn. ú/a of energy imports**
- **cp BAU: import dependency will rise EU wide**

2.10. EU-27 Development of Import Dependence up to 2030 (Baseline Scenario)



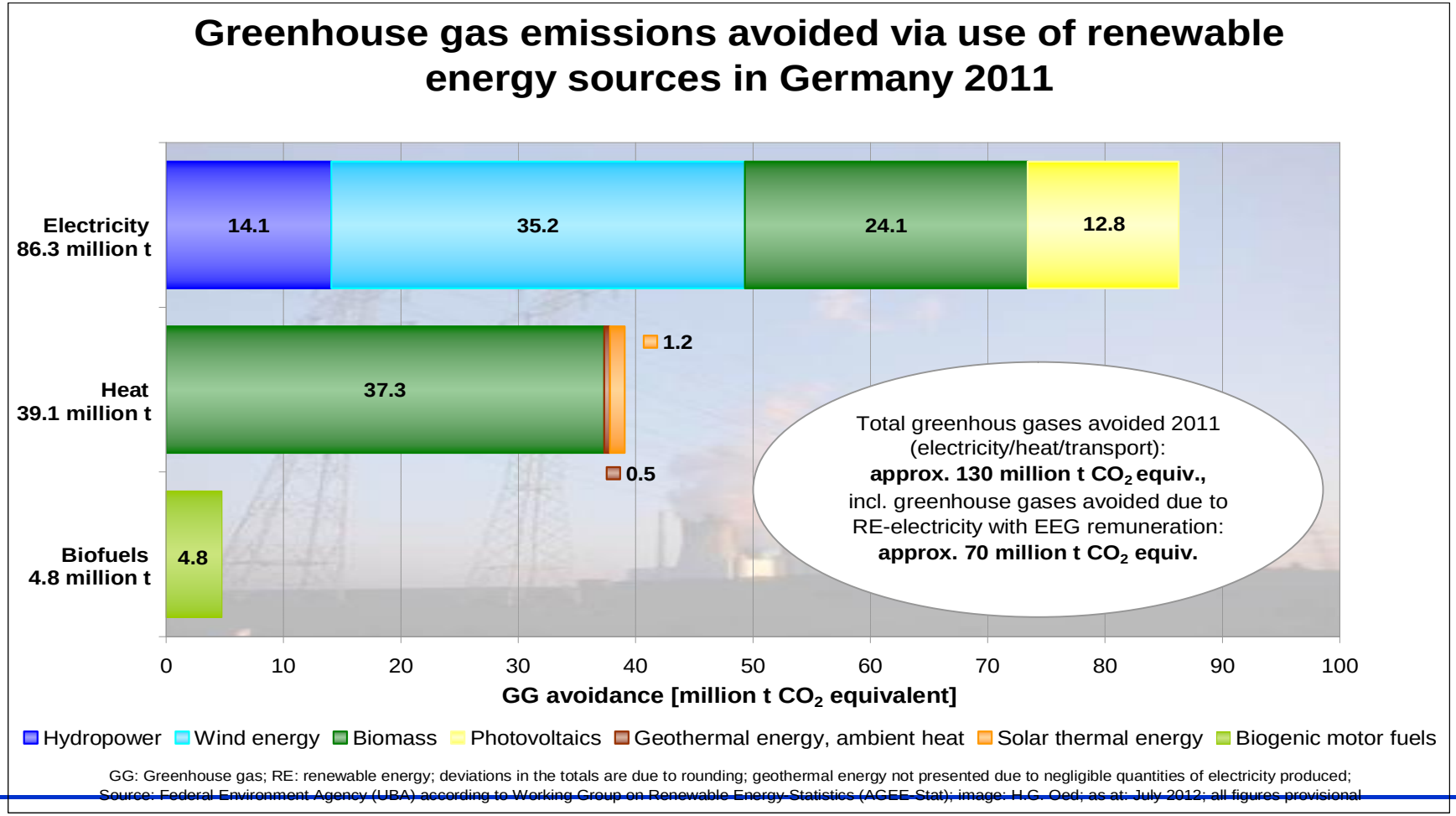
Source: European Commission DG TREN, PRIMES

Paradoxon of the Merit order effect

- **part of the support costs come from the lowered wholesale power market price**
- **RES-E lower the wholesale power market price but thereby increases overall support costs (=support payments minus market price for RES-E)**
- **reduction of the wholesale power price will be granted only gradually towards final consumers**
- **but since 2009 electricity prices for industry has come down by 2 ct/kWh!**
- **industry really starts to profit**

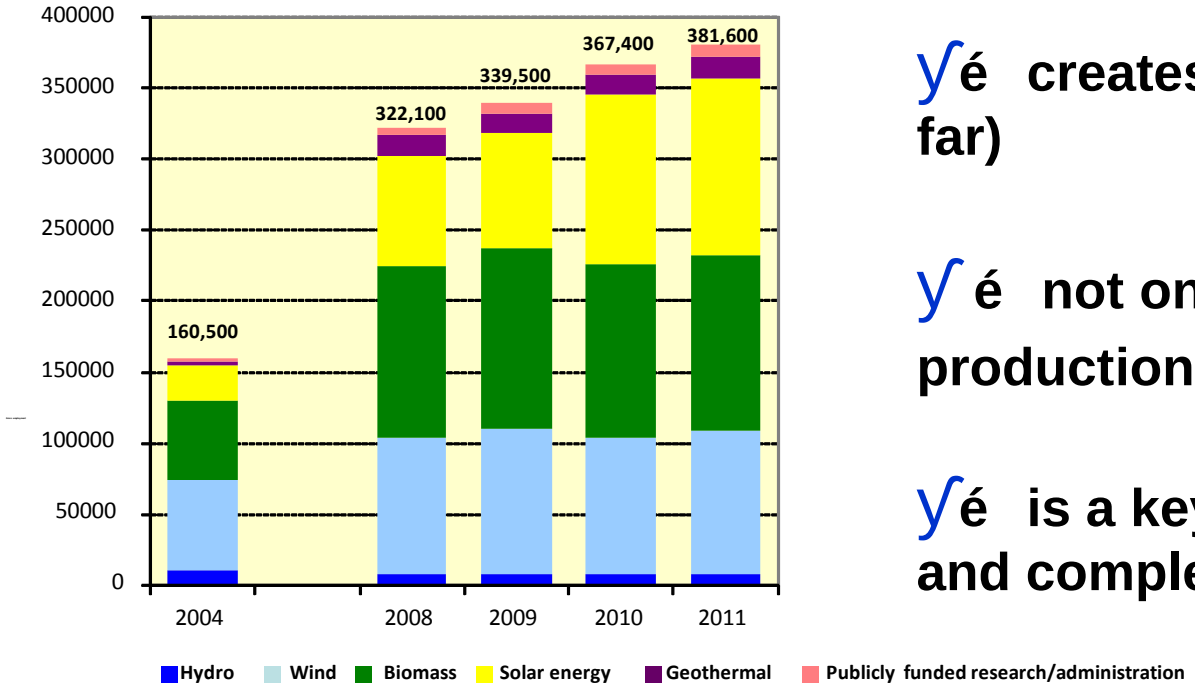
Saved costs for climate protection:

- 40ú - 140ú avoided external costs /t CO2
- 5.2 - 13 billion ú of saved external costs in 2011



Jobs and innovation

Development of gross employment in the renewable energies sector



The transformation of our energy system é

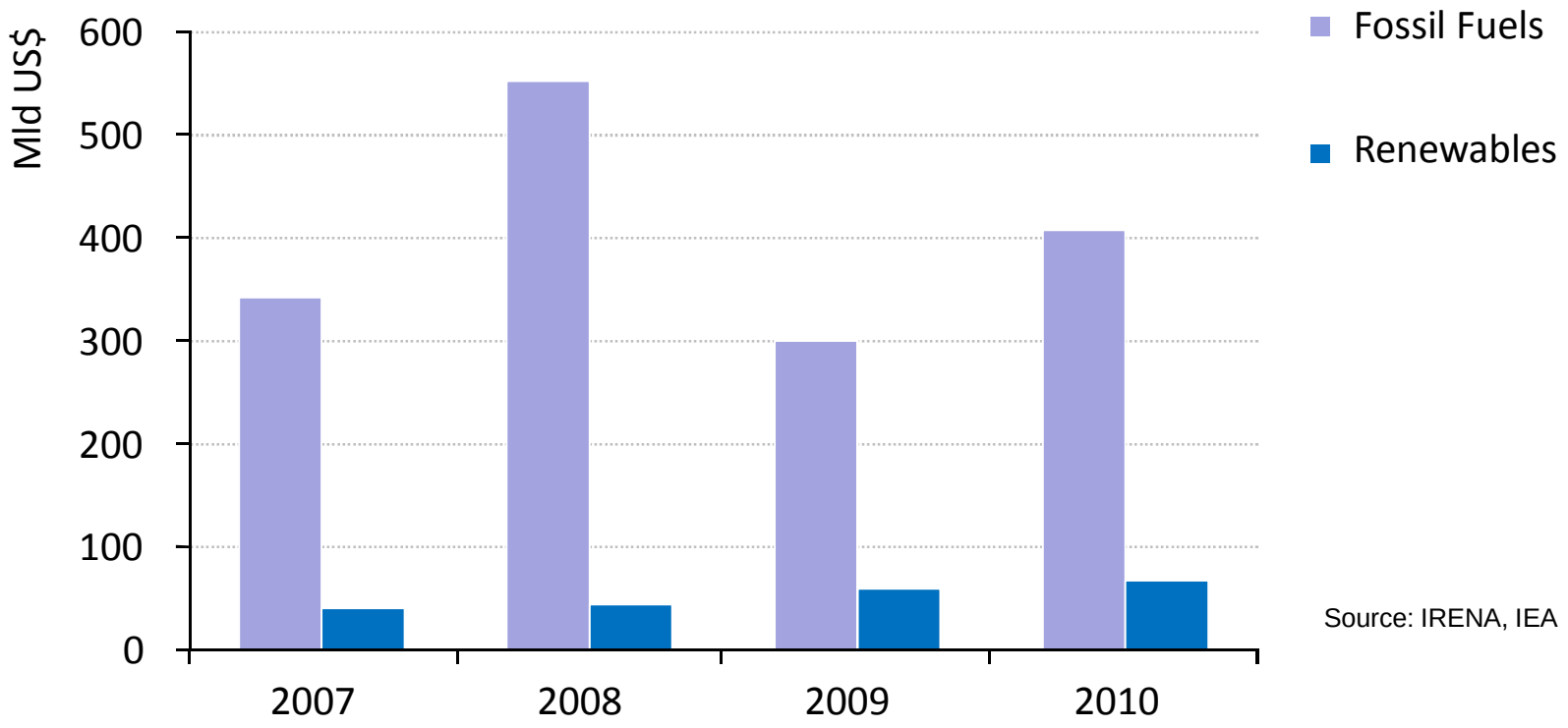
- **é creates new jobs (380.000 so far)**
- **é not only in the direct RES production but in the overall system**
- **é is a key driver for innovation and complete new concepts**

Overall system costs mattersé

- **one cannot look only to RES support costs**
- **But to opportunity costs on the overall system level**
- **EU Energy Roadmap 2050 shows:**
  - **decarbonisation is cheaper than doing nothing (climate change costs)**
  - **overall system costs in the high RES scenario for 2050 decarbonisation are <u>not</u> higher expansive than other decarbonisation pathways**
  - **and: this finding was based on old technology costs**
  - **and: a combined approach of RES and efficiency was missing (as in the German Energiewende)**

Investing in the future

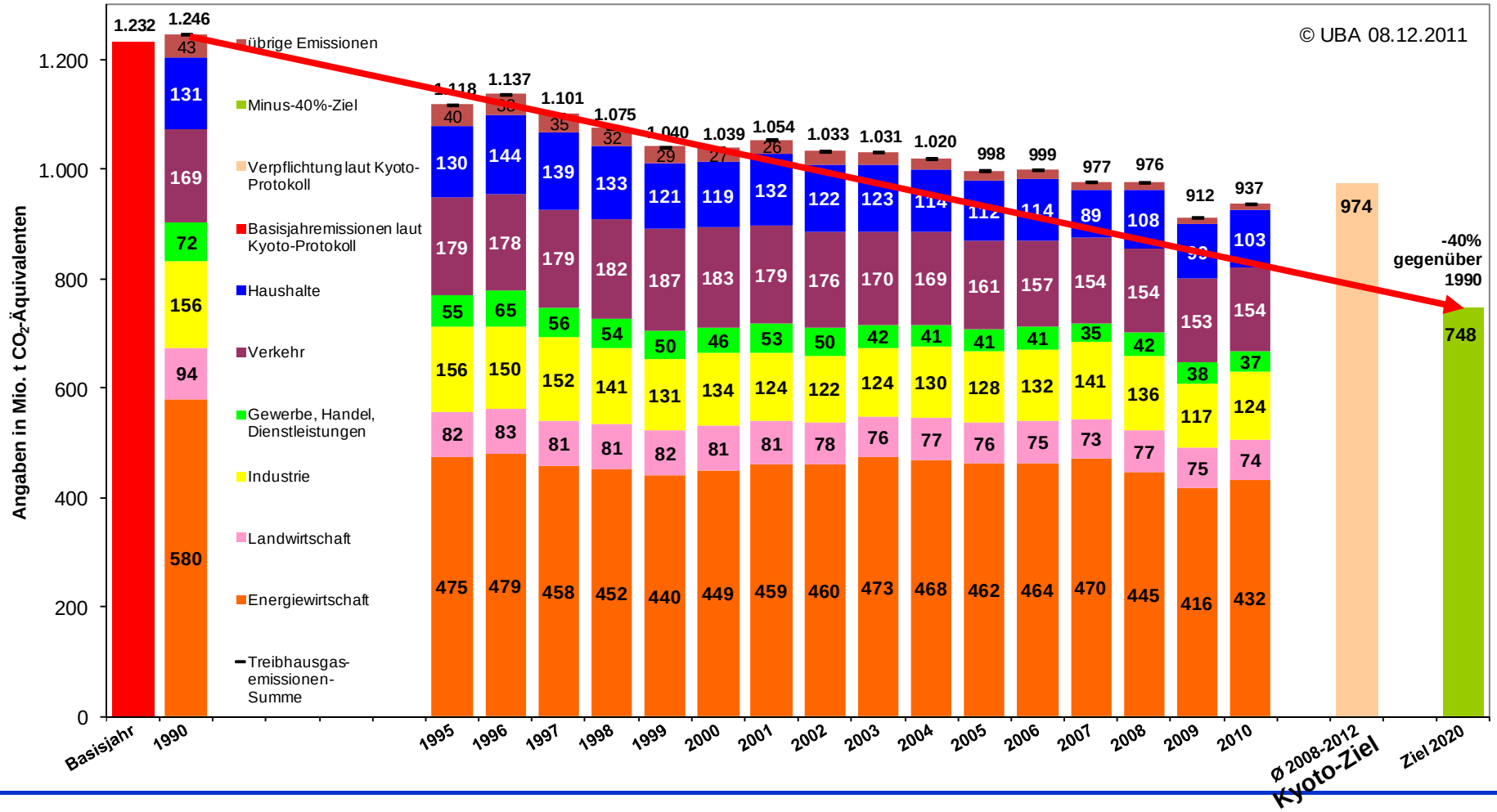
Worldwide Subsidies for Fossil Fuels and Renewables (in Billion US$)



Source: IRENA, IEA

Germanyós GHG balance

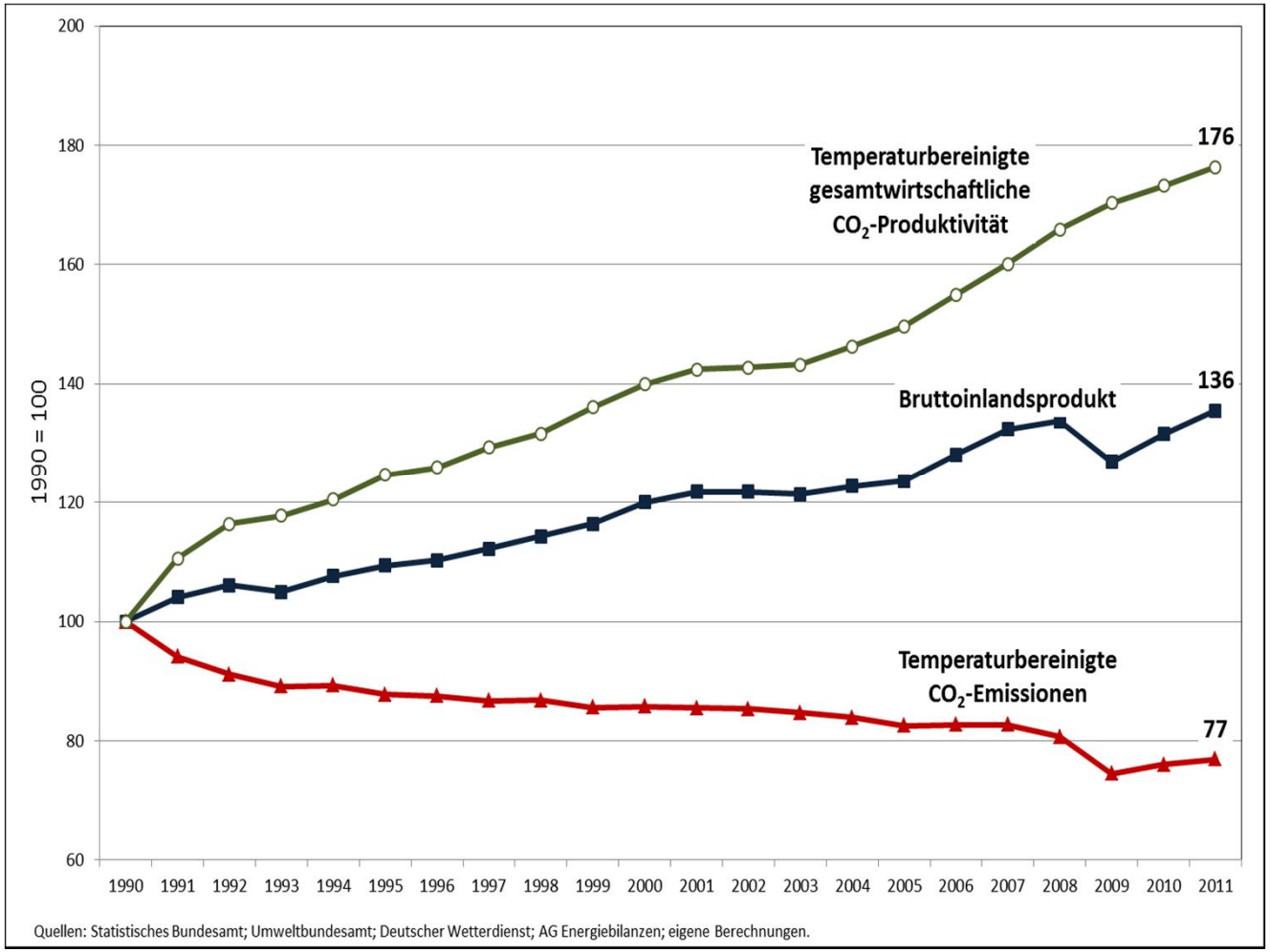
Entwicklung der Treibhausgasemissionen in Deutschland nach Sektoren



Decoupling of GDP and GHG-emissions in Germany

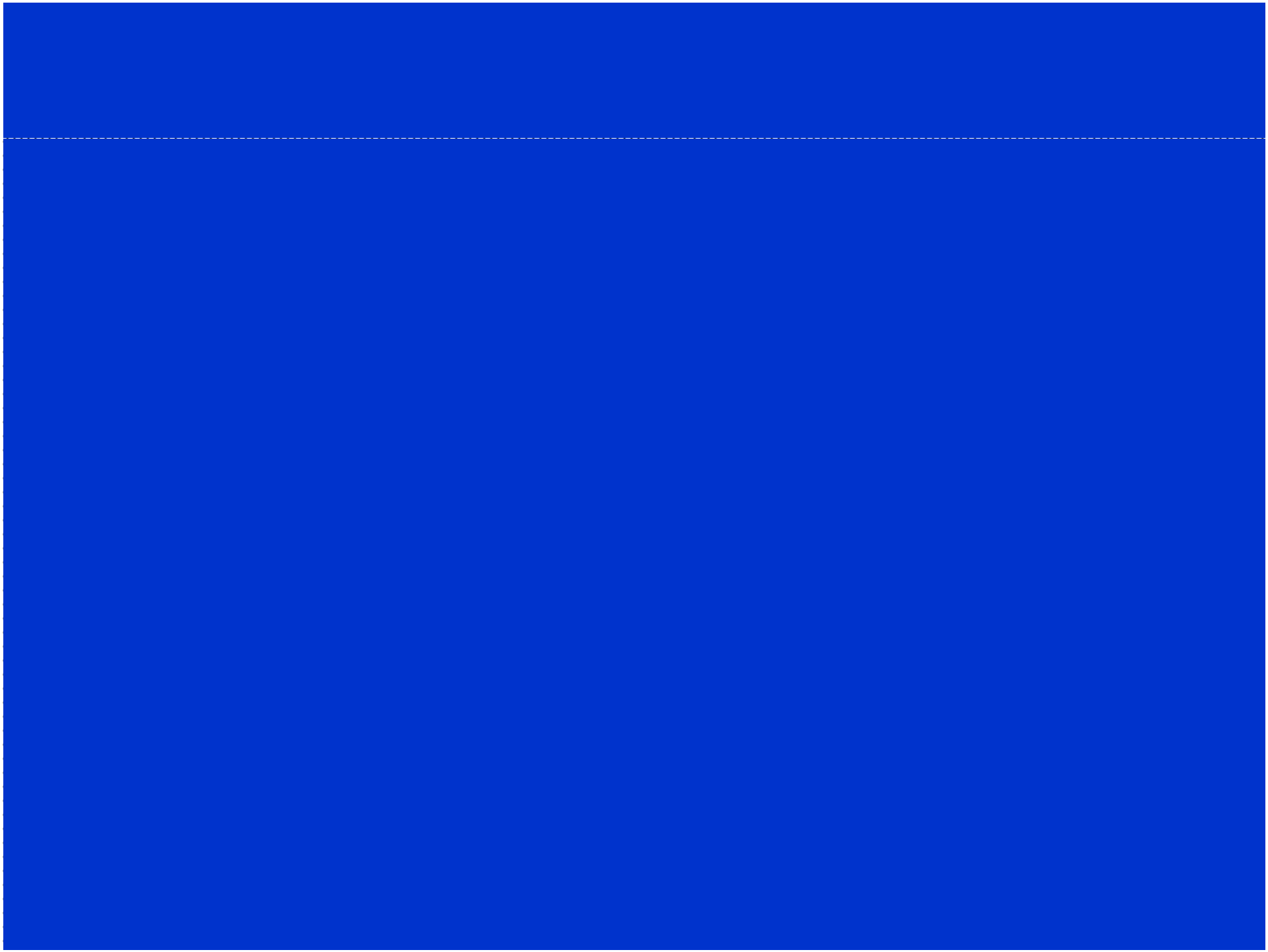
Results 2011

- **Energy consumption: -5,3 % (lowest since 40 years!)**
- **Economic growth: +3 % (real term GDP)**
- **Energy productivity: +3 %**



Consequence from cost perspective

- **In the long run: there is no alternative to investing in RES and efficiency, the matter is only how much one wants to rely on it**
- **But costs are nevertheless crucial for public acceptance and adabtability of the system and ist actors**
- **cost control**



Starting point: very different Energy policies in European neighbours

Energy mix remains MS competence (for good reason)

Article 194 para 2

2. Without prejudice to the application of other provisions of the Treaties, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall establish the measures necessary to achieve the objectives in paragraph 1. [é]

Such measures shall not affect a Member State's right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply, without prejudice to Article 192(2)(c).

But interpendencies in the internal energy market

Article 194 para 1

1. In the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, Union policy on energy shall aim, in a spirit of solidarity between Member States, to:

(a) ensure the functioning of the energy market;

(b) ensure security of energy supply in the Union;

(c) promote energy efficiency and energy saving and the development of new and renewable forms of energy; and

(d) promote the interconnection of energy networks.

A learning system

Energiewende faces challenges that can not be solved alone

1. Renewable energies:

- continuous expansion
- reducing support costs
- enhancing market integration

2. Energy efficiency:

- reducing energy consumption
- increasing energy security

3. Grid infrastructure:

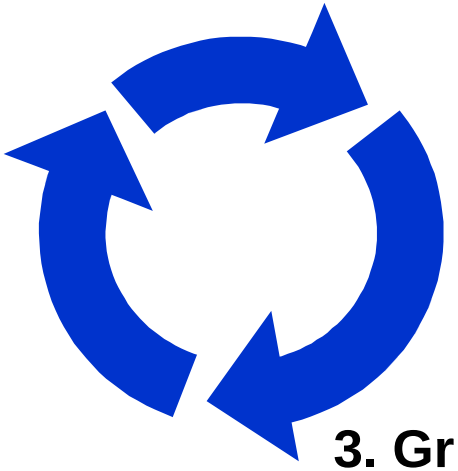
- Temporary loop flows
- expansion and modernisation
- integration of RE

4. Flexibilisation of the whole system

- flexible ***demand***
- flexible power plants
- complete new concepts and smart solutions

5. Keeping costs accepatable

- avoiding new subsidies
- balanced approaches
- fair effort sharing



Implications of the Energiewende for our neighbours

The Energiewendeé

é is not a ñclosed shopò

é calls for intensified cooperation and coordination

- **Renewables generation in Germany is being balanced in the European grid**
- **Electricity flows lead to challenges for grid stability (in particular ñloop flowsò)**
- **Grid extension most pressing issue in the EU context**
- **On the other side, RES generation in Germany**
  - **contributes to energy security across Europe by diversified, indigenous energy sources**
  - **helps reducing wholesale power market prices across EU**
  - **supports innovation and reduces technology costs for all**

Which way to follow in the EU?

- **Energy mix remains national responsibility; MS will follow different approaches**
- **But we need coordination and convergence of energy policies ï otherwise uncoordinated impacts**
- **We need to agree on Ănо-regretsñ**
- **aim for synergies where Ănо-regretsñ exists**

ĂNo regretsñfor all MS

- **energy efficiency**
- **RES deployment I: EU Roadmap 2050 shows: 30% RES share in 2030 is necessary to achieve 80-95% THG reduction in 2050**
- **RES deplyoment II: need diversified RES deplyoment accross Europe**
  - **Å concentration on only best sites leads to higher system costs (more grids, integration costs and storage (e.g. 30% RES imports to Germany will need doubling of EU grids)**
  - **Å diversified deployment, both in technologies and sites, helps enhancing Ăsecured levelñ of RES generation EU wide**
- **grid reinforcment**
- **RES market integration**
- **cooperation and coordination**

The case for cooperation

Enormous economic opportunities for cooperation in é

- **RES technology development**
- **Improving energy efficiency**
- **Developing a modern European grid**
- **Developing a completely new system competence: flexibilisation of the whole energy system**
- **driving overall innovation in the economy (not only RES technology)**

Case for cooperation in Renewable Energy

- Current reforms of the national renewable energy support schemes in all EU-MS
- Germany:
  - Since 1991: Renewable Energy Sources Act
  - Mistakes have been made, lessons have been learnt, experience can be shared
  - e.g. How to remain in control of dynamics in case of technology boost?

  ->flexible cap in PV
- Best-practice exchange
- E.g. Concerted Action on implementing RES-Directive (since 2010)
- Possible joint projects

Common efforts: Energy Efficiency

- **Energy efficiency is the most efficient way to**
  - **reducing GHG emissions**
  - **reducing energy dependence**
  - **reducing grid problems**
- **Large potential for energy efficiency improvements in both France and Germany.**
- **Need to jointly work towards an ambitious and binding set of measures within the EU Energy Efficiency Directive.**

Expansion of Electricity Grids

- **Grid extension in Germany:**
  - **reduce loop flows for neighbors**
  - **new North-South-lines in Germany**
- **Cross-border challenges:**
  - **developing an efficient and modern grid**
  - **reducing negative cross-border effects**
- **Common interest in a modern grid infrastructure**
- **Strengthening EU support for cross-boarder lines: CEF**
- **Enormous benefits from bilateral and regional cooperation on expanding electricity grids**

Conclusions

- **MS can decide on which of their energy resources they want to exploit (generation)**

- **but generated electricity should flow freely in the internal market in order to ensure**

  - **energy security**
  - **competition and thus lower costs for consumers**

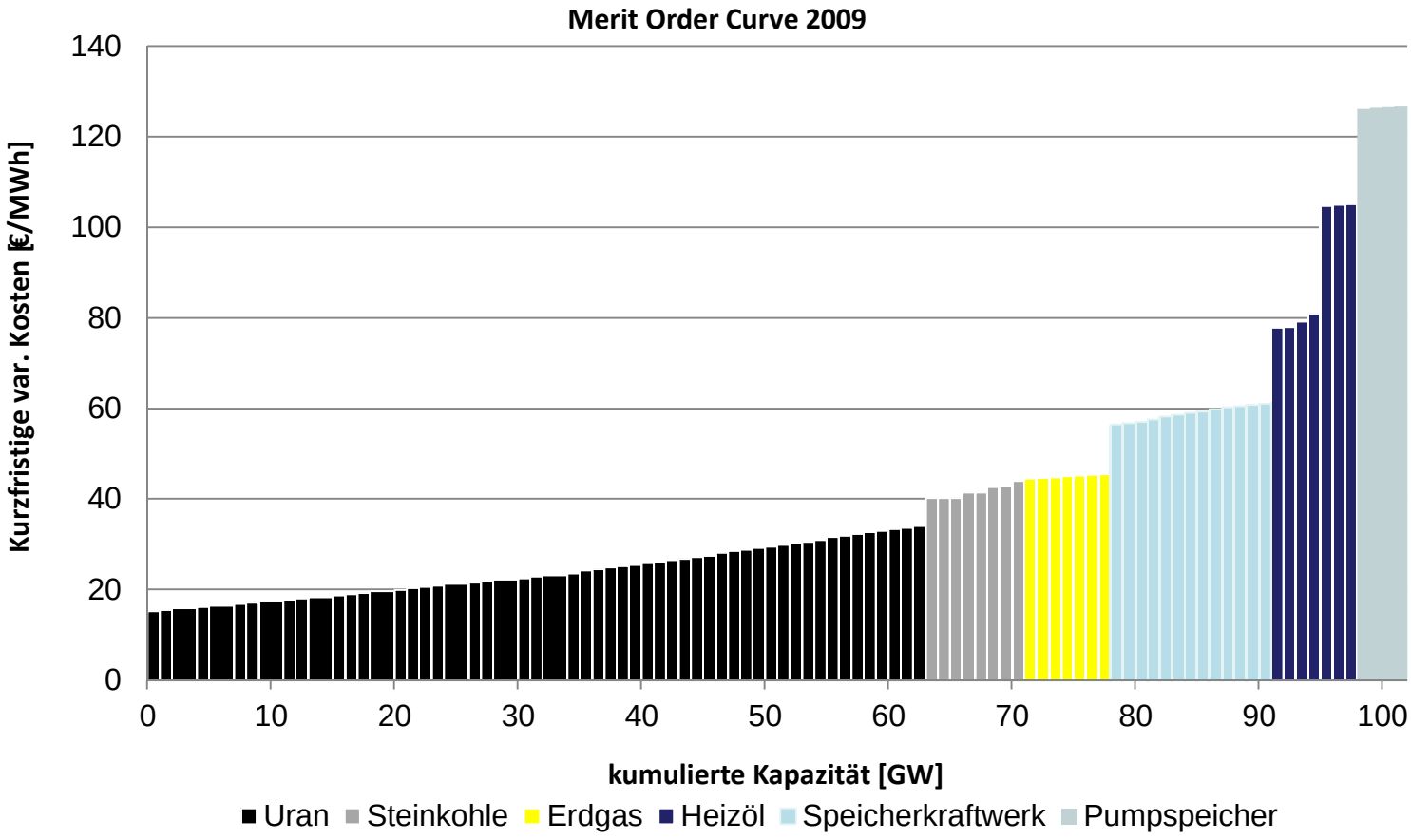
More information available at:

www.bmu.de

Energie
für Deutschland

add ons

French Merit Order Curve 2009



Ways of cooperation: Climate and Energy Dialogue

- April 2011: Agreement between the Ministers for Environment that a forum is needed to
  - Å intensify Polish-German dialogue on climate and energy issues
  - Å understand the respective approaches, goals and challenges
  - Å develop joint strategies
- Launched on 31 August 2011 in Warsaw
- Bilateral Environmental Council: 21-22 May 2012

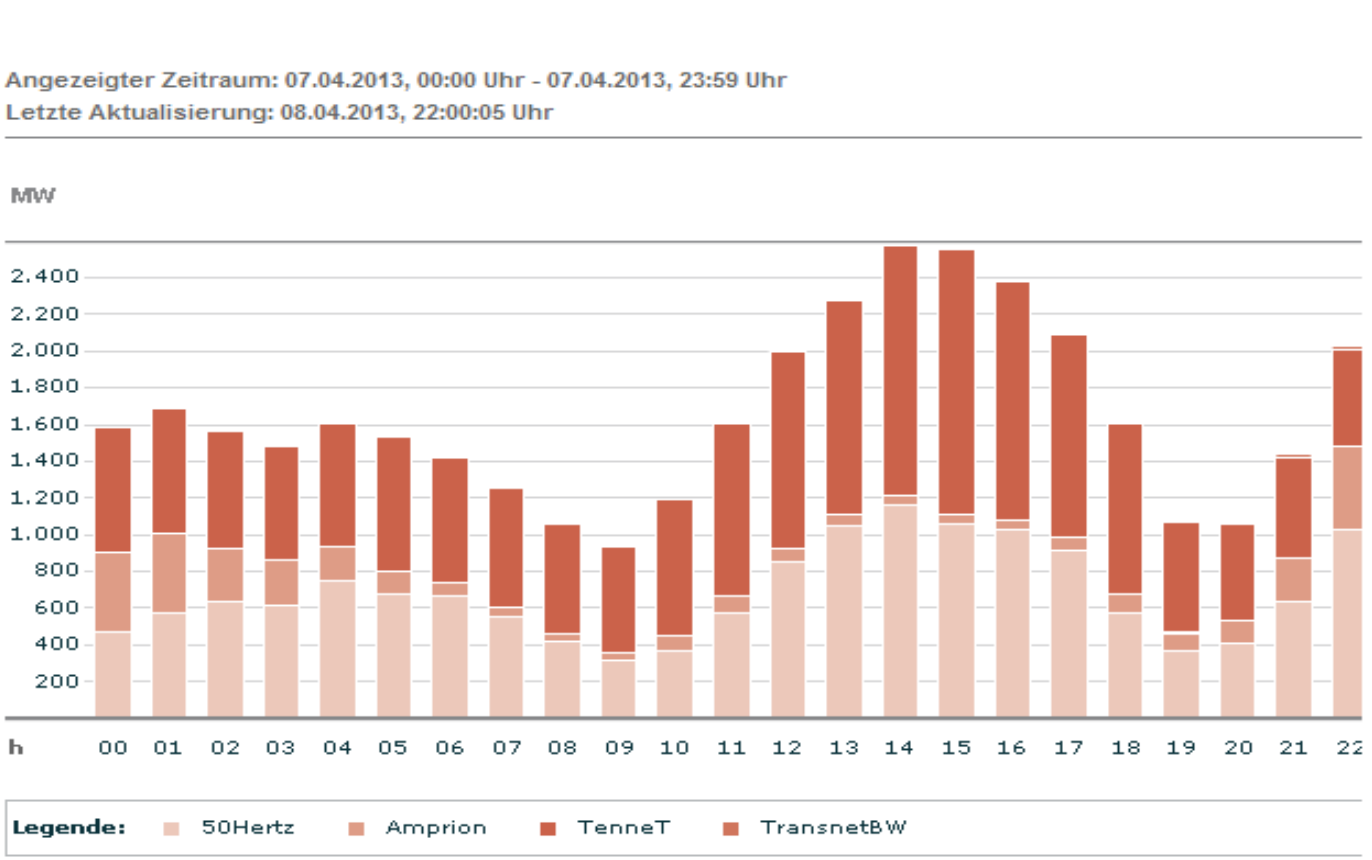
Economics of RES and Nuclear

I. Costs

- RES:
  - Investment in technology → learning curve
  - Wind offshore: 19 ú/ct → 3 ú/ct
- Nuclear:
  - High capital costs ï low costs of operation
  - Full cost calculation, incl. security and disposal → higher than RES
  - French authorities calculate 50ú / MW/h

II. Reliability

- RES:
  - Rely on wind and sun → load management, storage
- Nuclear:
  - frequently shut down due to technical problems (cooling)
  - not flexible to demand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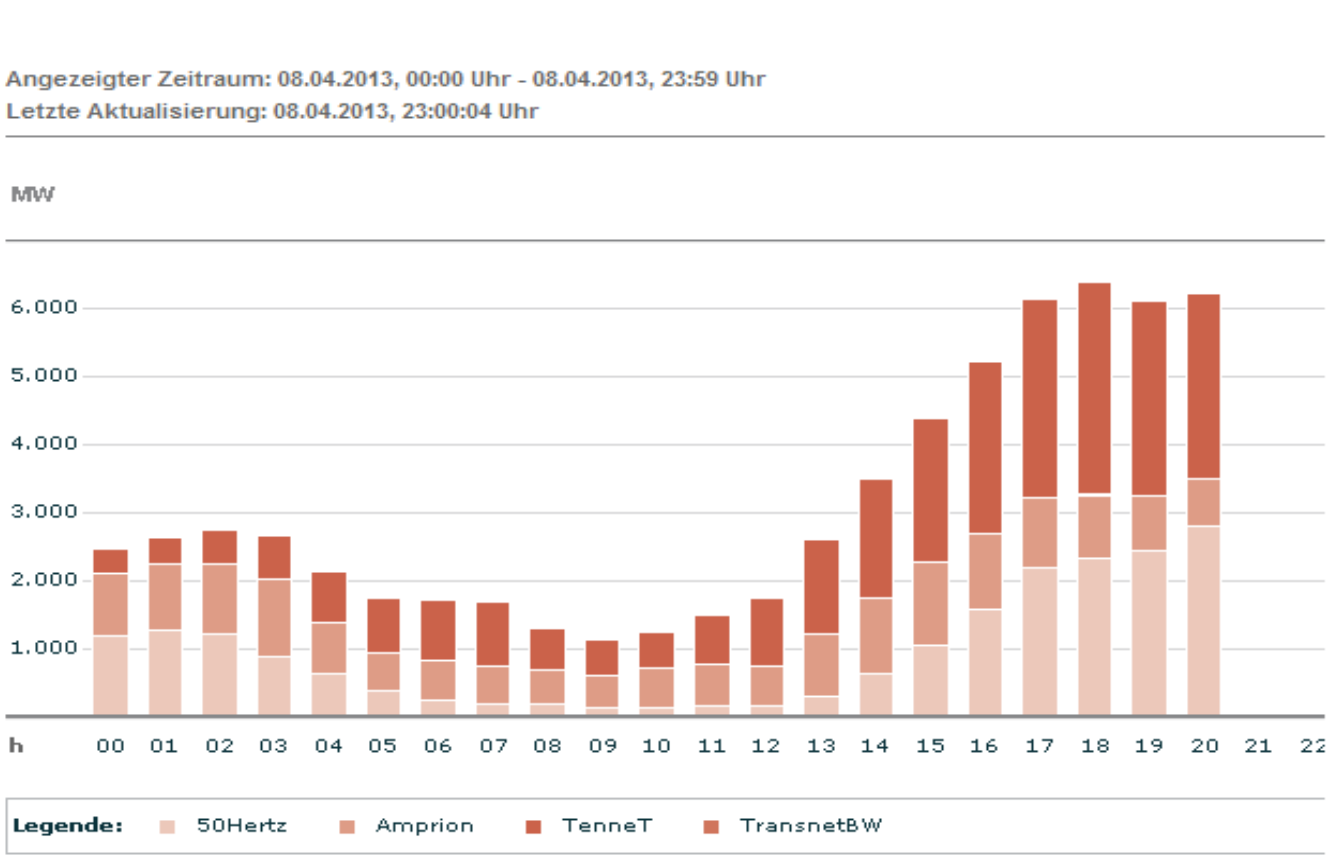
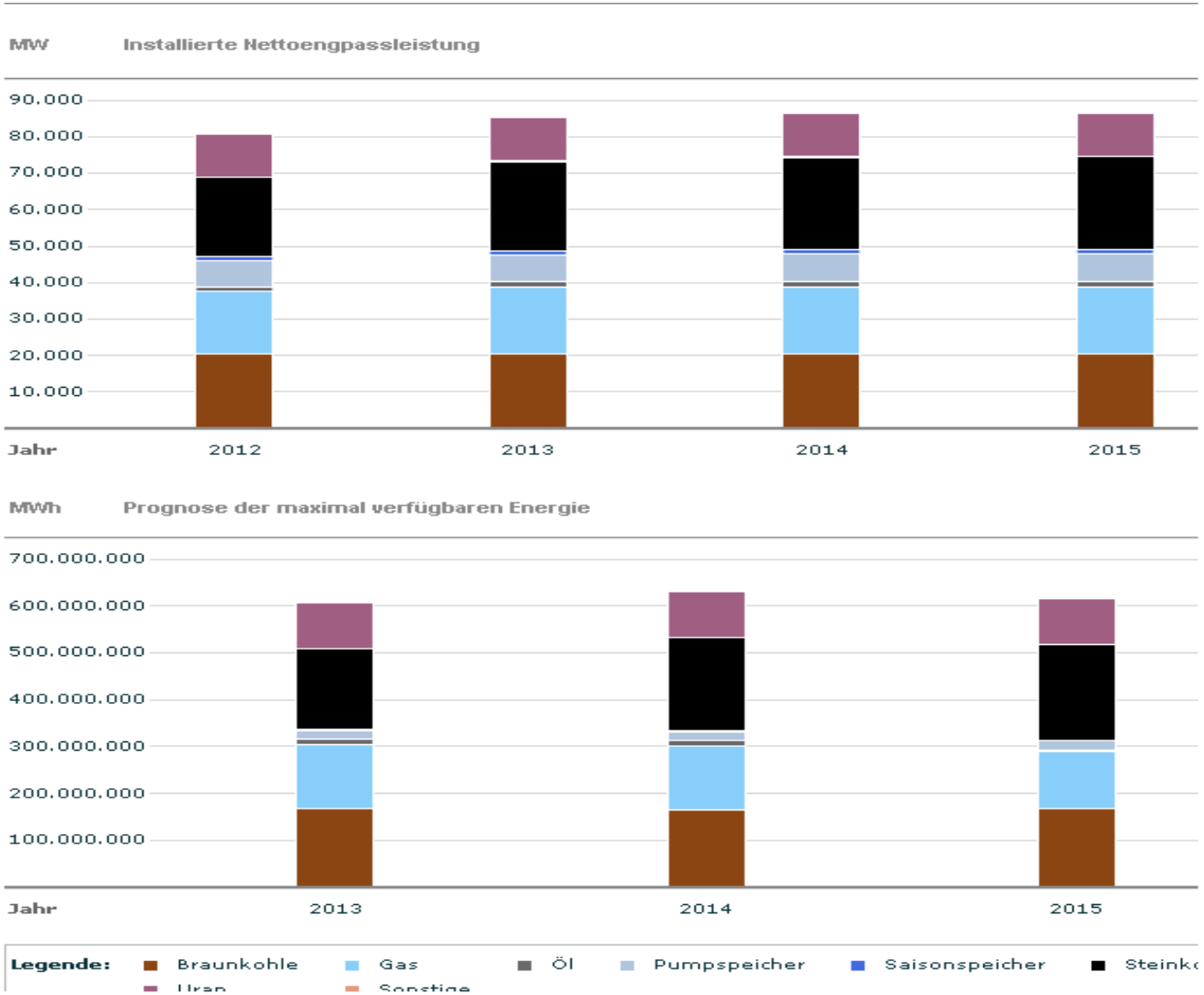
Letzte Aktualisierung: 08.04.2013, 22:00:05 Uhr
MW
2.400
2.200
2.000
1.800
1.600
1.400
1.200
1.000
800
600
400
200
h
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22
Legende:
50Hertz
Amprion
TenneT
TransnetBW

wind


Angezeigter Zeitraum: 08.04.2013, 00:00 Uhr - 08.04.2013, 23:59 Uhr
Letzte Aktualisierung: 08.04.2013, 23:00:04 Uhr
MW
6.000
5.000
4.000
3.000
2.000
1.000
h
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22
Legende:
50Hertz
Amprion
TenneT
TransnetBW

> 100 MW


MW
Installierte Nettoengpassleistung
90.000
80.000
70.000
60.000
50.000
40.000
30.000
20.000
10.000
Jahr
2012
2013
2014
2015
MWh
Prognose der maximal verfügbaren Energie
700.000.000
600.000.000
500.000.000
400.000.000
300.000.000
200.000.000
100.000.000
Jahr
2013
2014
2015
Legende:
Braunkohle
Gas
Öl
Pumpspeicher
Saisonspeicher

	Roof top				Ground mounted	
	Ò10 KWp	Ò40 kWp	Ò1 MWp	Ò10 MWp	Ò10 MWp	
Start of operation						
degression			2,5 Prozent			
01.01.2013	17,02	16,14	14,40	11,78	11,78	
degression			2,5 Prozent			
01.02.2013	16,65	15,48	14,08	11,52	11,52	
degression			2,2* Prozent			
01.03.2013	16,28	15,14	13,77	11,27	11,27	
degression			2,2* Prozent			
01.04.2013	**15,92**	**14,81**	**13,47**	**11,02**	**11,02**	
degression			2,2* Prozent			

* Die Degression von 2,2 Prozent ist ein Schätzwert anhand der vorläufigen Zahlen von Dez. (die Degression kann auch 2,5 Prozent betragen)

	Roof top				Ground mounted	
	Ò10 KWp	Ò40 kWp	Ò1 MWp	Ò10 MWp	Ò10 MWp	
Start of operation						
degression			2,5 Prozent			
01.01.2013	17,02	16,14	14,40	11,78	11,78	
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01.02.2013	16,65	15,48	14,08	11,52	11,52	
degression			2,2* Prozent			
01.03.2013	16,28	15,14	13,77	11,27	11,27	
degression			2,2* Prozent			
01.04.2013	**15,92**	**14,81**	**13,47**	**11,02**	**11,02**	
degression			2,2* Prozent			
* Die Degression von 2,2 Prozent ist ein Schätzwert anhand der vorläufigen Zahlen von Dez. (die Degression kann auch 2,5 Prozent betragen)						