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Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

Germany's energy transformation - Opportunities and Challenges for cooperation

Forum of Low Emission Economy

Development of Low Emission Economy in the EU

April 19, 2013
Warsaw

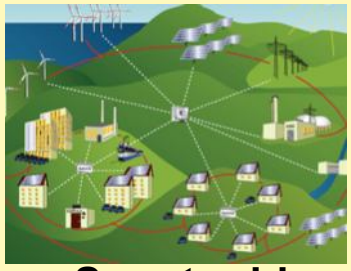
I. Transforming Germany's Energy System:

Goals of energy and climate policy

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

		2020	2030	2040	2050
Climate	Greenhouse gases (vs. 1990)	- 40%	- 55%	- 70%	- 80 to - 95%
Renewable energies	Share of electricity	35%	50%	65%	80%
	Overall share (Gross final energy consumption)	18%	30%	45%	60%
Efficiency	Primary energy consumption	- 20%	●●●●●●●●●●●●●●▶		- 50%
	Electricity consumption	- 10%			- 25%
	Energy consumption in buildings	20% heat demand			80% primary energy

Energy Policy: Consensus



Smart grid

Storage

PV: important

E-mobility

Grid expansion

Wind: No 1

Efficiency

Mix of RES

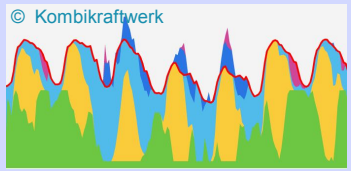
Challenges to be tackled

New business models needed

Governing the transformation

Higher costs for RES investments

Role of nuclear and fossil power



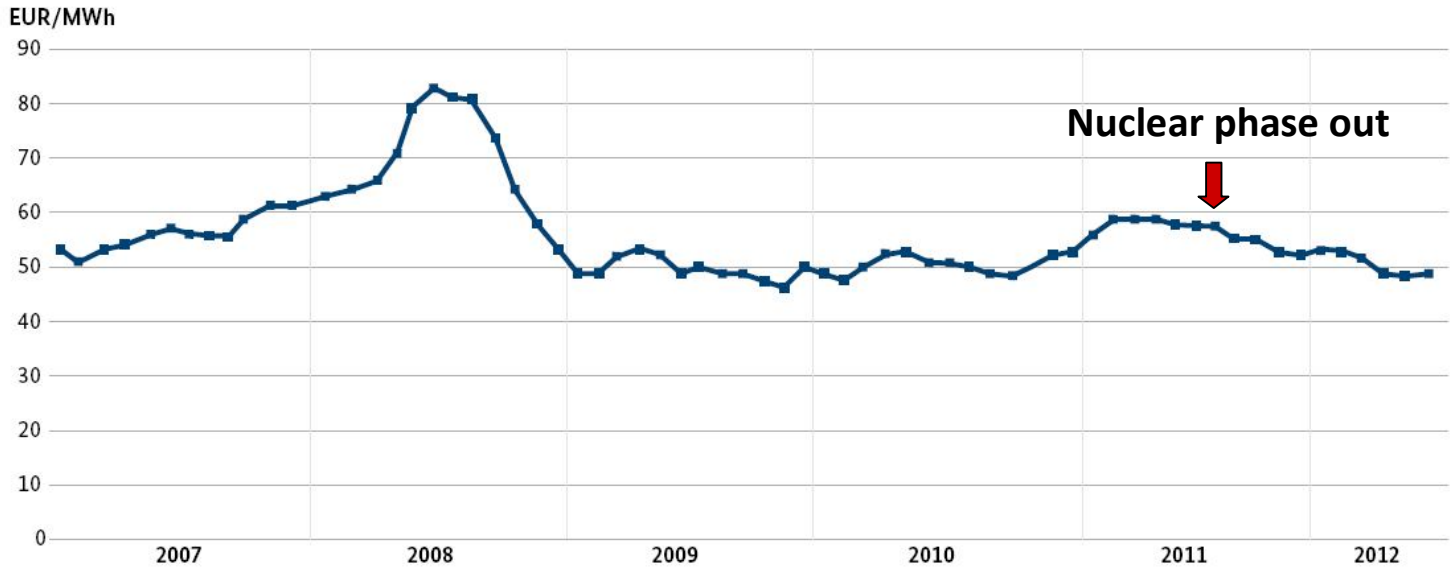
Fluctuating electricity

Sustainable biomass

I. Transforming Germany's Energy System:

No impact on spot market prices and imports

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety



Quelle: BMWi/ BMU Monitoringbericht

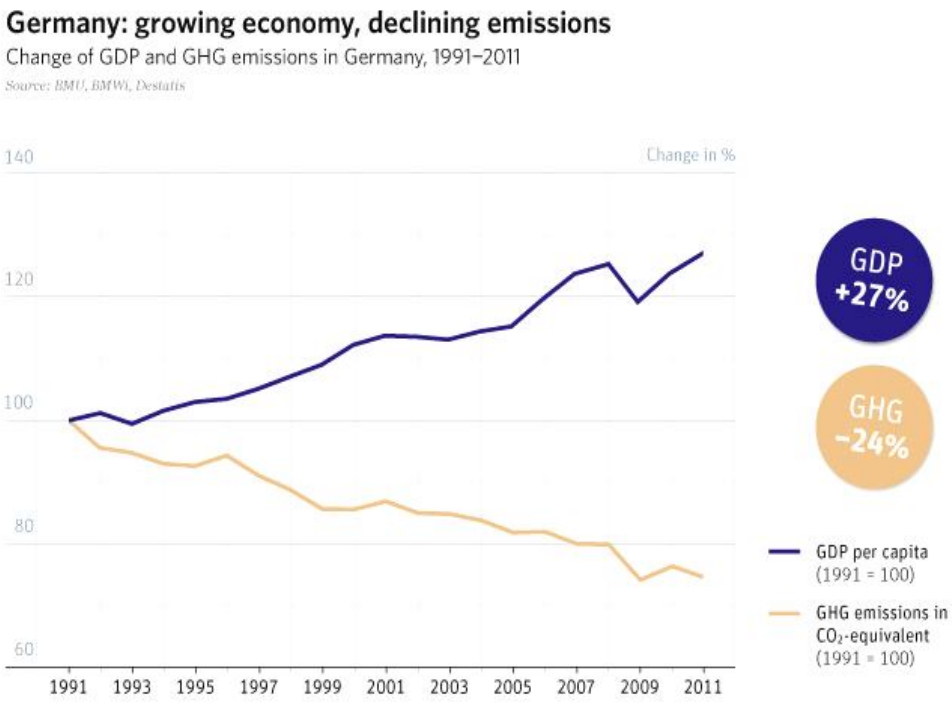
- Concerns of **impact on spot market prices** due to phase out of eight nuclear power plants were **unfounded**
- Average **electricity price on spot market** in Germany before phase out: around 55 €/MWh (base) and around 57 €/MWh (peak)
- Spot market price has returned to level prior to moratorium in 2011 and in 2012 **even below** prior levels
- Germany remains **net exporter of electricity** in 2011 and 2012

I. Transforming Germany's Energy System:

Where are we today?

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

- **Newly installed capacity** in 2012
  - onshore wind power: more than 2,000 MW (total: 31 GW)
  - PV: more than 7.500 MW (total: 32,6 GW)
- **Renewable sources have become second-largest source for electricity** generation in Germany (surpassing gas, hard coal and nuclear power)
- **46 % increase of final energy productivity** between 1990 – 2011
- **Greenhouse gas emissions** are **24% below 1990 levels**, outperforming national Kyoto Target



Source: HBS Energy Transition

I. Transforming Germany's Energy System:

Goals of energy and climate policy

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

1. Renewable energies:

- swift and continuous expansion
- cost-effective and market integration

2. Energy efficiency:

- reducing energy consumption
- increasing energy security

3. Grid infrastructure:

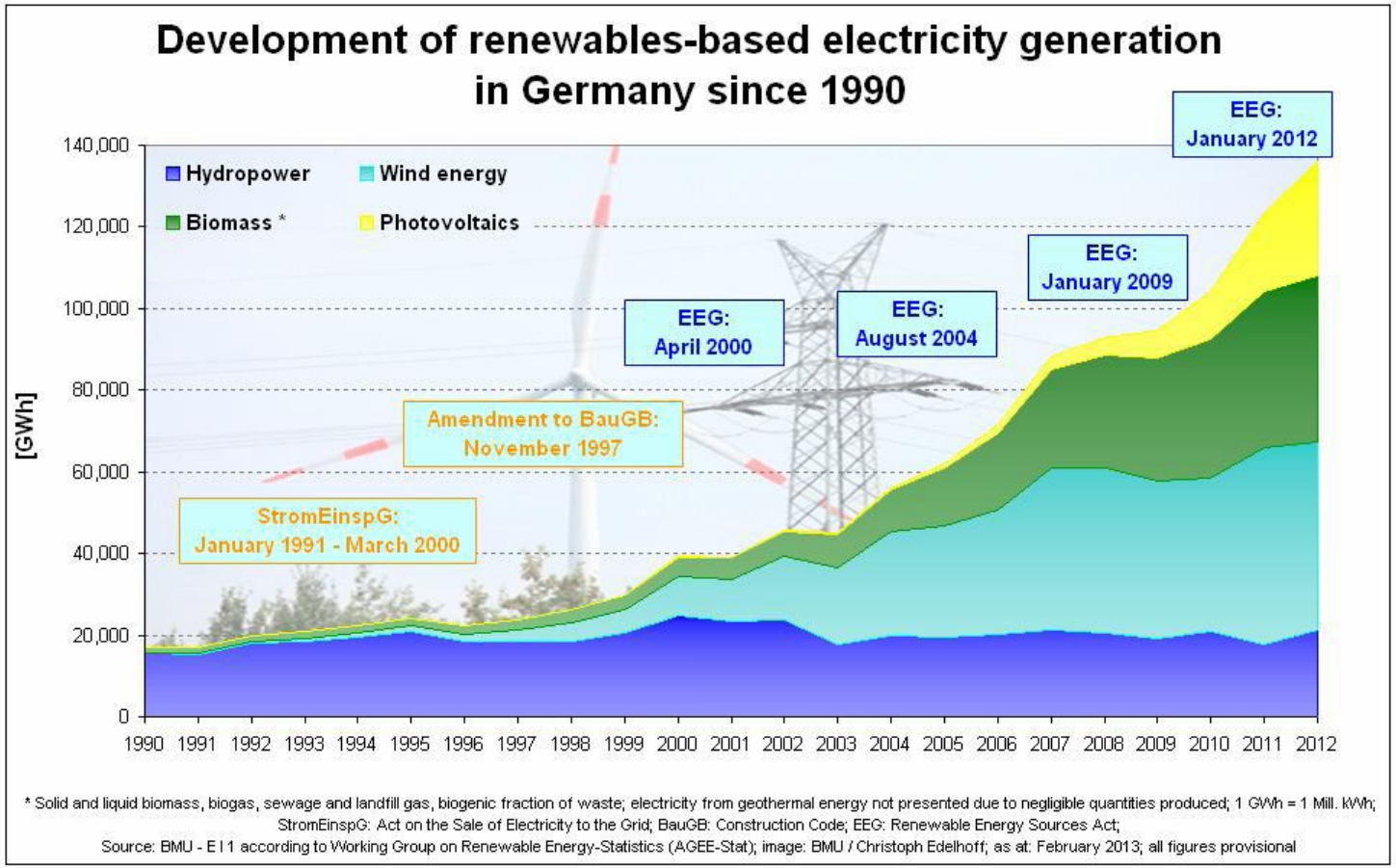
- expansion and modernisation
- integration of RE

I. Transforming Germany's Energy System:

Where are we today?

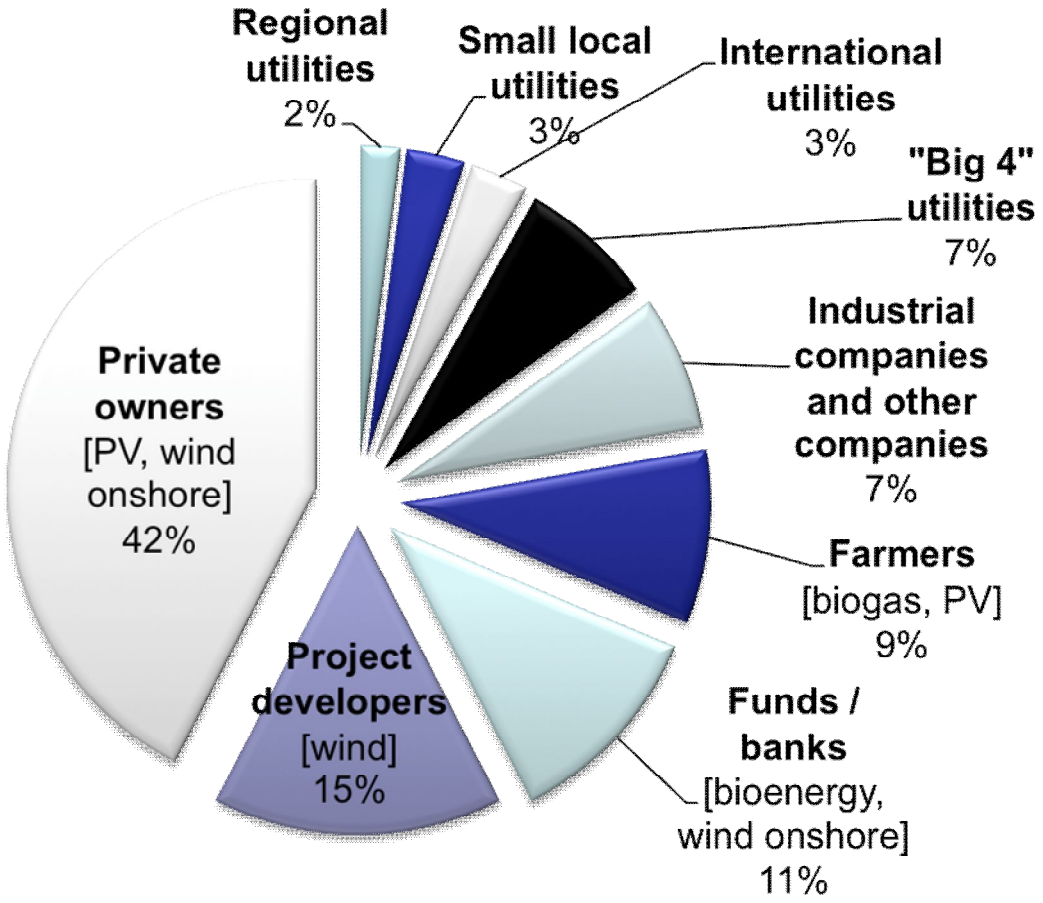
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

- **Share of renewable energies in electricity supply:**
  increase from around 6 to 23% over past 12 years



How everything began – Bottom-up approach

Ownership distribution of installed RES capacity for electricity production in 2010 (53 GW)



Source: trend:research, 2010: "Anteile einzelner Marktakteure an Erneuerbaren Energien Anlagen in Deutschland"

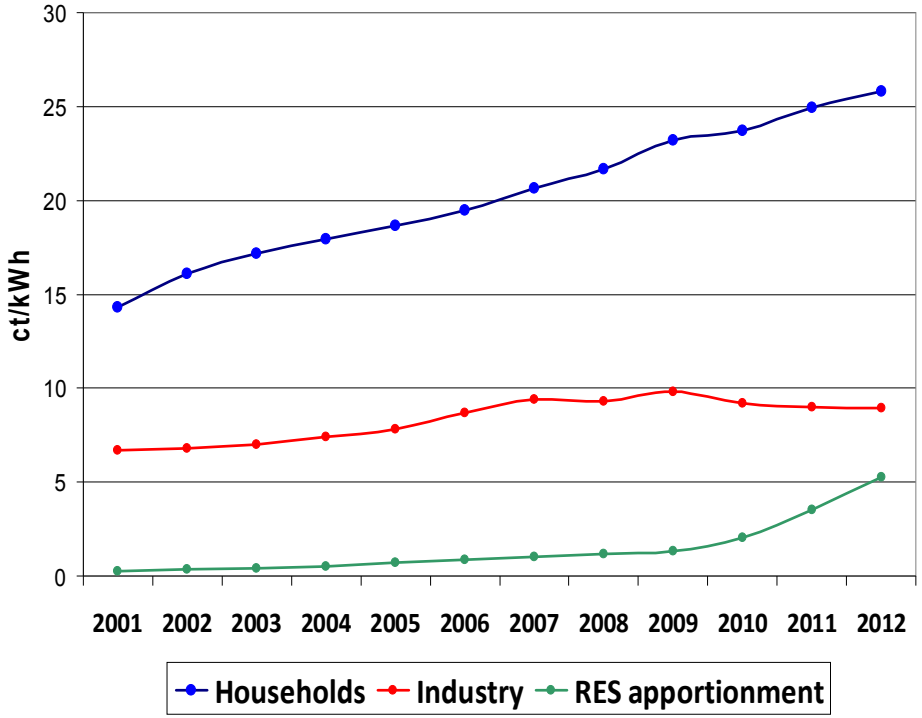
I. Transforming Germany's Energy System:

Challenges – Rising Household electricy prices

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Electricity prices have been rising - however the levy for the **extension of renewable energies only accounts for about 10% of a normal household's electricity costs.**

Development electricity prices

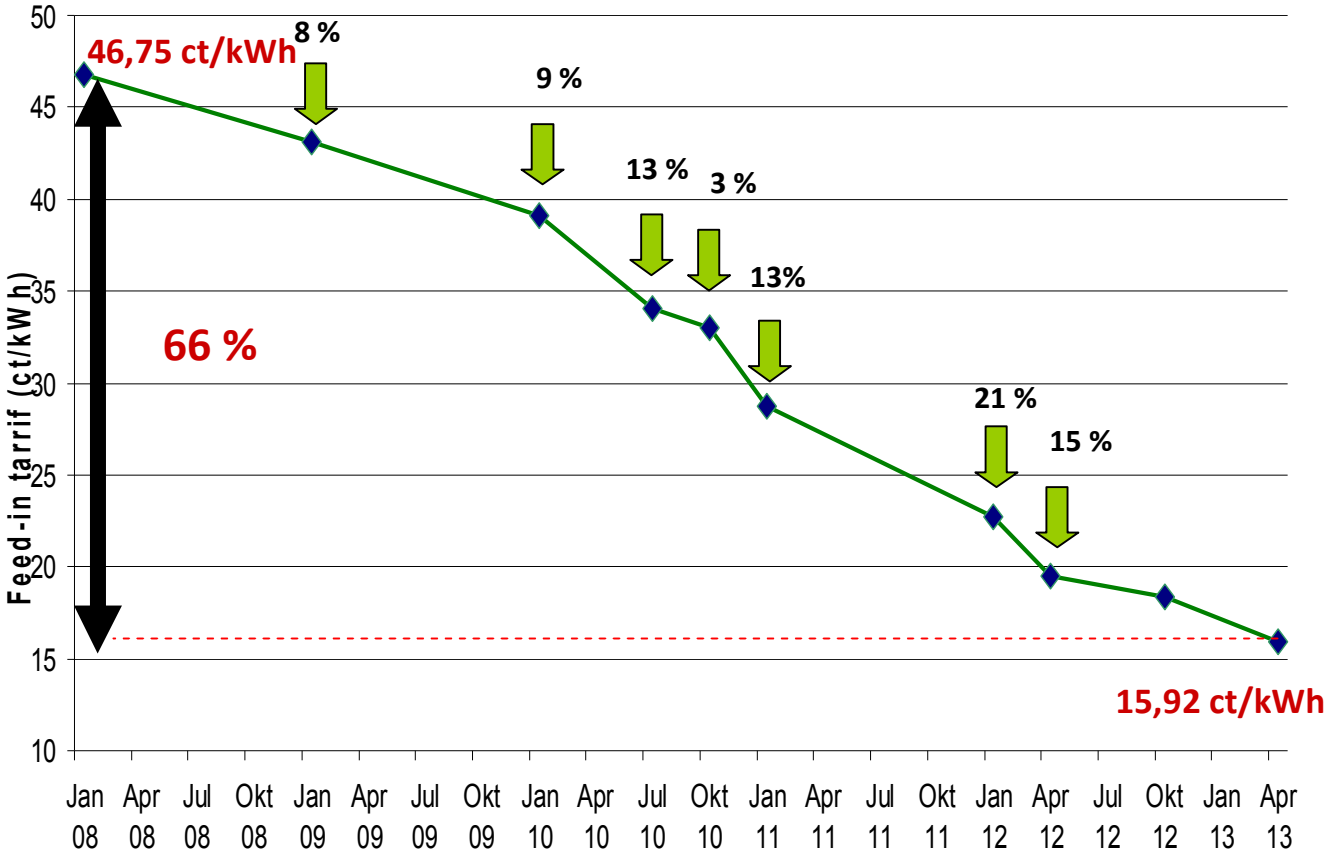


I. Transforming Germany's Energy System:

Challenge – Decreasing cost curve photovoltaic

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Several amendments of Renewable Energy Act



- **Feed-in tariff for on-roof photovoltaic decreased from 47 Ct/kWh in 2008 to 16 Ct/kWh in April 2013 → 66% since 2008**
- **Renewables reach market maturity with the help of German feed-in-tariffs**

Energy Efficiency

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

- improves security of supply
- reduces primary energy consumption
- reduces dependence of energy imports
- reduces GHG emissions cost effectively
- accelerates innovative technologies
- promotes economic growth
- creates jobs

Efficient Power Generation

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Law on Cogeneration (CHP)

25% of electricity generation from co-generation by 2020

Source: BMU

→The **„Mini-CHP Programme“** supports small CHP plants for the supply of heat for commercial and residential housing

- launched by BMU in 2012
- Investments in CHP with a capacity of up to 20 KW are eligible to an investment allowance (between 1.500 – 3.700 EUR)
- well received in the market 16 MW_{el} CHP generation capacity (03.2013)

Efficient Buildings

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Standards for new buildings
→ Energy Saving Ordinance "EnEV"

Subsidies

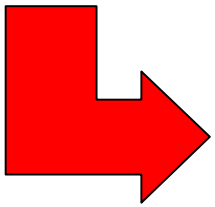
- (1.5 bn €/a 2012 - 2014) for refurbishing buildings (better insulation, more efficient heating) → Program: Energy Efficient Renovation (KfW)
- low interest rates and grants for energy efficient new buildings above standard (Program KfW 40, 55, 70)

Energy "passport" for buildings provides information on energy demand for prospective buyer or tenant.

Efficient Industry

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Large untapped potential: app.10 bn € per year



from 2013 energy management systems are compulsory for electricity tax exemptions of energy intensive industry

Efficient Power Consumption in SME

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Energy consulting and investment subsidized for SME:

- Initial consulting / “stock taking”: up to 80% of cost and up to 1280€ in total.
- Detailed consulting: up to 60% and up to 4800€ in total.
- Concessional (subsidized) credit for investments in energy efficiency with savings of at least 15-20% of previous energy consumption.

Study: *realized consultations 2008-2010 have led to*

- *total energy saving of 1921 GWh*
- *investments in energy saving measures of €666 million*
- *annual energy cost savings of €122 million*

Efficient Power Consumption in Households

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

- Information / Labeling (EU) / websites / counselling
- Audits and consultation on energy saving in low income households (Climate Initiative):
  - Training for unemployed people, who then provide basic on the spot advice to low income households.
  - 2008 – 2012: installation of ca. 800.000 energy efficiency appliances in 70.000 households
  - **average savings of 395 kWh electricity resp.133 € energy and water costs per year**

Bottom-up – National Climate Initiative

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

- **NCI Basic facts:**
  - Started in 2008
  - Total budget: 2008-2011: 900 million €
  - CO2-Emissions avoided: 2008-2011: 4,3 million t
- **Programmes and projects** for a wide range of **target groups**
  - Local authorities and social institutions
  - Business and industry
  - Consumers
  - Education institutions

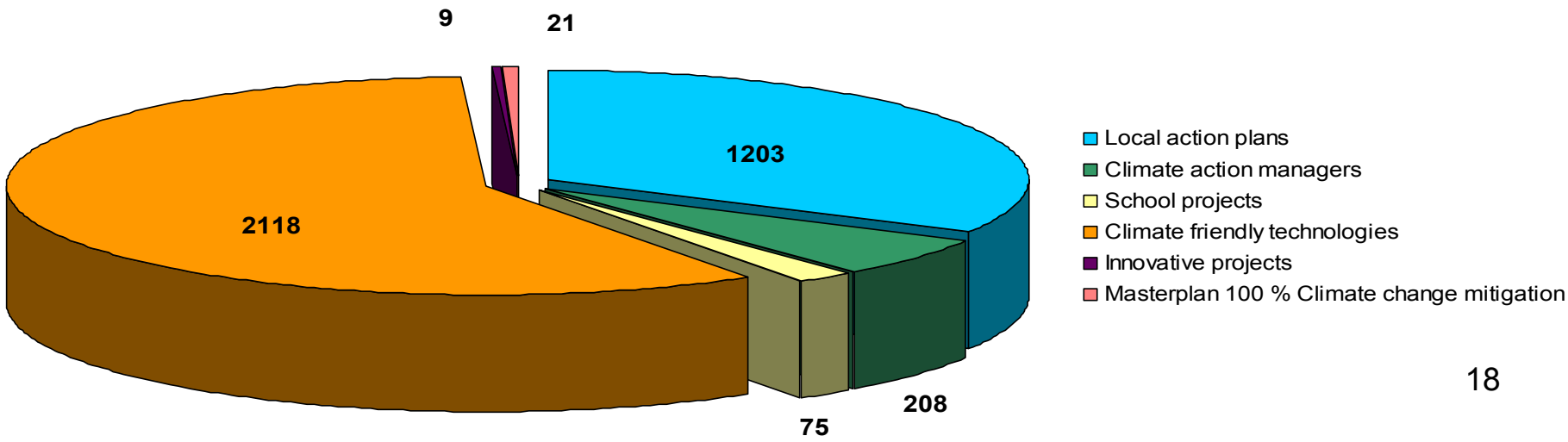
Bottom-up – NCI – Grants for local authorities

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

„Kommunalrichtlinie" – Funding support for climate protection projects implemented by local authorities, social and cultural institutions

- Between 2008 and 2012 support for **> 3.600 projects in > 1.900 local authorities**
- More than **190 million Euro** have been granted.
- The yearly revised grant schemes shows rising demand (2011: 1400 applications; 2012: 1600 applications; 2013: 3.500 applications)

Number and category of co-financed projects (2008 - 2012)

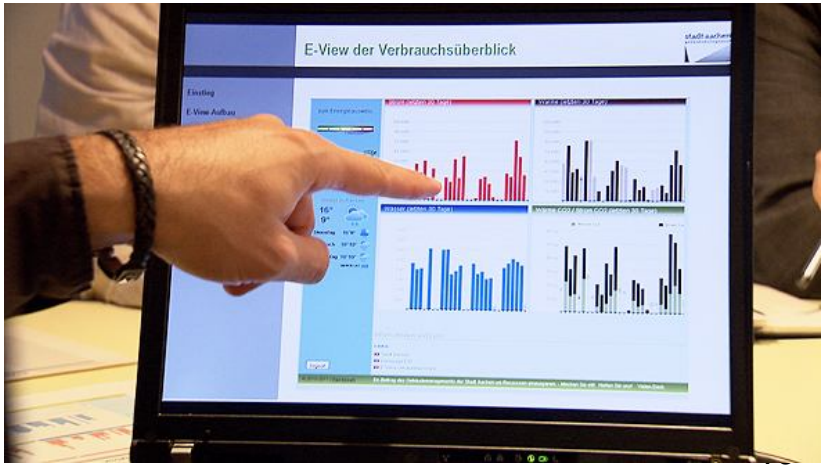


Awarded project:
„E-View: Energy-Display in Aix-la-chapelle“

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

- Internet-based energy monitoring & control system for 196 locally owned buildings
- **Saves around 1.700 t of CO_2 / year and 10 % of energy and water costs** in the communal buildings
- **Pay-back of the initial investment costs (400.000,- €) within few years**
- Open access to E-View for everyone fosters transparency and energy-friendly behaviour
- **Winner of Category 1: „Communal Buildings“ at „Local Climate Protection Competition 2012“ of German Institute of Urban Affairs***

***www.klimaschutz.de/kommunen**



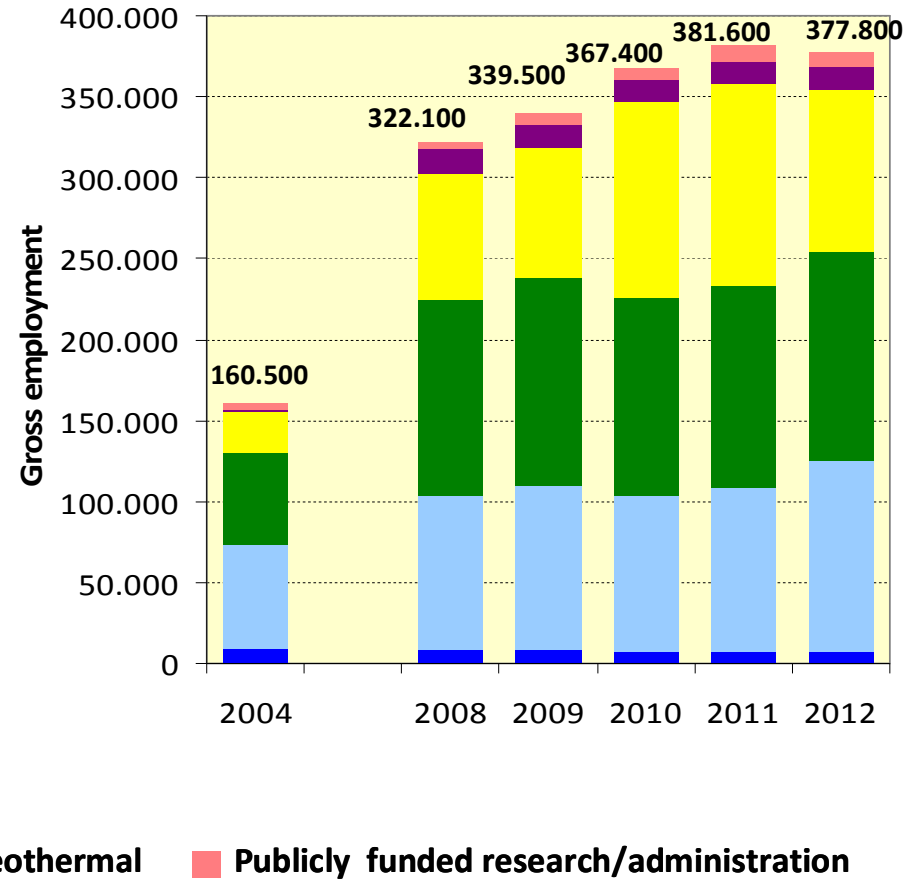
I. Transforming Germany's Energy System:

Opportunity – Innovation and employment

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

The transformation of our energy system …

- **saves fossil fuel imports** in the size of 7 billion Euros per year (2011)
- makes our **energy mix more diverse and more secure**
- **creates investments** in renewable energies: 19.5 billion Euros (2012)
- **helps us achieve our climate policy goals**
- **creates new jobs** - 380.000 so far
- is a key **driver for innovation**



II. Polish German Cooperation in the energy sector: Opportunities

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

- **Climate and Energy Dialogue: launched August 2011**
  - intensify Polish-German dialogue on climate and energy issues
- **Cooperation in Renewable Energy and Energy Efficiency**
  - Best-practice exchange including possible joint projects
- **Large potential for energy efficiency improvements** in both Poland and Germany.
  - Need to jointly work towards an ambitious and binding set of measures within the EU Energy Efficiency Directive.
- **Grid extension: Common interest in developing an efficient and modern grid infrastructure**
  - reducing negative cross-border effects
  - reduce loop flows for neighbours

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

More information available at:

www.bmu.de

www.erneuerbare-energien.de

Energie für Deutschland

III. EU framework

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

- **German/Polish energy transformation needs to be embedded in an EU framework:**
  - encouraging investment by setting reliable long-term framework conditions for reducing emissions by 80-95% by 2050
  - enhancing coordination and convergence of energy policies
  - identifying overlaps and possible common steps needed for all MS

- **Importance of EU Climate and Energy Roadmaps**
  - Long-term guidance and planning reliability necessary for investments

- **Further development of EU climate and energy policy necessary**
  - The future of the ETS
  - EU framework for RES support scheme
  - Energy Efficiency

I. Transforming Germany's Energy System:

Bottom-up – 100% RE-regions

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

100% RE-regions project (www.100-ee.de)

- Aims at promoting renewables by a bottom-up approach
- network provides advice and support for regions interested in joining
- Funded by federal government
- Focus on rural areas
- More and more urban areas are joining
- Applications possible twice a year

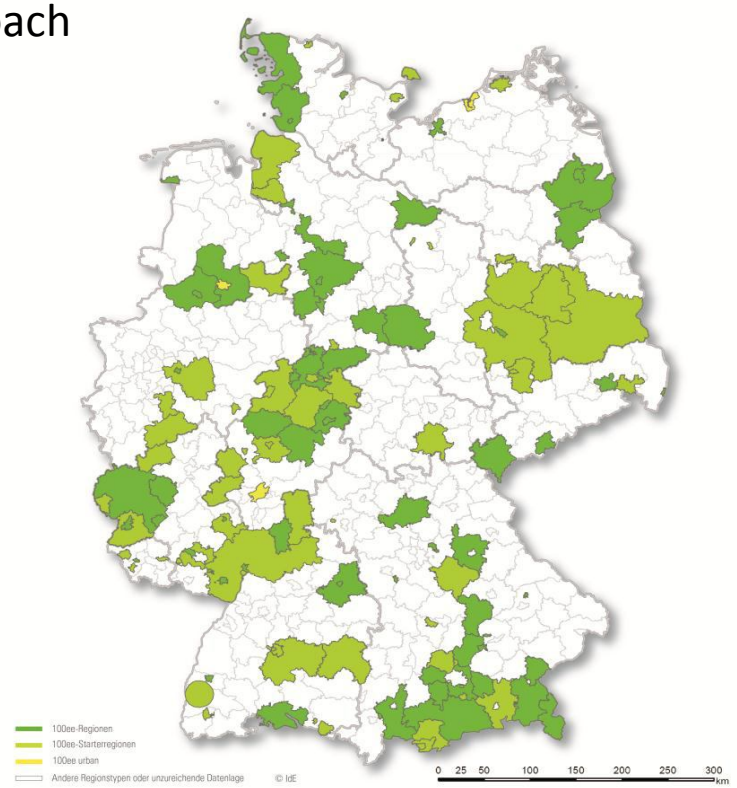
Number of regions:

100RE-regions: 73

100RE-starting regions: 60

100RE urban: 3

(as of March 2013)



Facts & Figures

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Contribution of renewable energy sources to energy supply and greenhouse gas emission reductions in Germany in 2012

Share of renewable energy sources		
in total final energy consumption	[%]	**12.6**
in total gross electricity consumption		**22.9**
in total heat supply		**10.4**
in total fuel consumption[1)]		**5.5**
in total primary energy consumption[2)]		**11.7**
Greenhouse gas emissions avoided via use of renewable energy sources in Germany 2012		
GHG-emissions	[mill. t]	**approx. 146**
RE-electricity with EEG remuneration		*approx. 81*

1) Basis until 2002: motor fuel consumption by road traffic; from 2003: total consumption of motor fuel, excluding jet fuel, military and inland waterway shipping;
2) Calculated by the physical energy content method, after Working Group on Energy Balances e.V. (AGEB);
Source: BMU - E I 1 according to Working Group on Renewable Energy-Statistics (AGEE-Stat) and Federal Environment Agency (UBA); deviations in the totals are due to rounding;
as at: February 2013; all figures provisional

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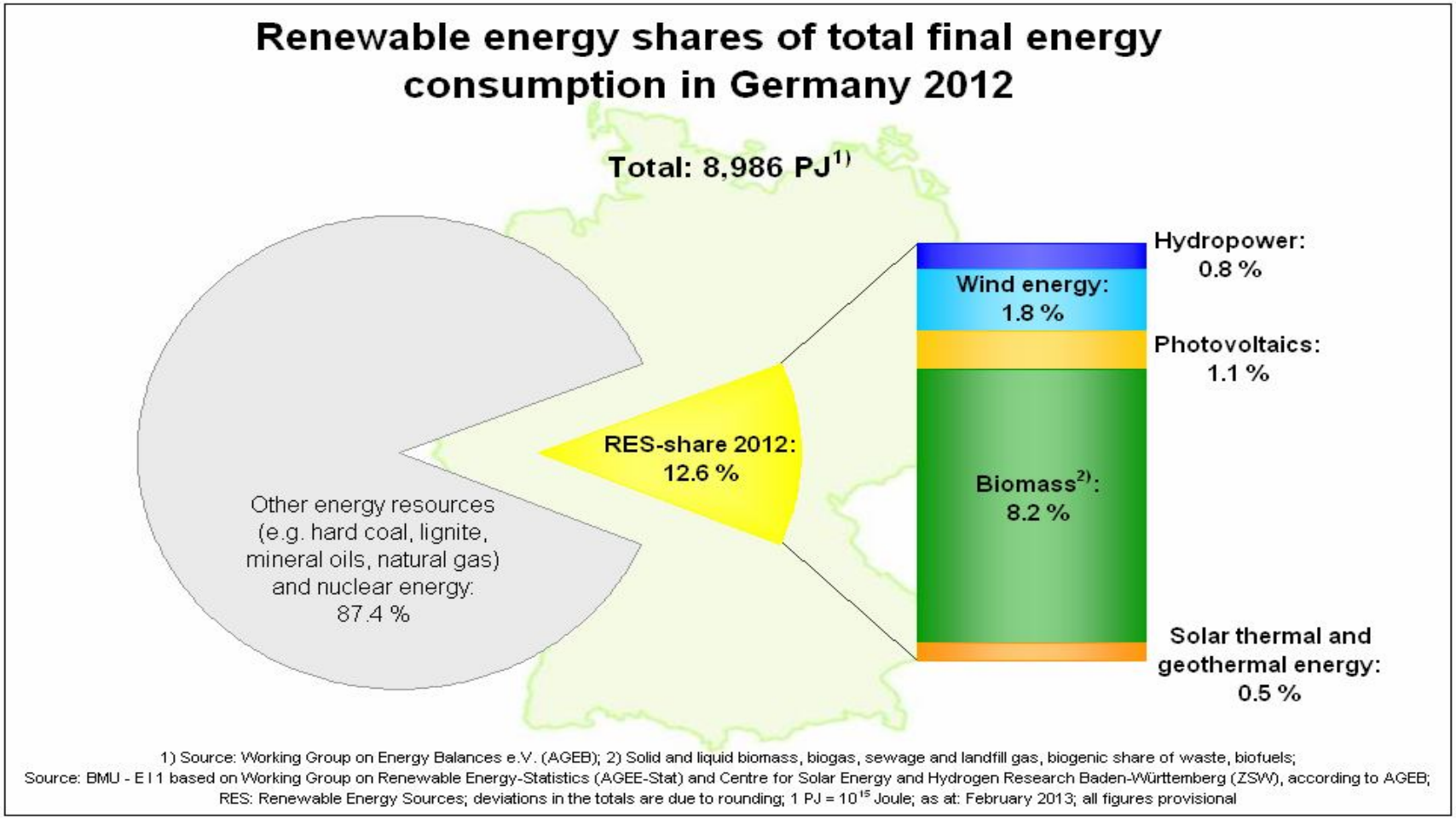

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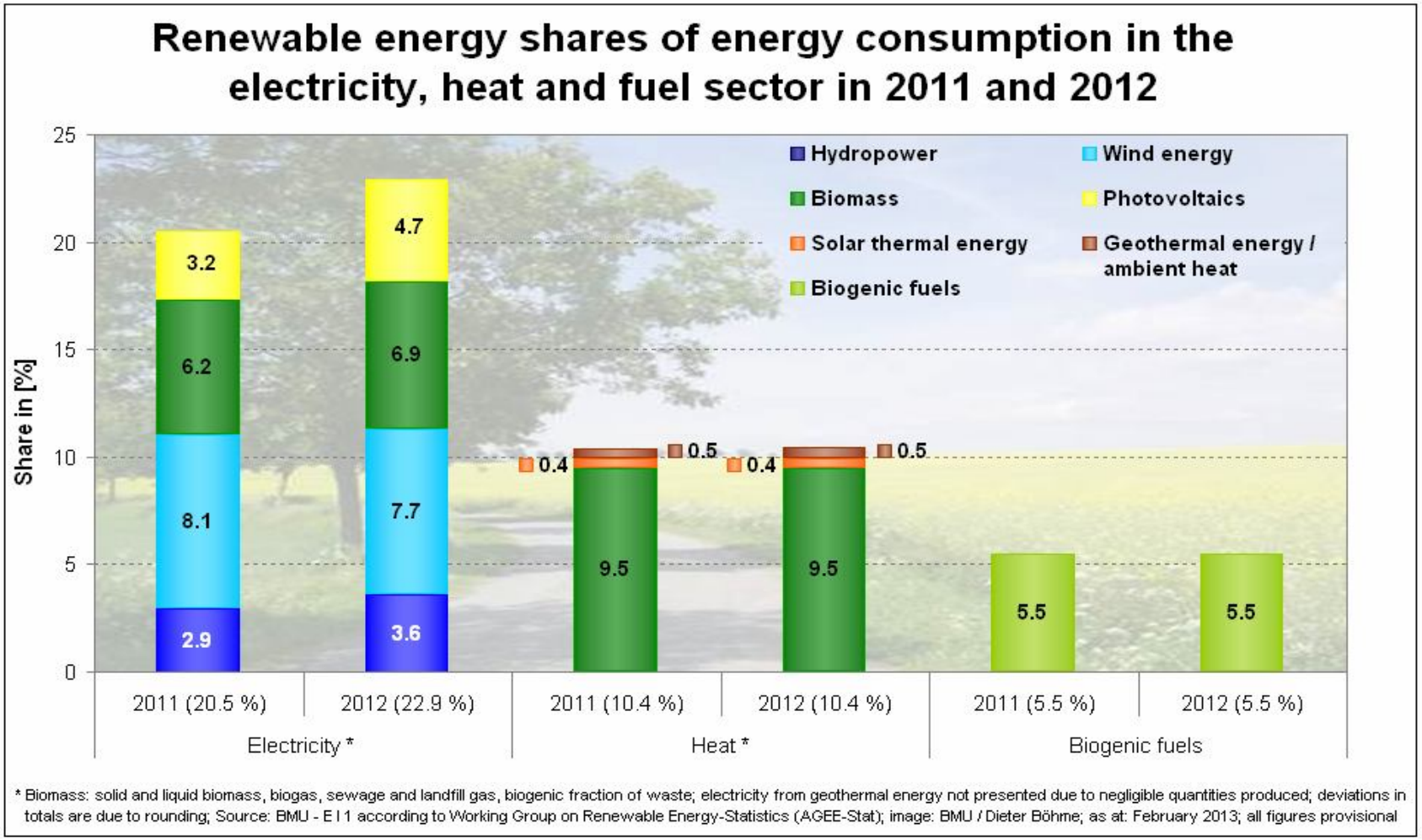

* Biomass: solid and liquid biomass, biogas, sewage and landfill gas, biogenic fraction of waste; electricity from geothermal energy not presented due to negligible quantities produced; deviations in totals are due to rounding; Source: BMU - E I 1 according to Working Group on Renewable Energy-Statistics (AGEE-Stat); image: BMU / Dieter Böhme; as at: February 2013; all figures provisional

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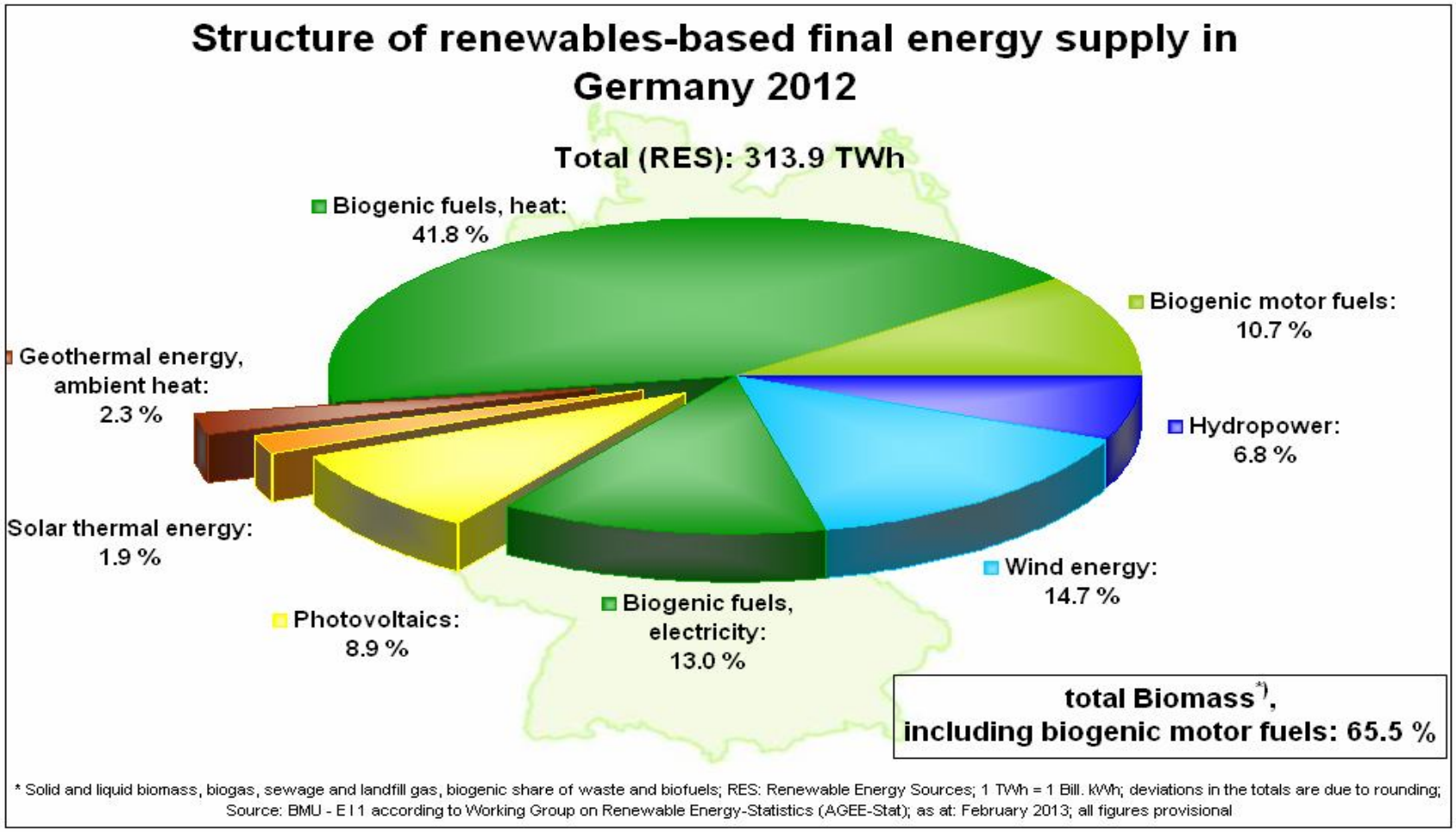

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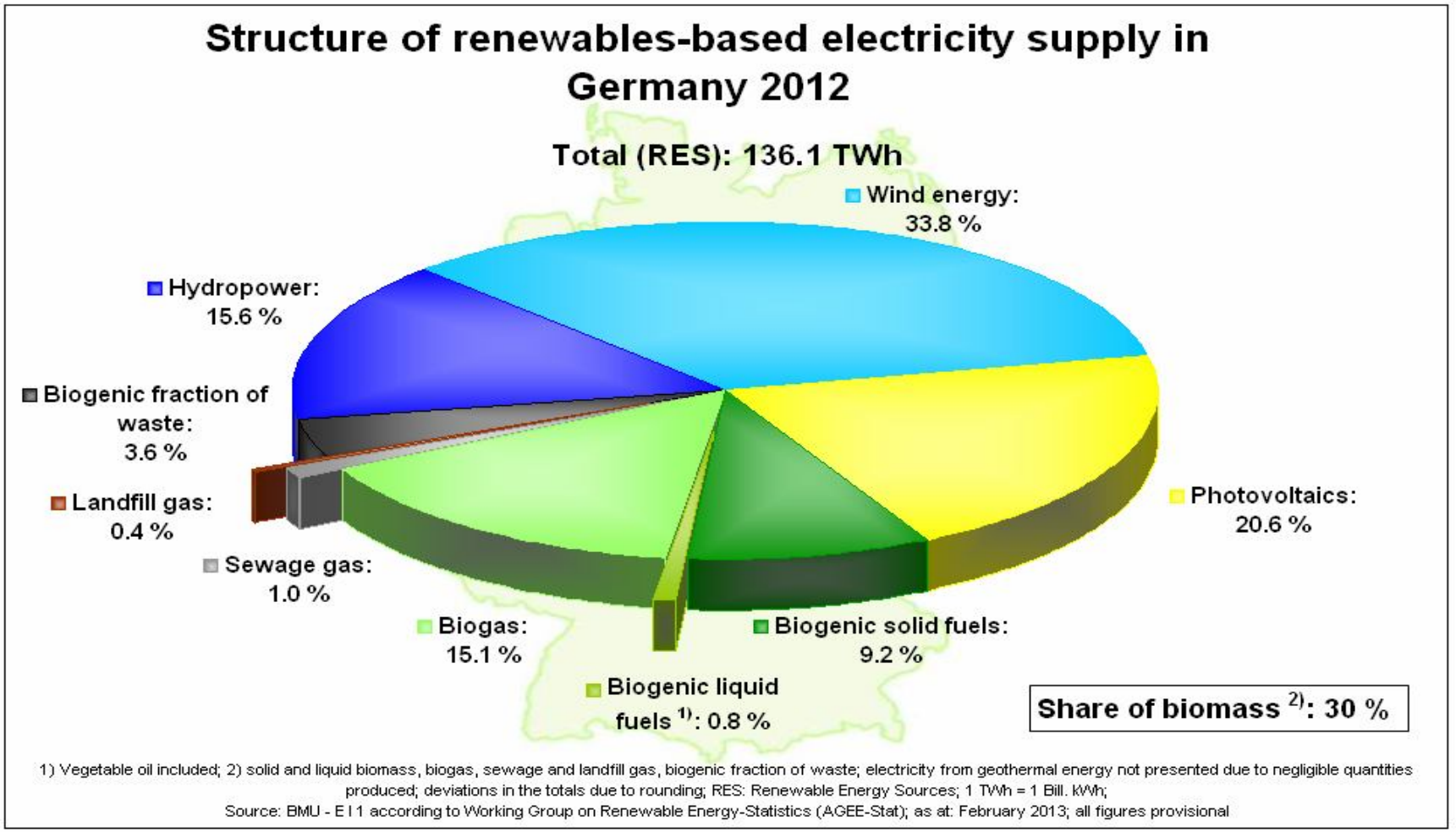

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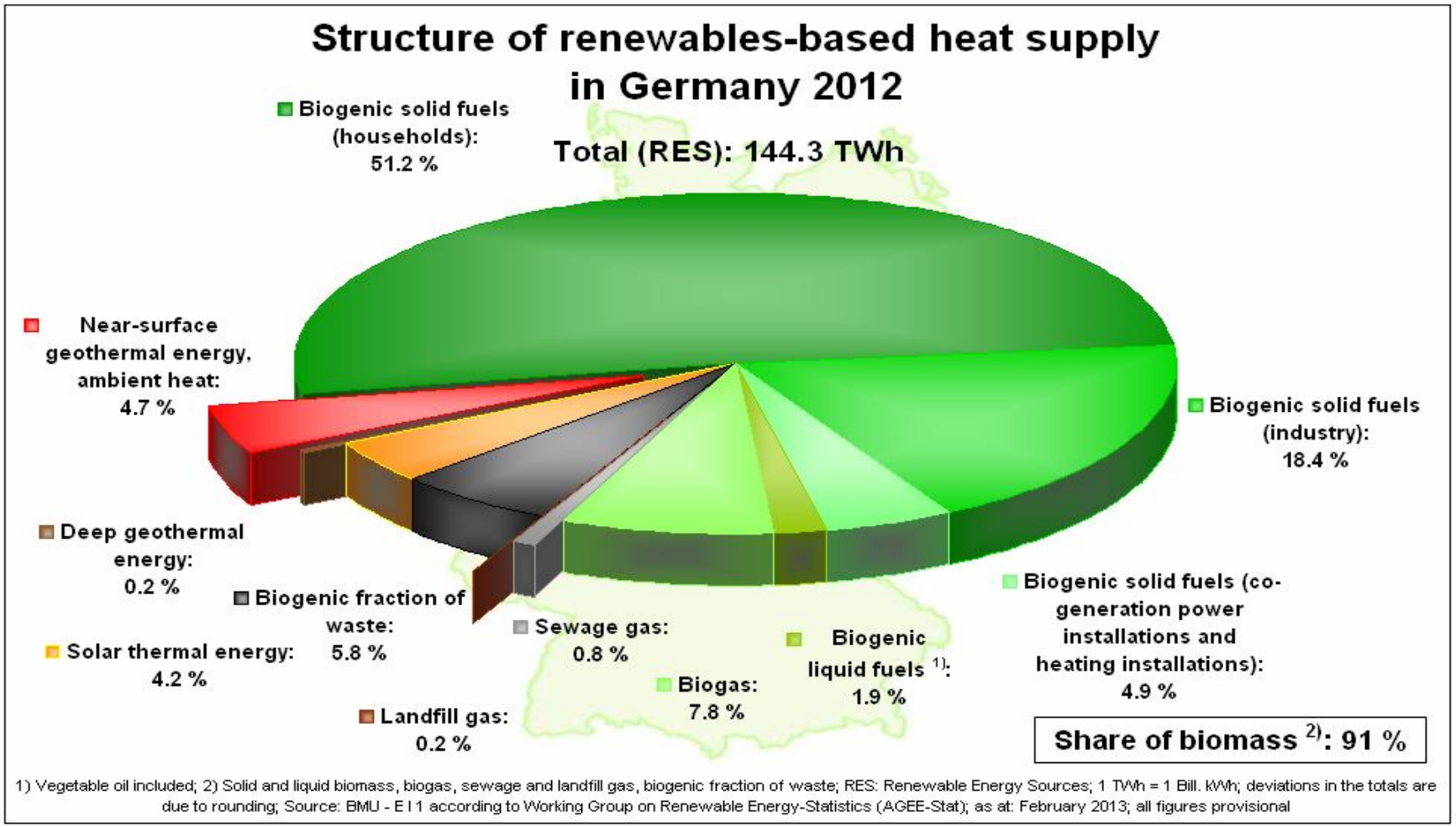

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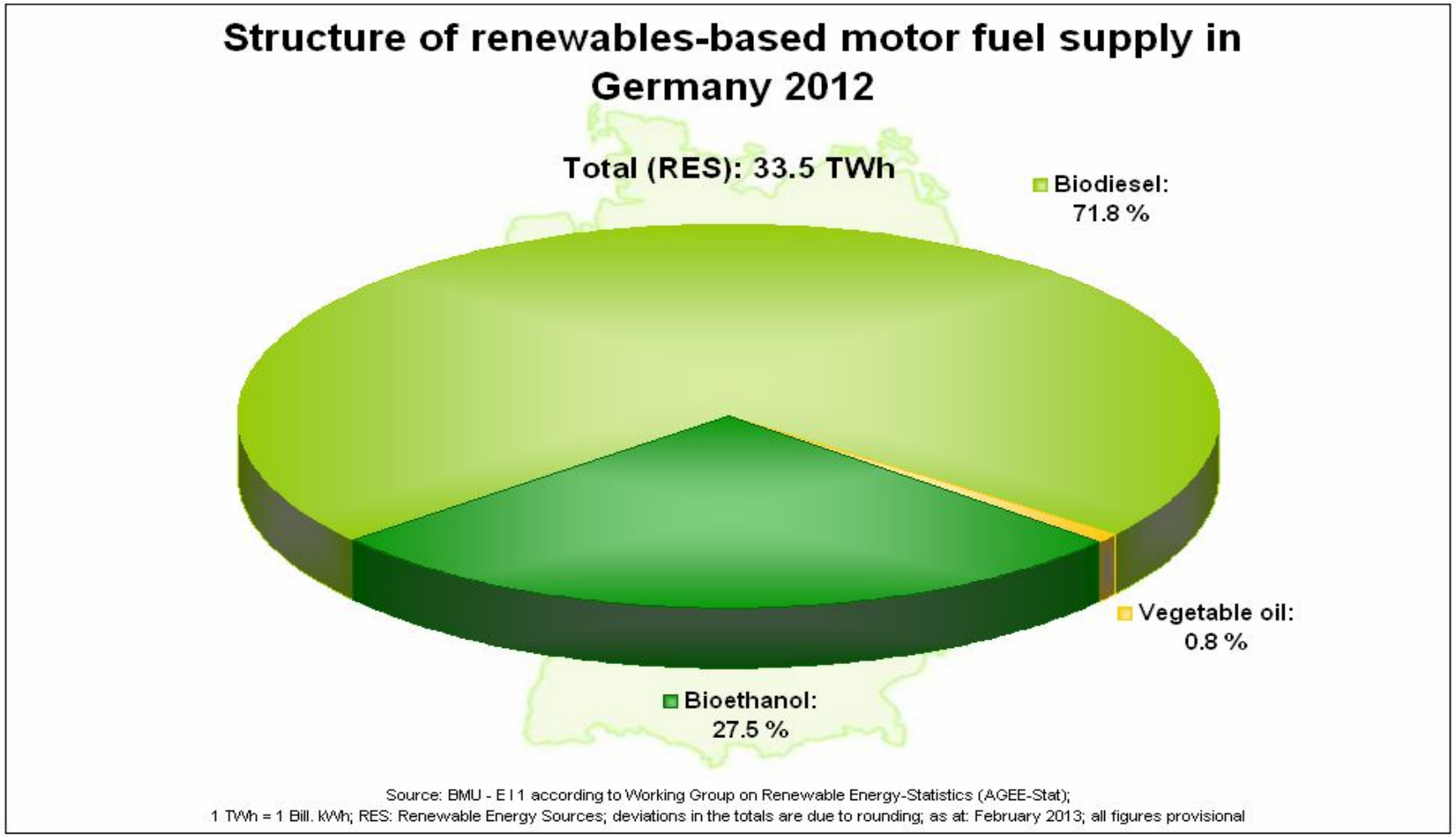

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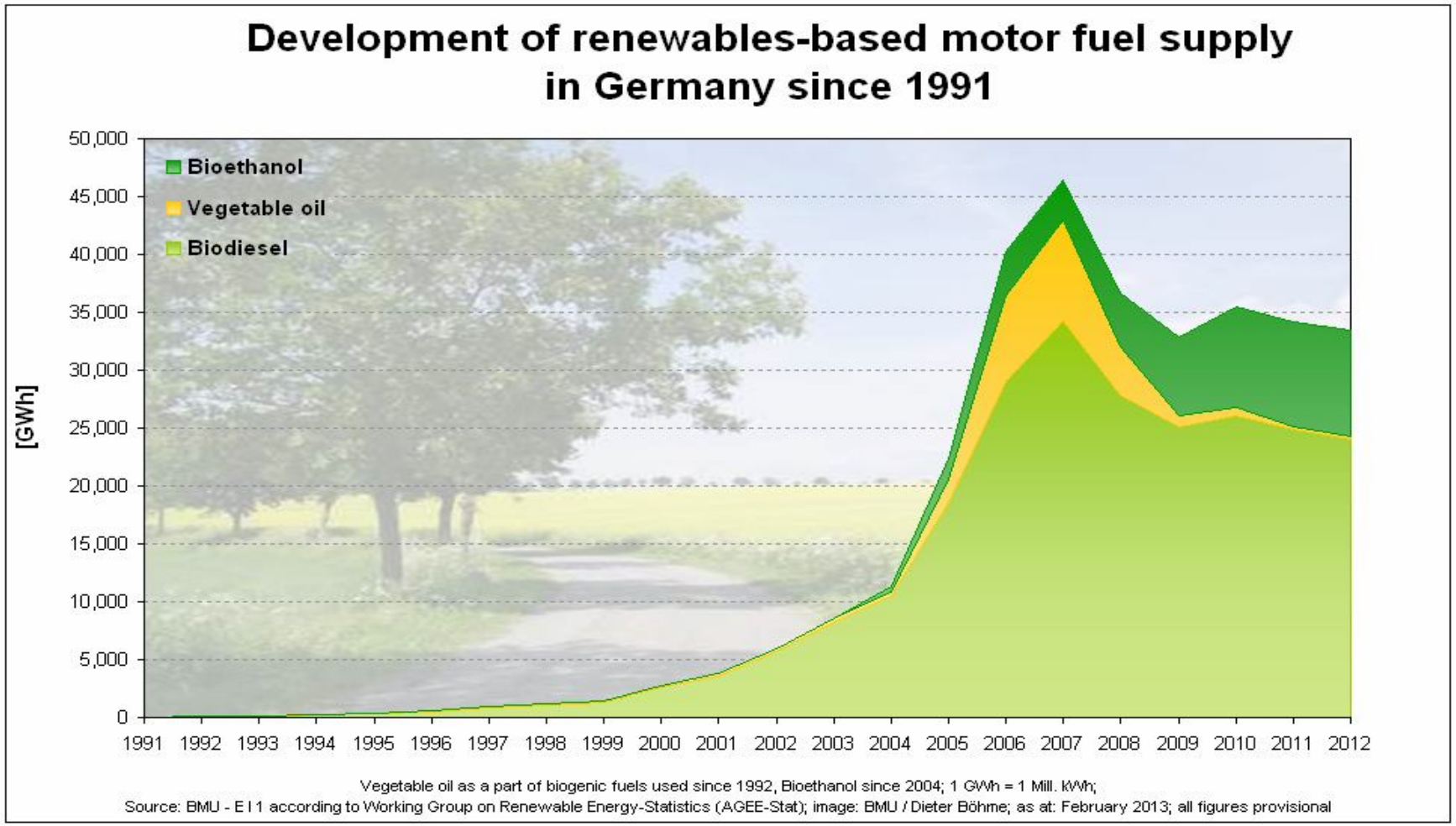

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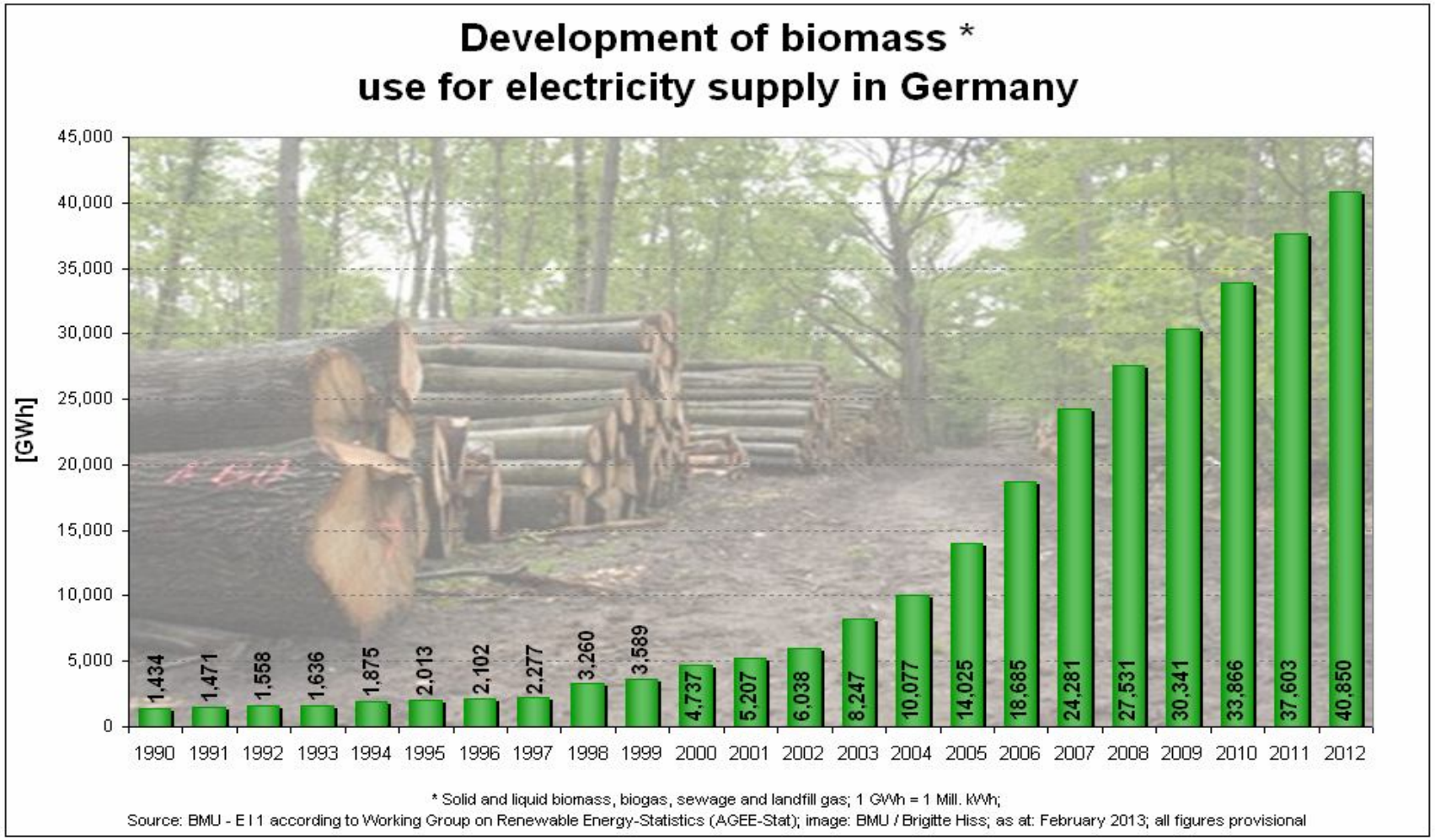

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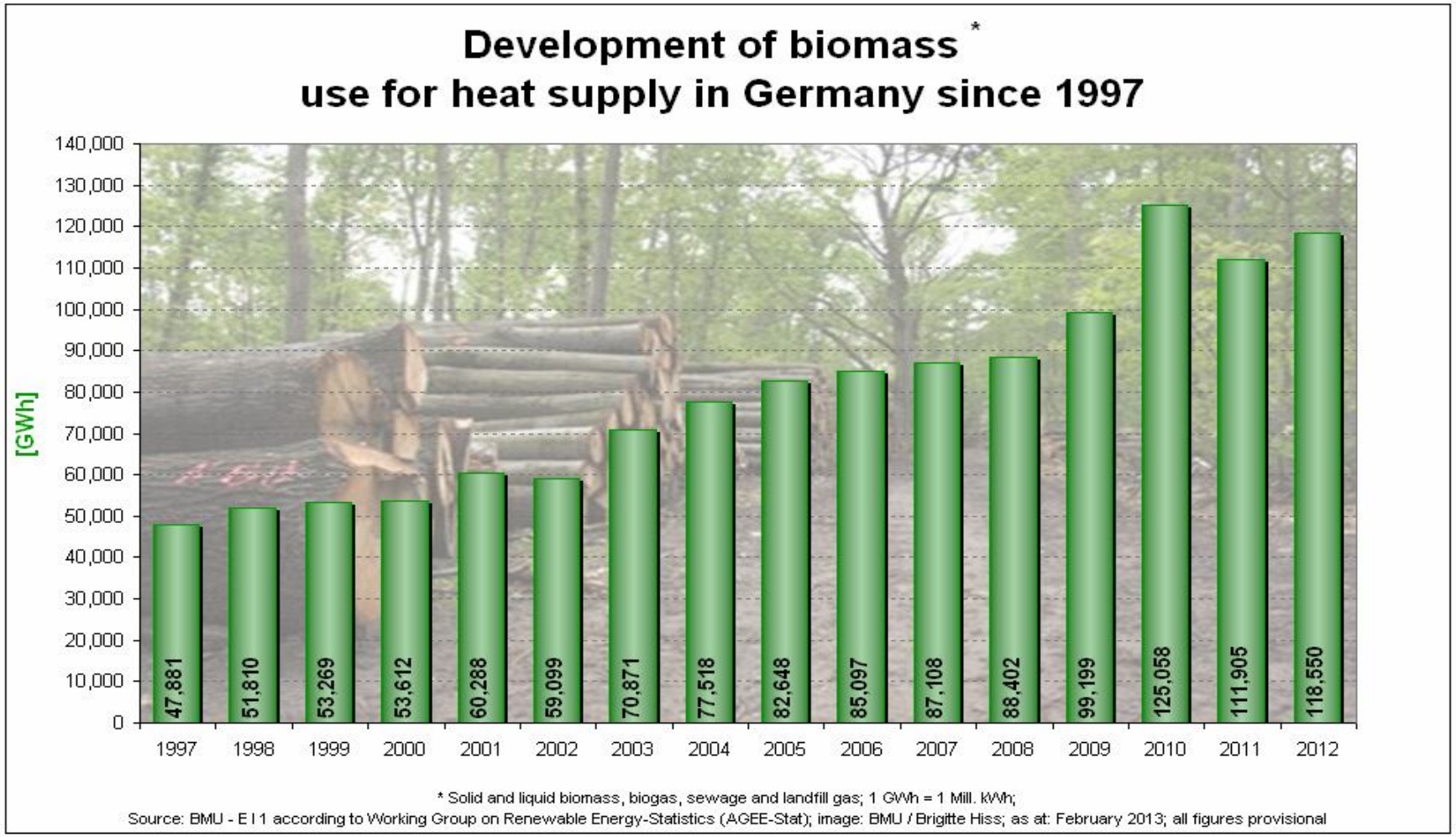

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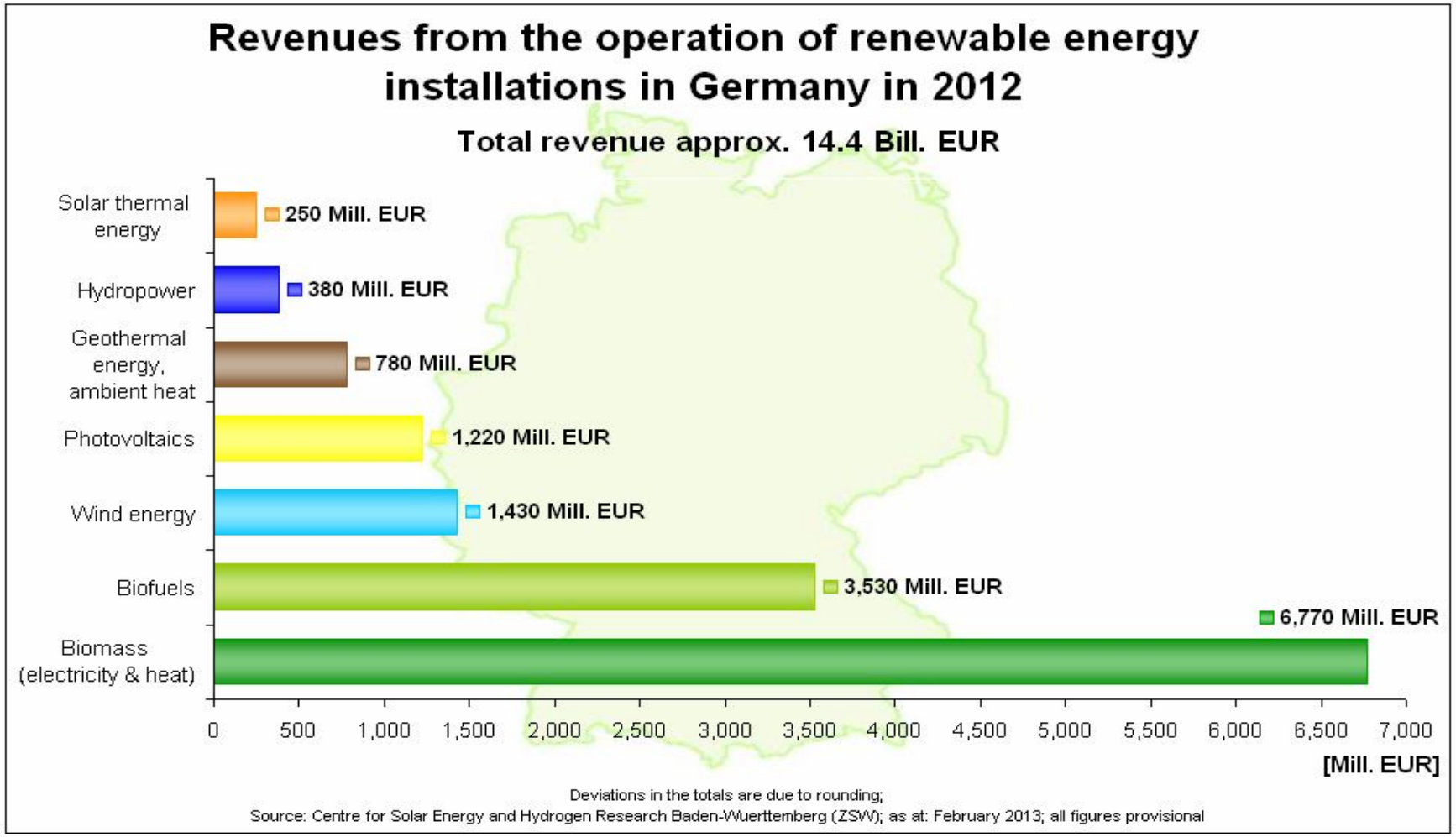
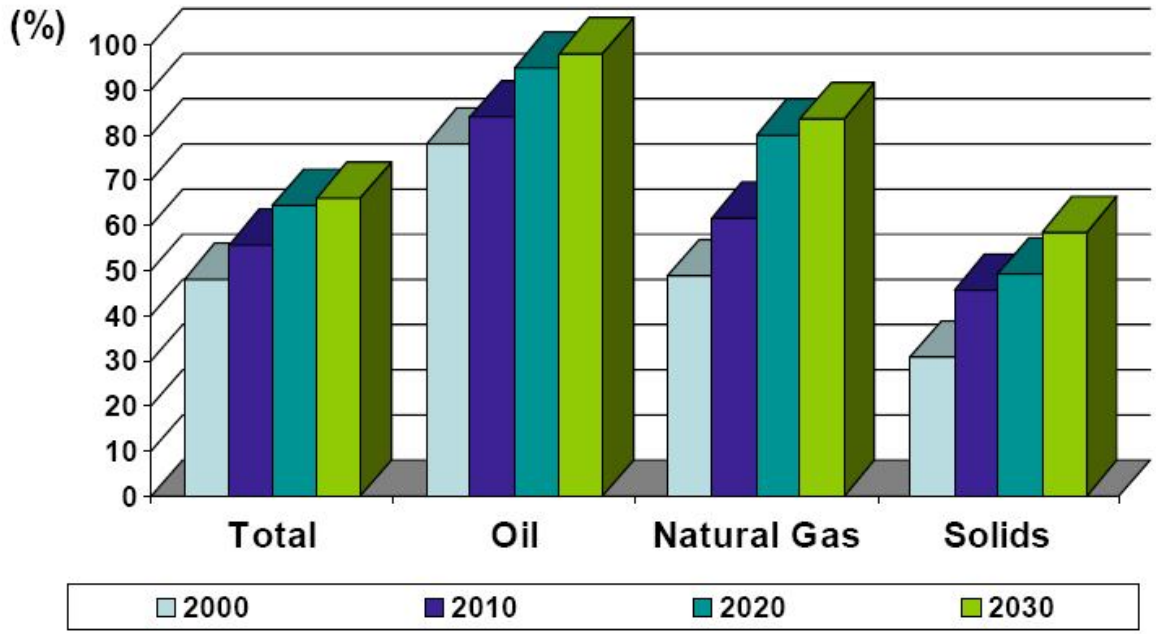


Climate and energy policy pays off: Driver Energy Security

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

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

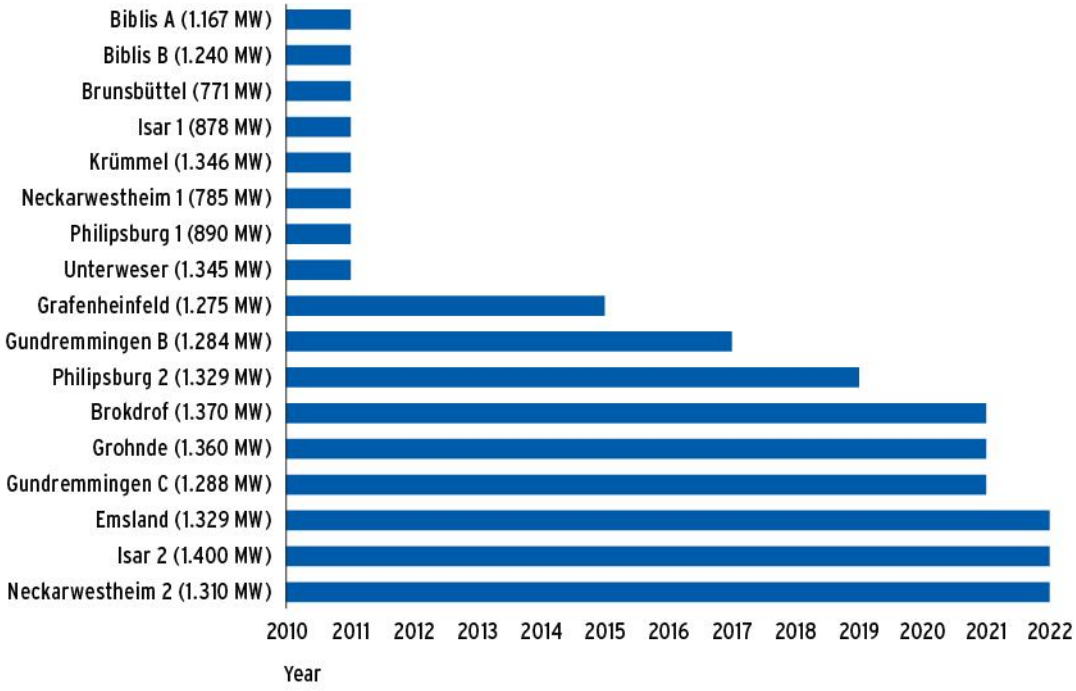


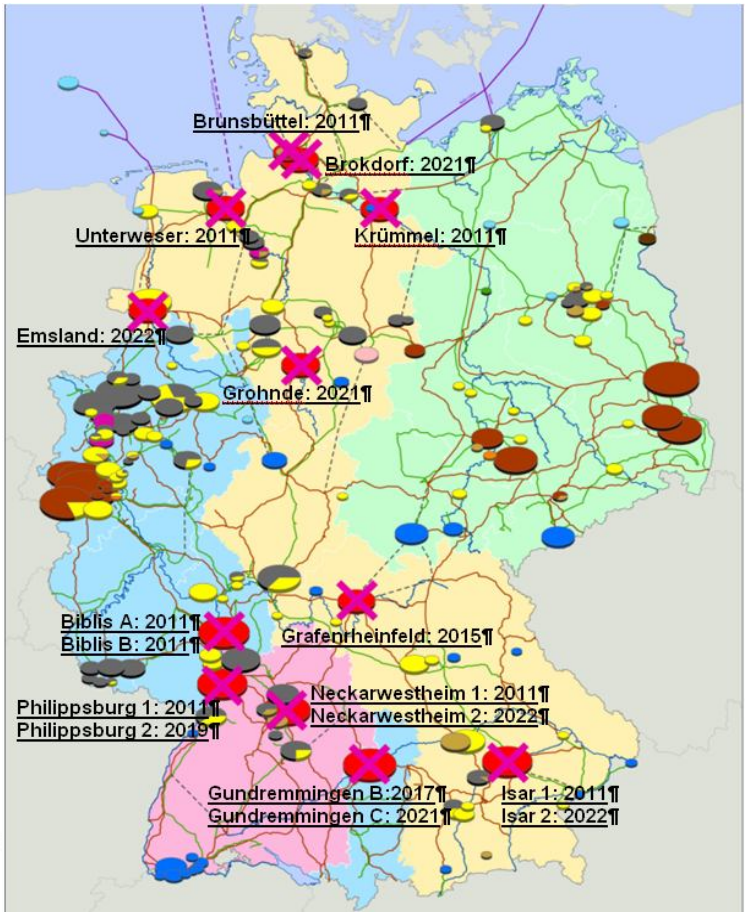
Source: European Commission DG TREN, PRIMES

Nuclear phase-out by 2022

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

- 7 oldest plants + Krümmel decommissioned in 2011
- Gradual phasing out of nuclear power by 2022





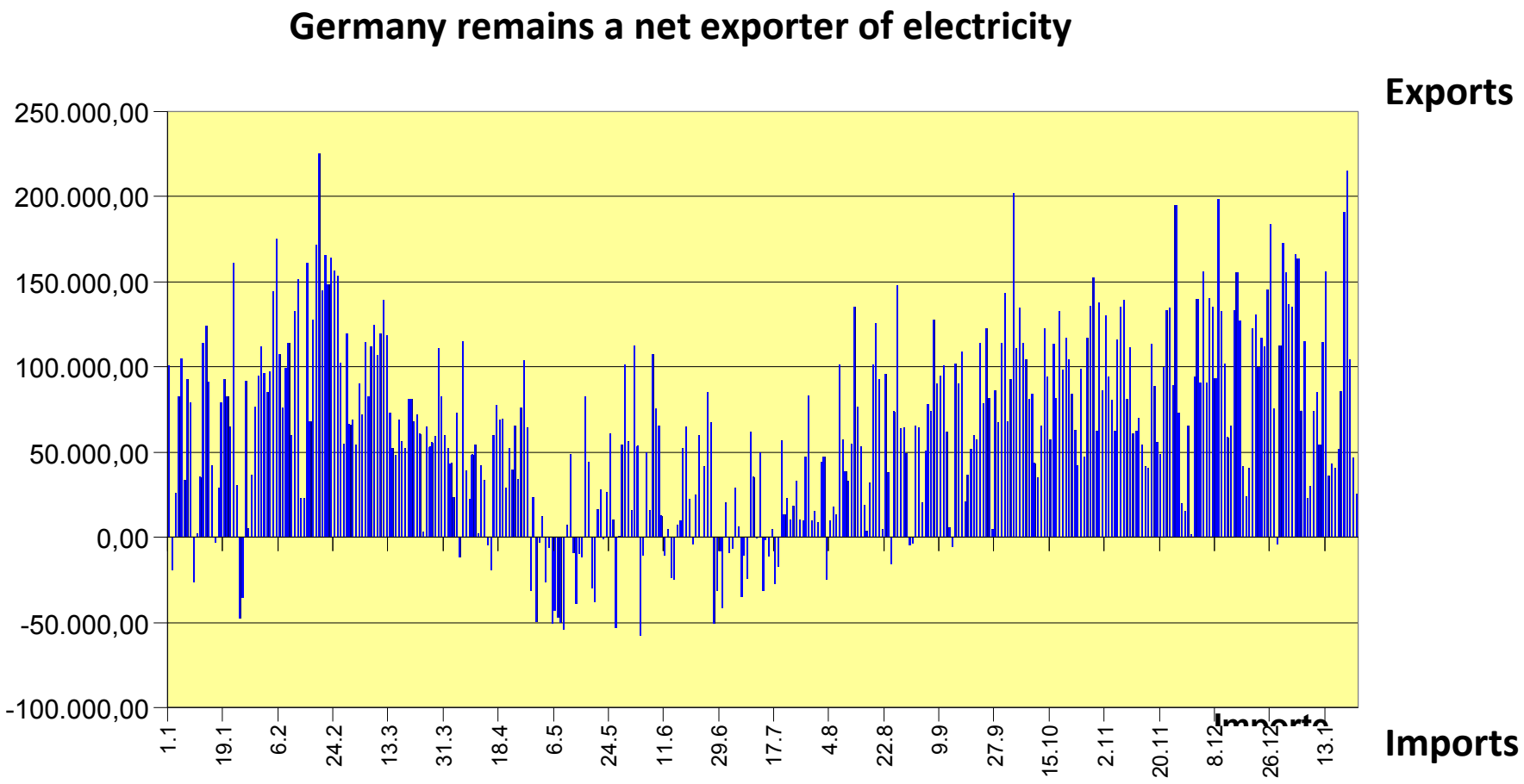
	2011	2015	2017	2019	2021	2022	total
Capacity taken off grid in MW	8.422 *	1.275	1.284	1.329	4.018	4.039	20.367

* 2.1 GW already removed from the grid since 2008

Source: UBA

Germany remains a net exporter of electricity

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety



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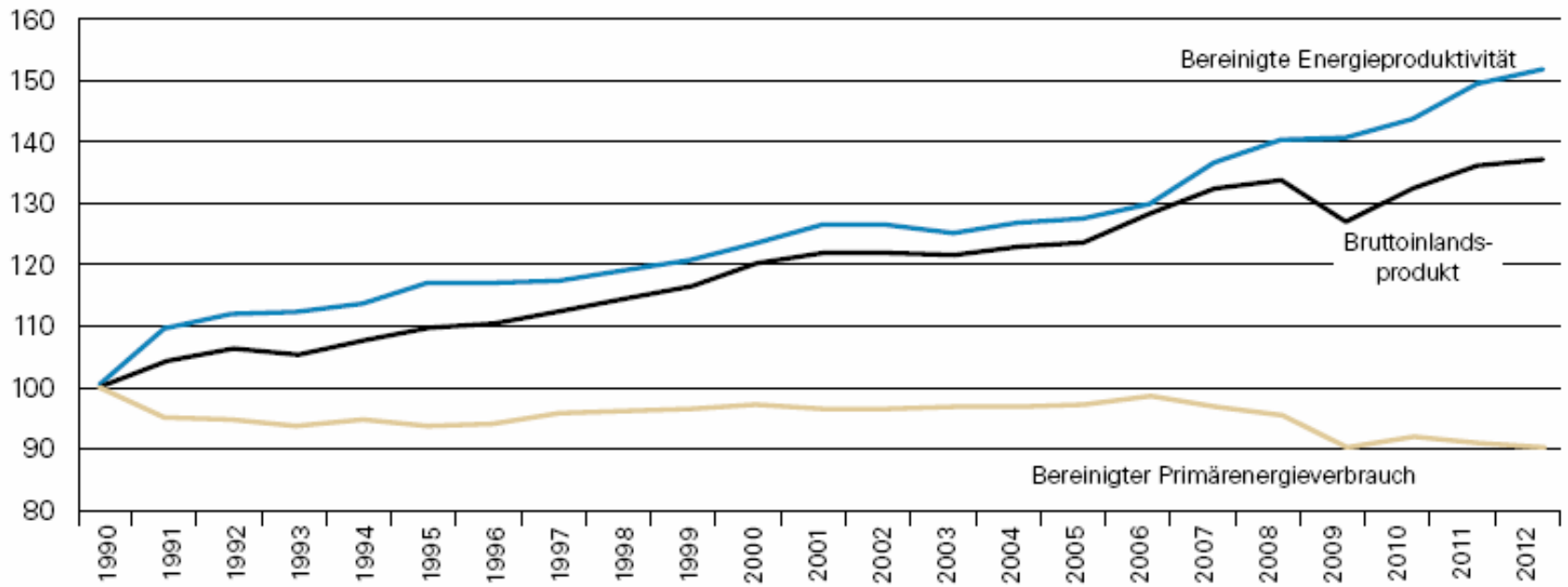
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Bruttoinlandsprodukt, Primärenergieverbrauch und Energieproduktivität in Deutschland 1990 bis 2012

1990 = 100

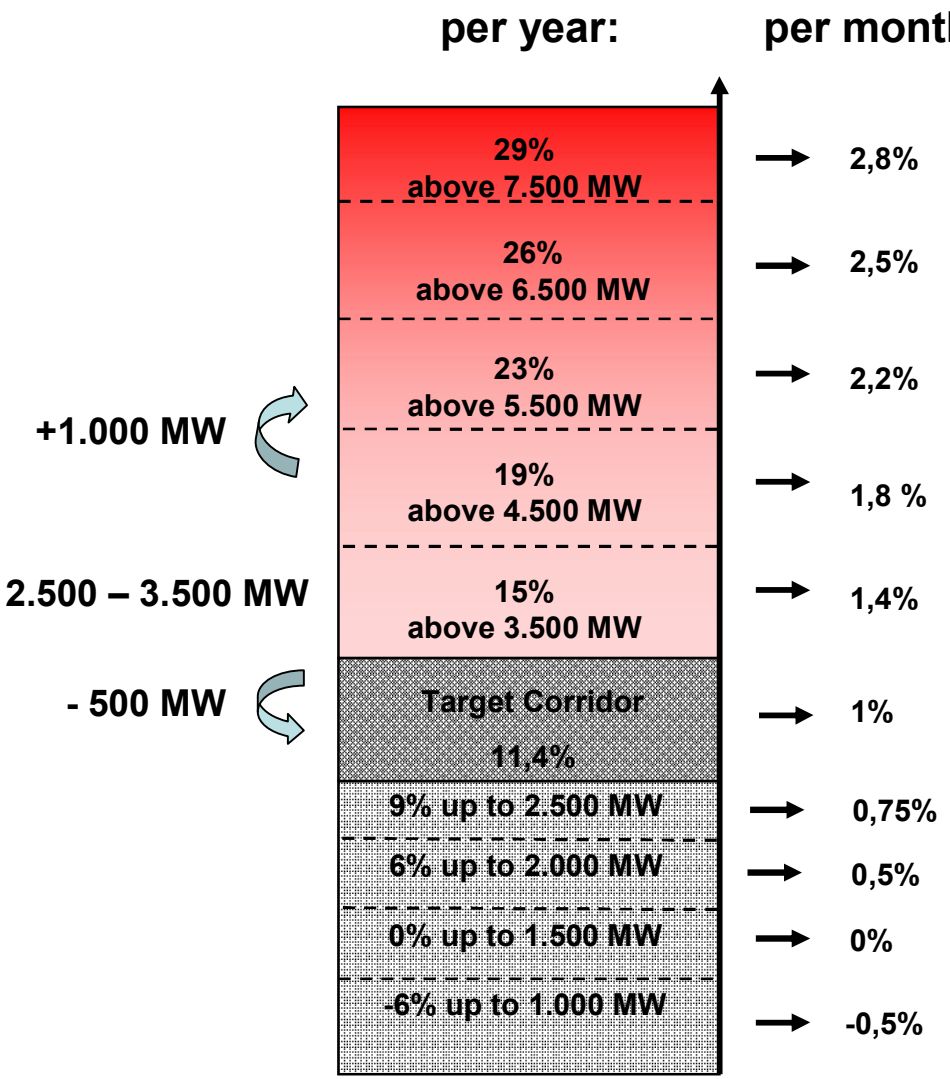
AGEB



Quellen: Statistisches Bundesamt; AG Energiebilanzen e.V.

EEG 2012 – Photovoltaic degression

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety



- Overall cap of 52 GW Solar PV: Expiration of EEG PV support
- But: continuation of priority feed-in

EEG 2012 – new PV tariffs (€ct/kWh)

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

start of operation	Installed Capacity Roof-Top				Free-Field-Installations	
	up to 30 kW	up to 100 kW	up to 1.000 kW	above 1.000 kW	conversion areas	others
as of 1.1.2012	24,43	23,23	21,98	18,33	18,76	17,94
	up to 10 kW	not applicable	up to 1.000 kW	above 1.000 kW, max 10 MW	all, max 10 MW	
as of 1.4.2012	19,50 (<10kW)	18,50 (< 40kW)	16,50	13,50 (up to 10MW)	13,50	
New! Market integration model	tariffs paid for x% of annual production			not applicable	not applicable	
	100% (<10kW)	90% (>10kW)				