BEE
Bundesverband
Erneuerbare Energie e.V.

Tokyo, 26th May 2015

Energiewende made in Germany

- Economic Value and Energy Security -

Dr. Hermann Falk
German Renewable Energy Federation (BEE)

Who are we?

BEE
Bundesverband
Erneuerbare Energie e.V.

We are **the voice of the renewable energy industry** in Germany.

We are **26 industry associations and organizations** of the hydropower, wind energy, solar energy, biomass and geothermal energy industry. We represent the interests of more than **30,000 single members**, among which **5,000 companies**.
German renewable energy industry stands for **380.000 jobs**.

Bundesverband WindEnergie e.V. | Bundesverband BioEnergie e.V. | Fachverband Biogas e.V. | GtV Bundesverband Geothermie | BSW Bundesverband Solarwirtschaft | AEV | BVMW Bundesverband mittelständische Wirtschaft | BVP | bsm | bwp Bundesverband Wärmepumpe e.V. | DGS | DEPV Deutscher Energieholz- und Pellet-Verband e.V. | EnergieVerein Forum für Energierecht, Energiepolitik und Erneuerbare Energien e.V. | FnBB e.V. | VDB Zukunft tanken. | WFG Wirtschaftsforum Geothermie | WVW Wirtschaftsverband Windkraftwerke e.V.

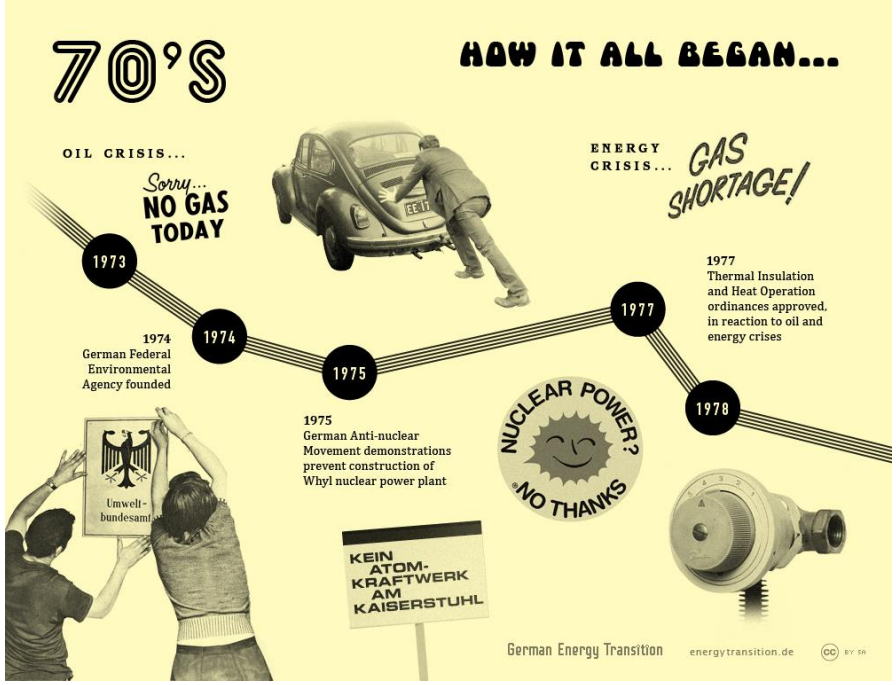
Bundschuh-Biogas-Gruppe e.V. (BBG) | Förderkreis Biogas e.V. | OWAG Ostbayrische Windanlagen GbR | Verband Deutscher Biomasseheizwerke e.V. | Windenergie Nordeifel e.V.

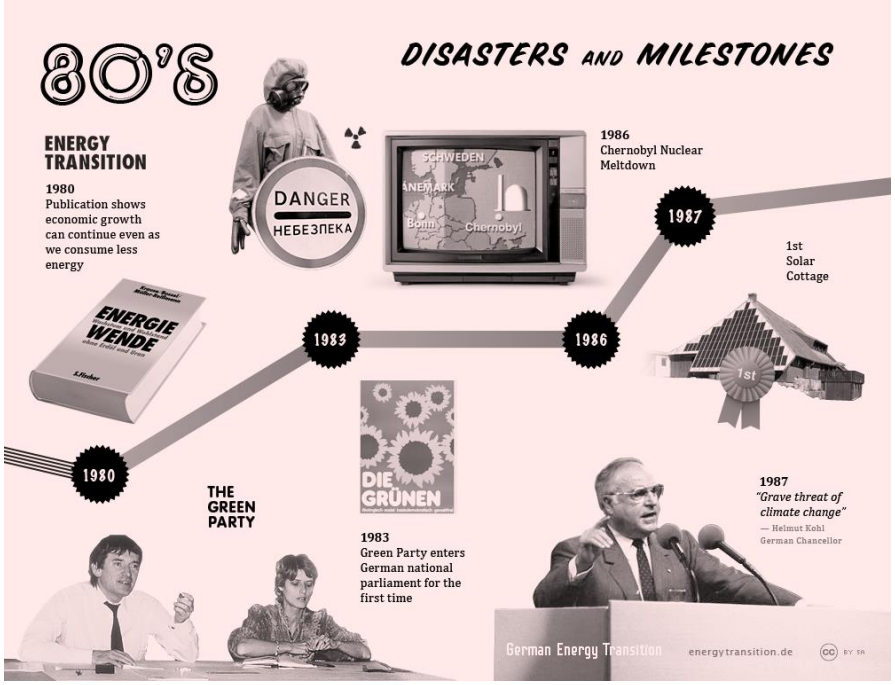
Agenda

1. The “Energiewende”
2. Benefits of the Transformation
3. Challenges of the Transformation

The History of the „Energiewende“ (1 I 3)

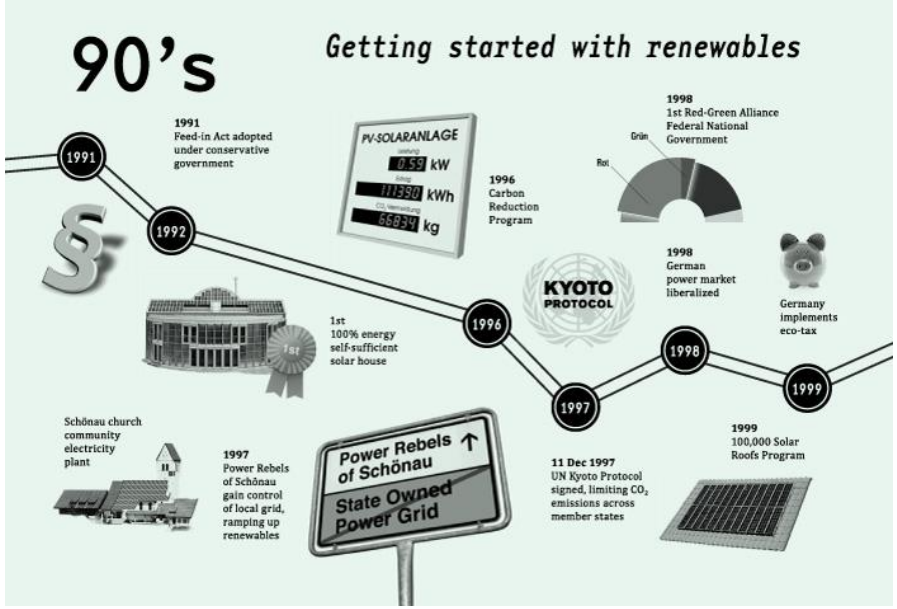
BEE Bundesverband Erneuerbare Energie e.V.

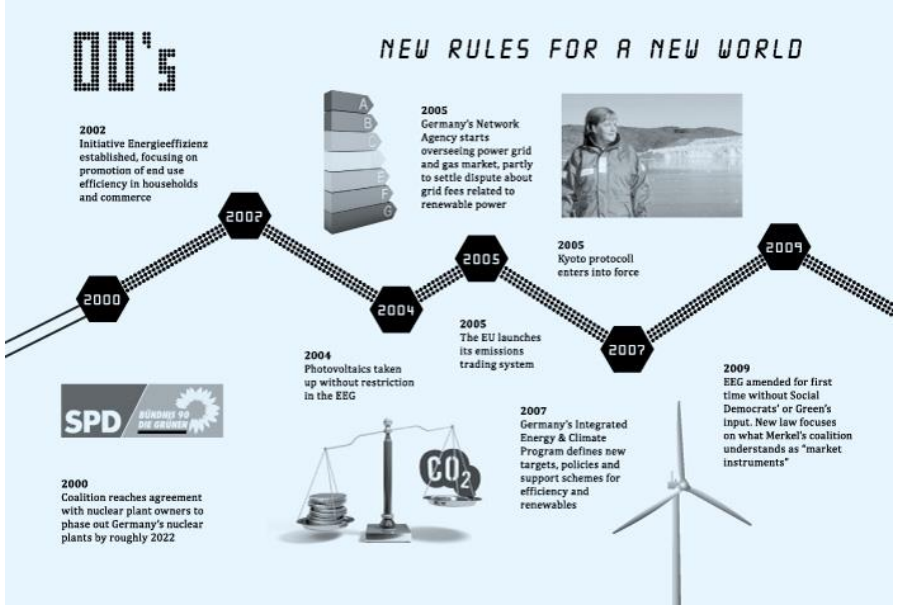




The History of the „Energiewende“ (2 I 3)

BEE Bundesverband Erneuerbare Energie e.V.





The History of the „Energiewende“ (3 I 3)

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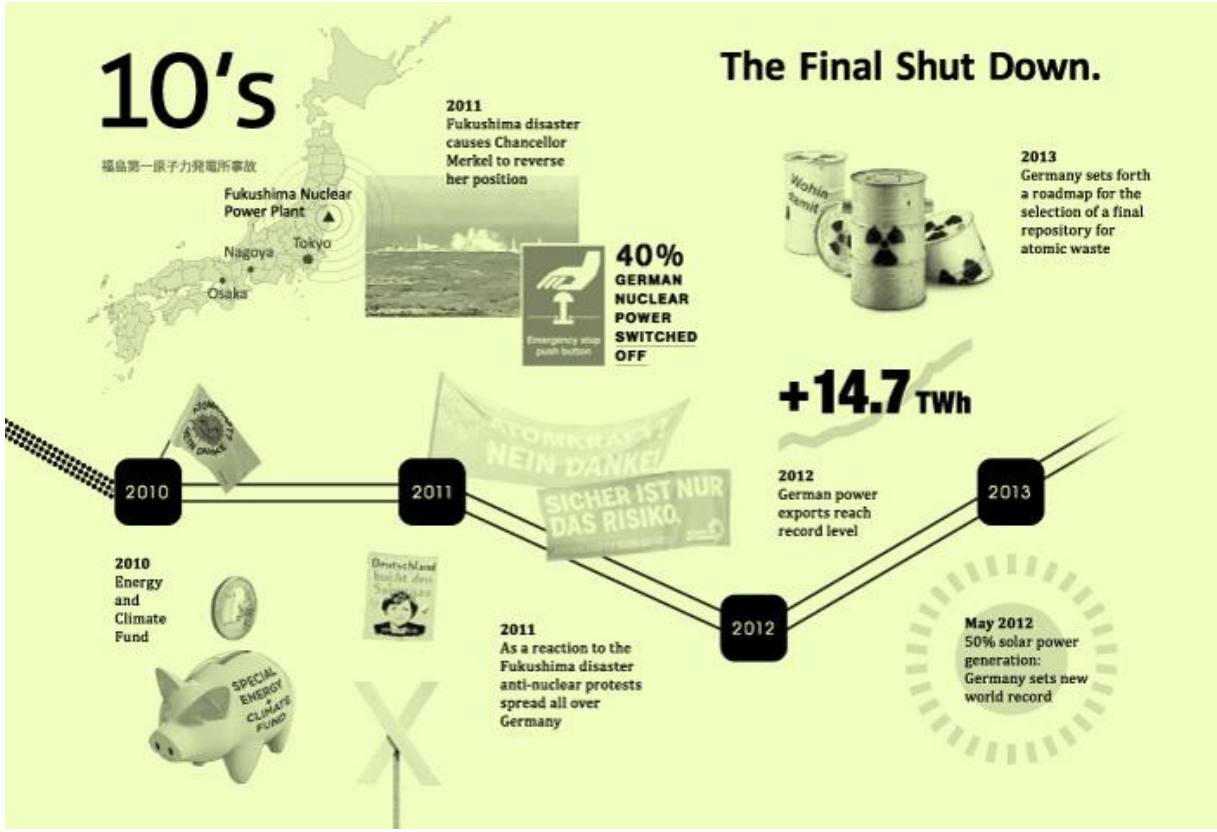

The “Energiewende”

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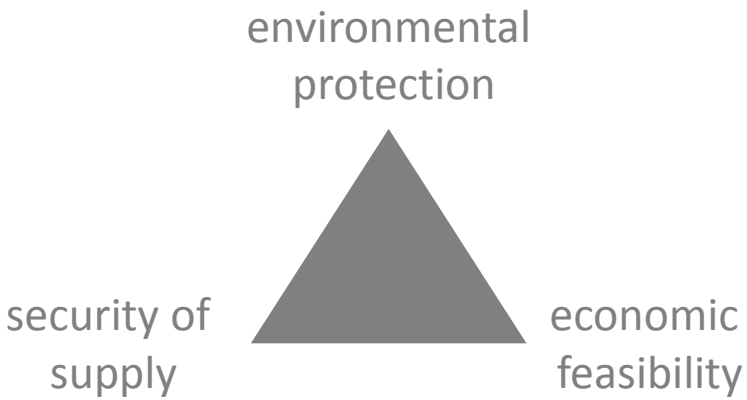
Only with a significant expansion of RES the climate policy objectives in Germany will be achievable



- 80 to -95% CO2 →2050

→ **A power supply with 100% RES is possible by 2050, even earlier in the electricity sector**

The “Energiewende”

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German Climate and Energy Goals

- 40% less **greenhouse emissions** until 2020, 80 – 95% less until 2050 (in comparison to 1990)
- 18% **renewable energy share** of **final energy consumption** until 2020, 60% until 2050
- 40-45% **renewable energy share** of **electricity production** until 2025, 55-60 % until 2035
- **reduction of primary energy consumption** by 20% until 2020, 50% until 2050 (in comparison to 2008)
- 10% **less electricity demand** until 2020 and even 25% until 2050 (in comparison to 2008)
- **doubled energy efficiency** by 2020 compared to 1990
- **renewable heat**: 14% share by 2020

→ Germany’s emission reduction targets exceed those of the EU!

The “Energiewende”

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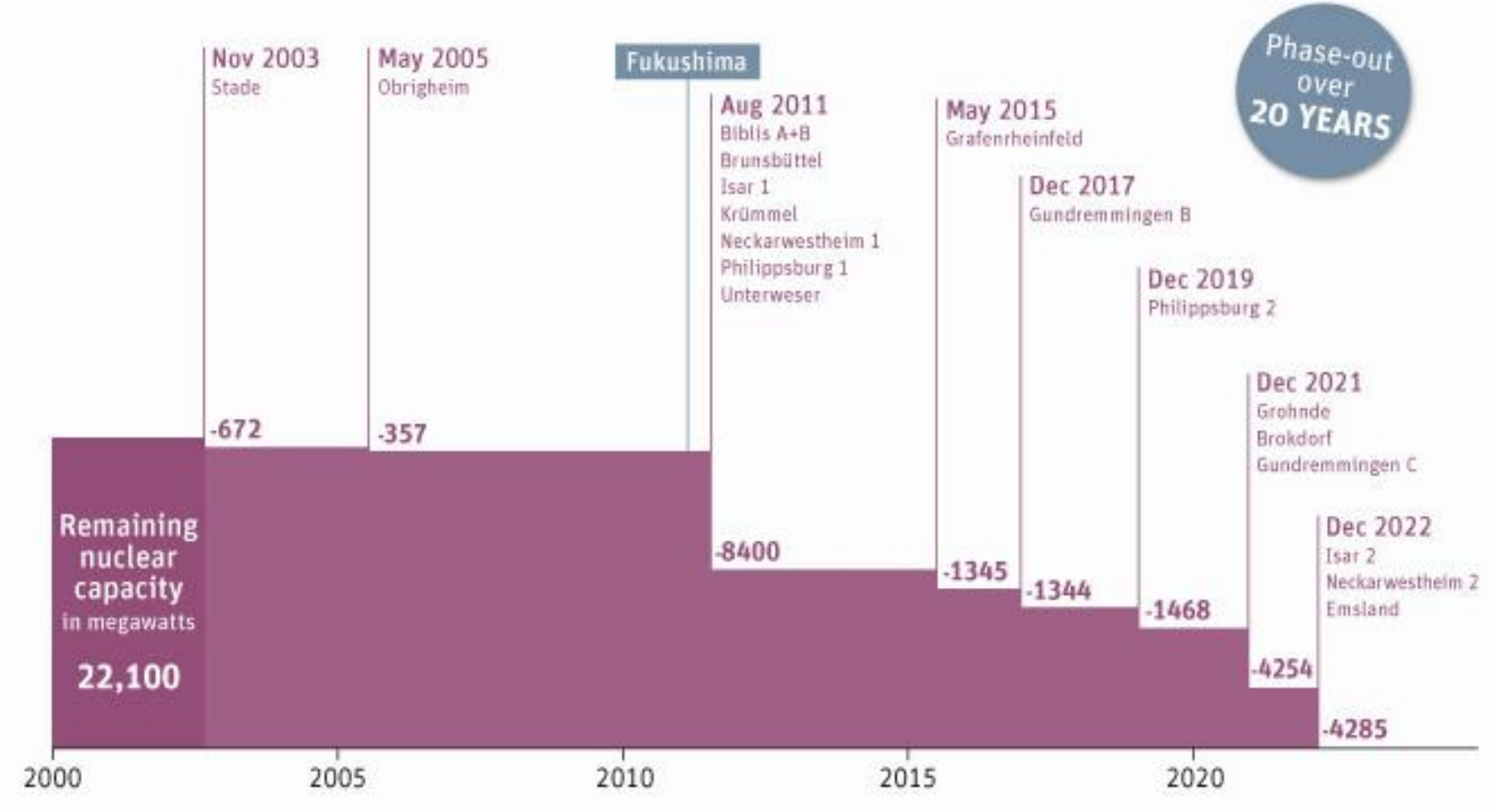
Germany is gradually shutting down all nuclear power plants

Declining nuclear energy installed capacity in Germany, 2000-2022



The “Energiewende”

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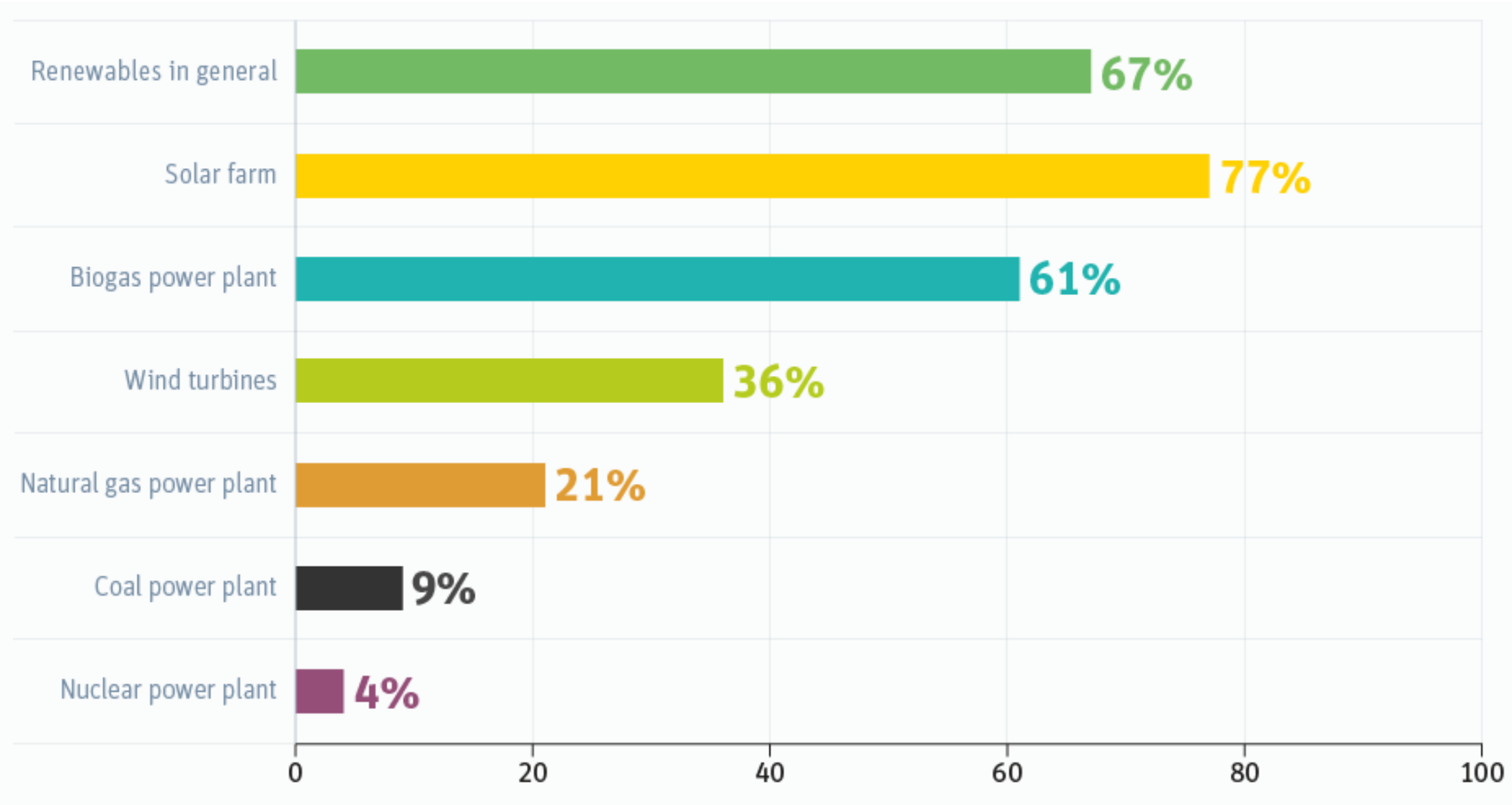
RES have broad support in Germany

Share of Germans who “like” or “like a lot” living close to power generation, Oct 2012



source: Heinrich Böll Stiftung 2013, AEE; energytransition.de

The “Energiewende”

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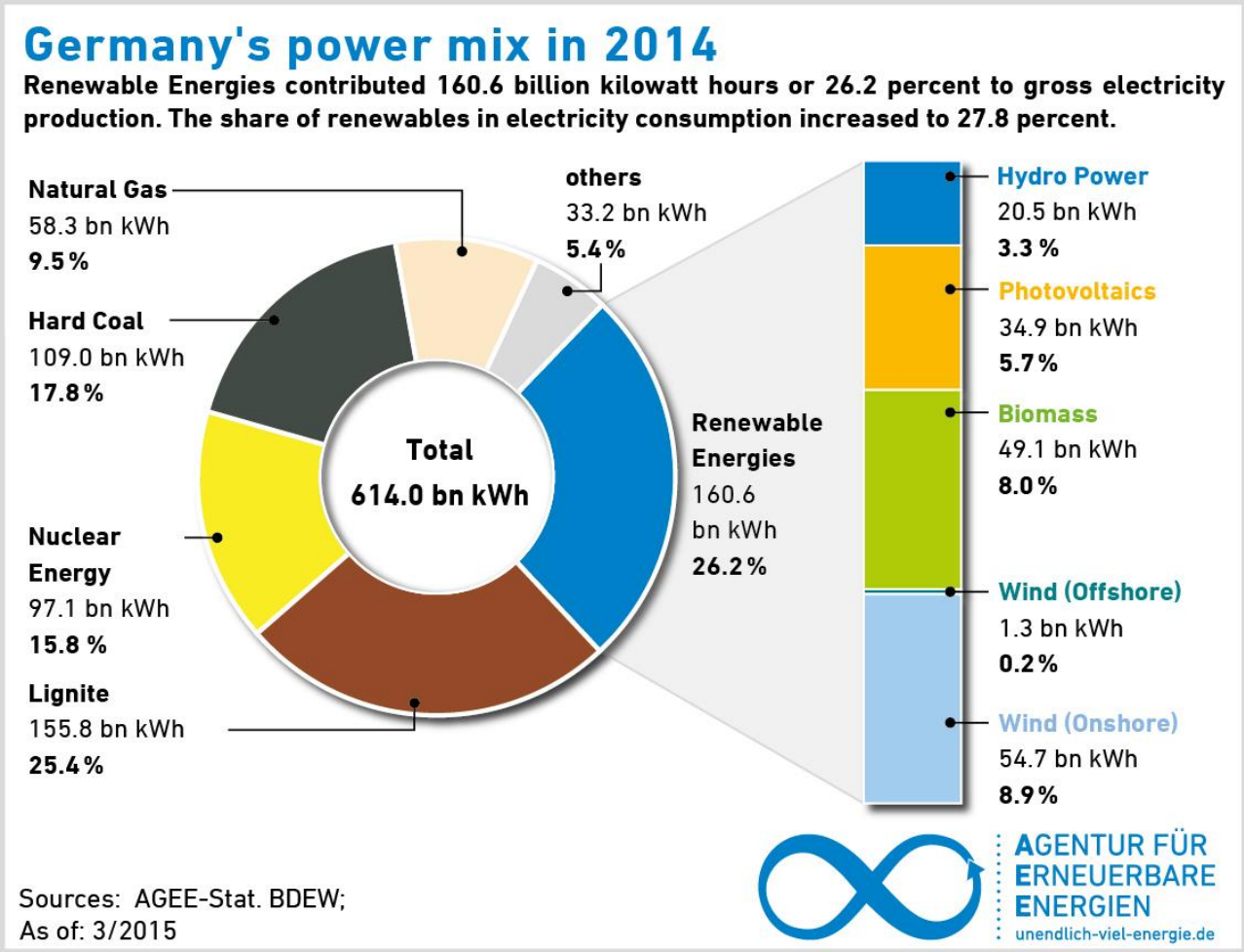
The RES in Germany are now a strong and growing pillar



The “Energiewende”

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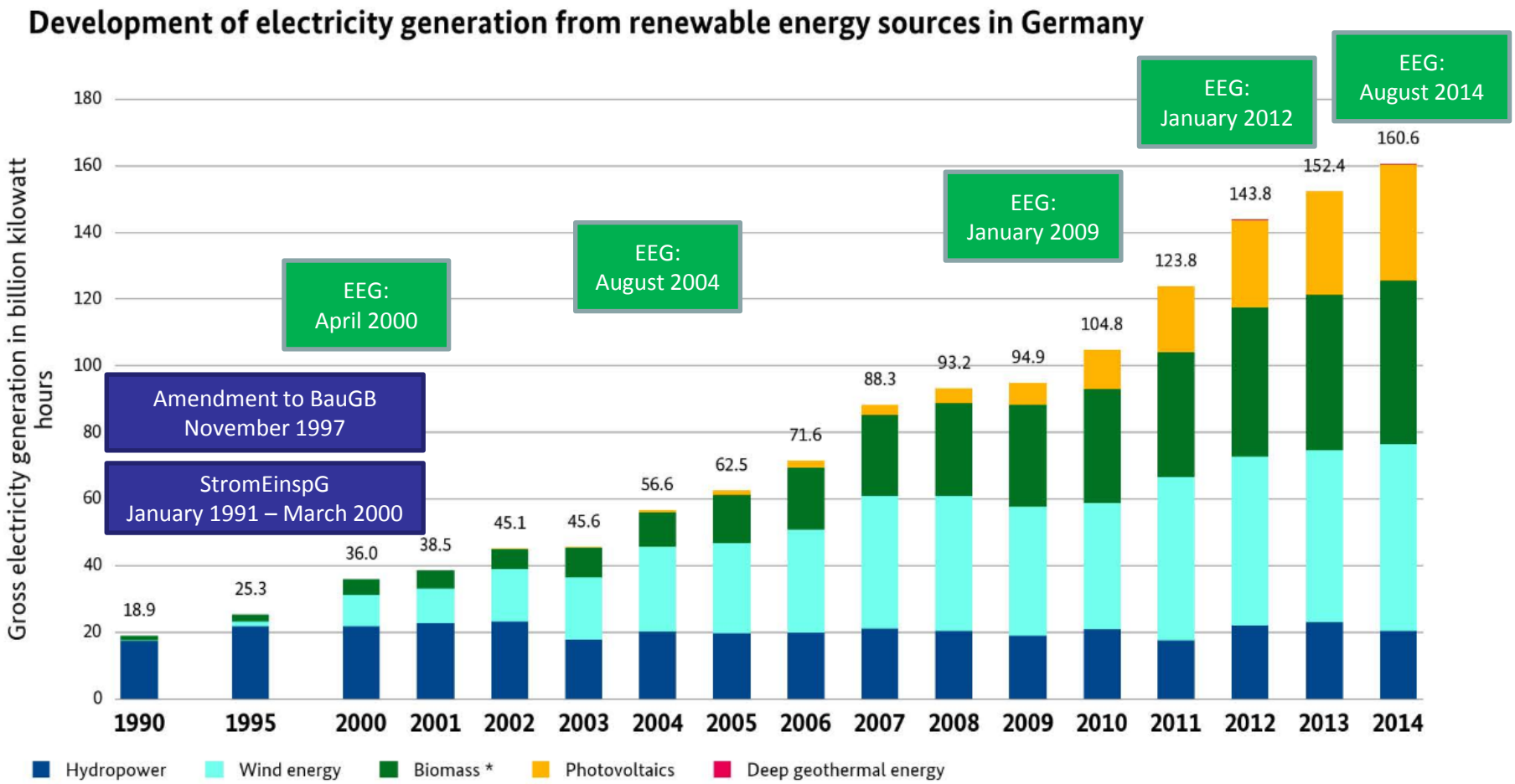

* incl. solid and liquid biomass, biogas, biomethane, sewage gas and landfill gas as well as the biogenic fraction of waste, from 2013 incl. sewage sludge; BMWi based on Working Group on Renewable Energy-Statistics (AGEE-Stat); as at February 2015; all figures provisional

Adapted from „Renewable Energy Sources in Germany 2014“, BMWi, 2015

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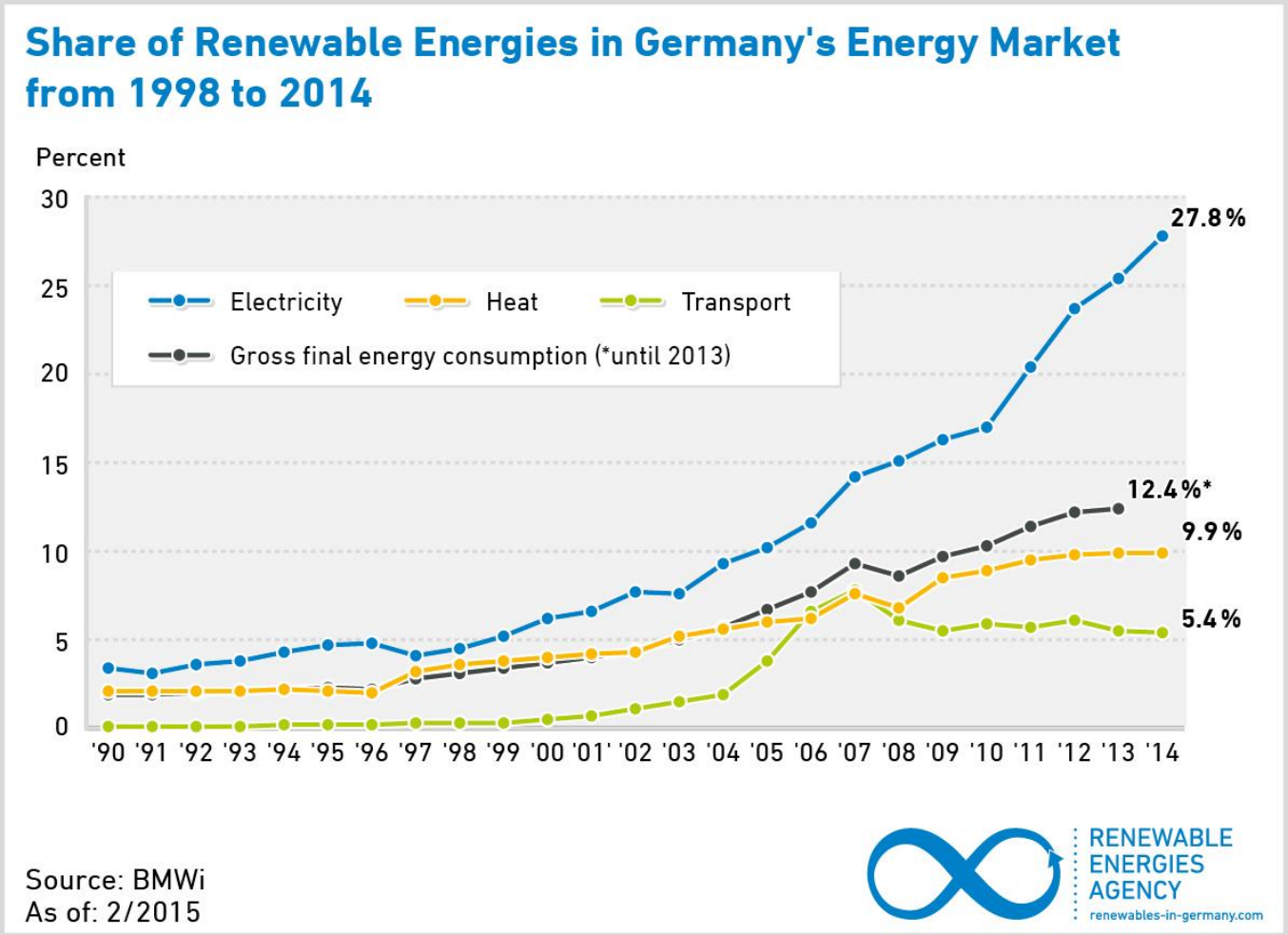

The “Energiewende”

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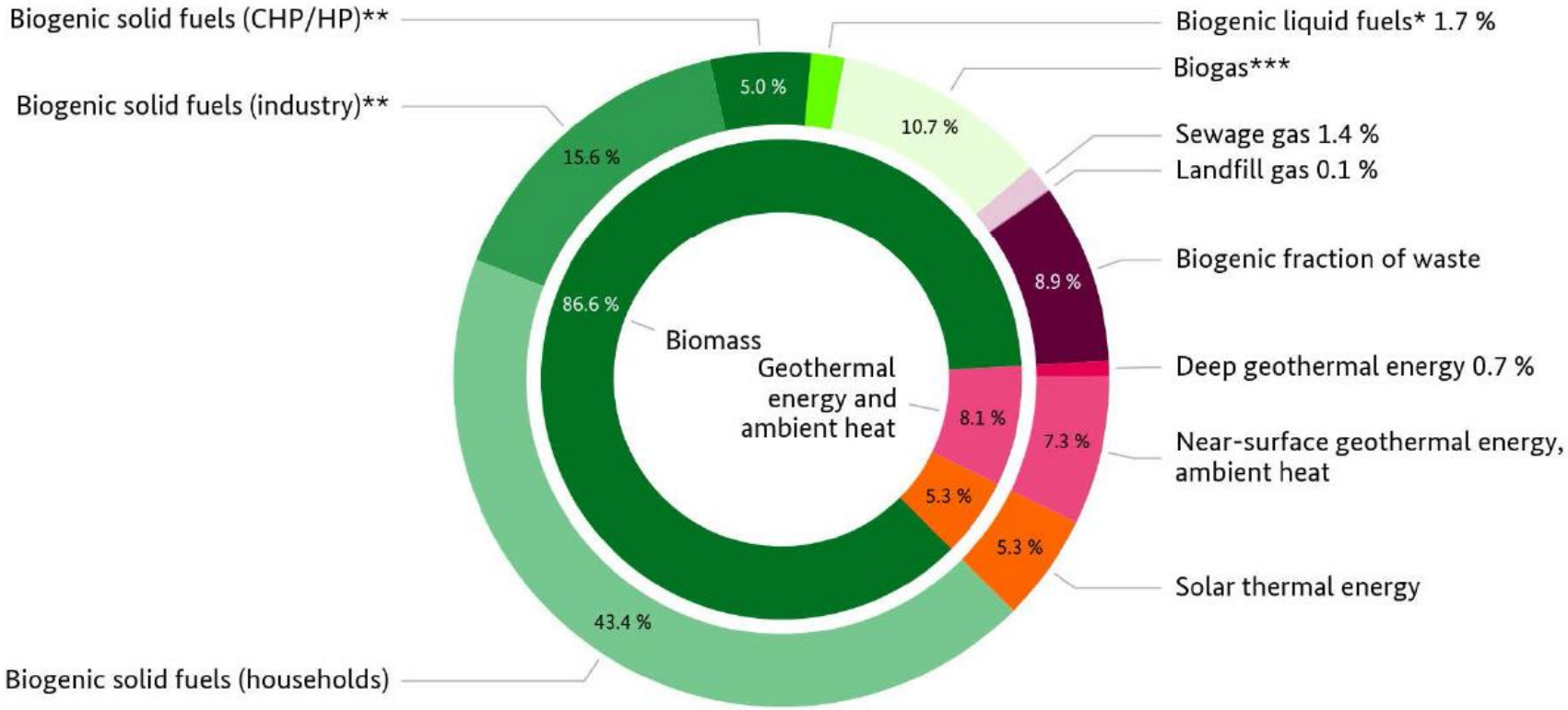
Renewables-based heat consumption in Germany 2014
Total: 130.9 billion kilowatt hours



* incl. biodiesel used in farming, ** incl. biogenic share of waste, *** biogas, biomethane, sewage gas and landfill gas; BMWi based on Working Group on Renewable Energy-Statistics (AGEE-Stat); as at February 2015; all figures provisional

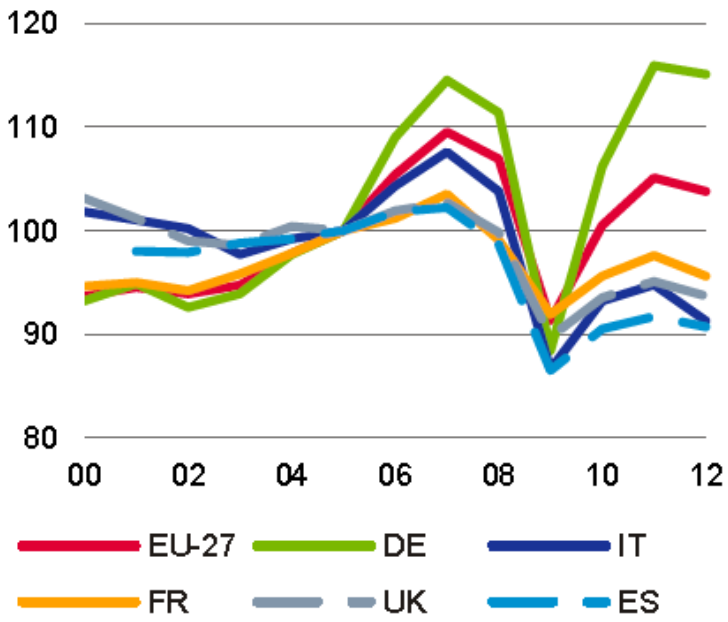
Adapted from „Renewable Energy Sources in Germany 2014“, BMWi, 2015

Industrial added value:
D 26 %, USA 13 %, EU 17 %

Deutschland zieht EU-Durchschnitt nach oben

2

Reale Bruttowertschöpfung im Verarbeitenden Gewerbe, 2005=100

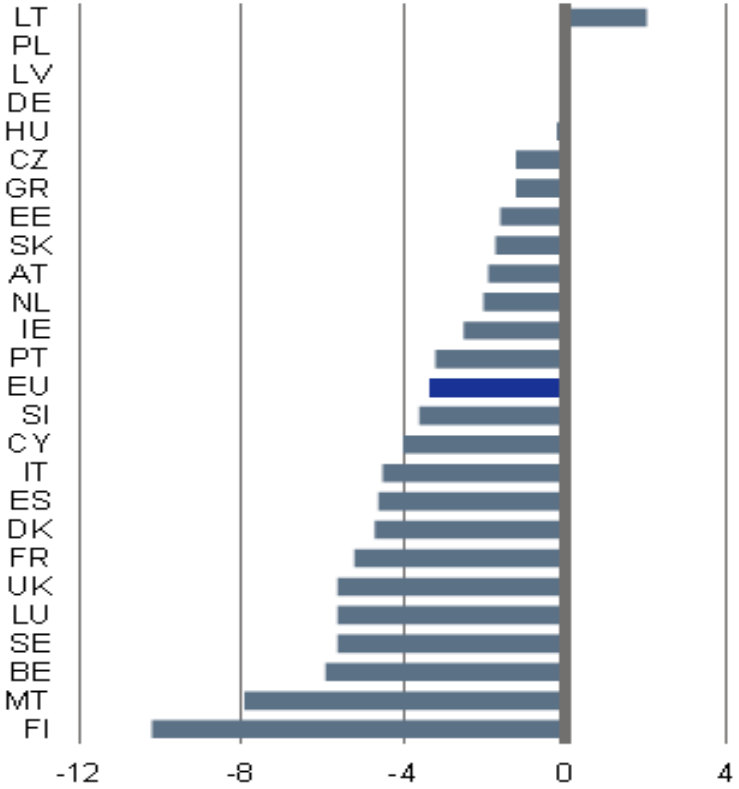


Quelle: Eurostat

Industrieanteil legt nur in wenigen Ländern zu

5

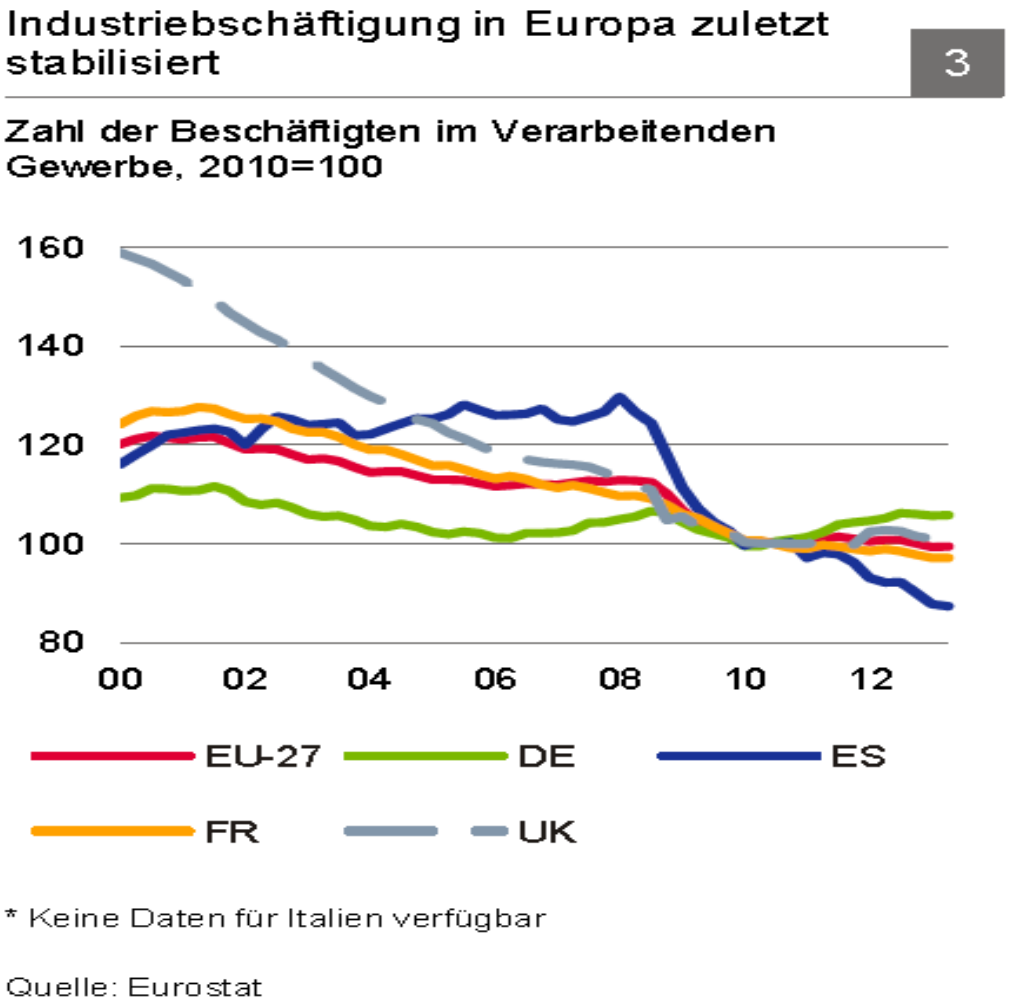
Veränderung des Anteils des Verarbeit. Gewerbes an gesamter BWS, 2012 gg. 2000, %-Punkte



Quelle: Eurostat

Source: Deutsche Bank DB Research 2013 basierend auf Eurostat

German industry employment is most stable



Source: Deutsche Bank DB Research

RES create more jobs than conventional energy does

Bundesverband Erneuerbare Energie e.V.

Employment in Germany in renewable and conventional energy sectors, 2005-2011

A thorough study of the German market estimates a net job creation of around 80,000, rising to 100,000 – 150,000 in the period from 2020 to 2030

source: Heinrich Böll Stiftung 2013,BMU/BMWi; energytransition.de

Right direction I

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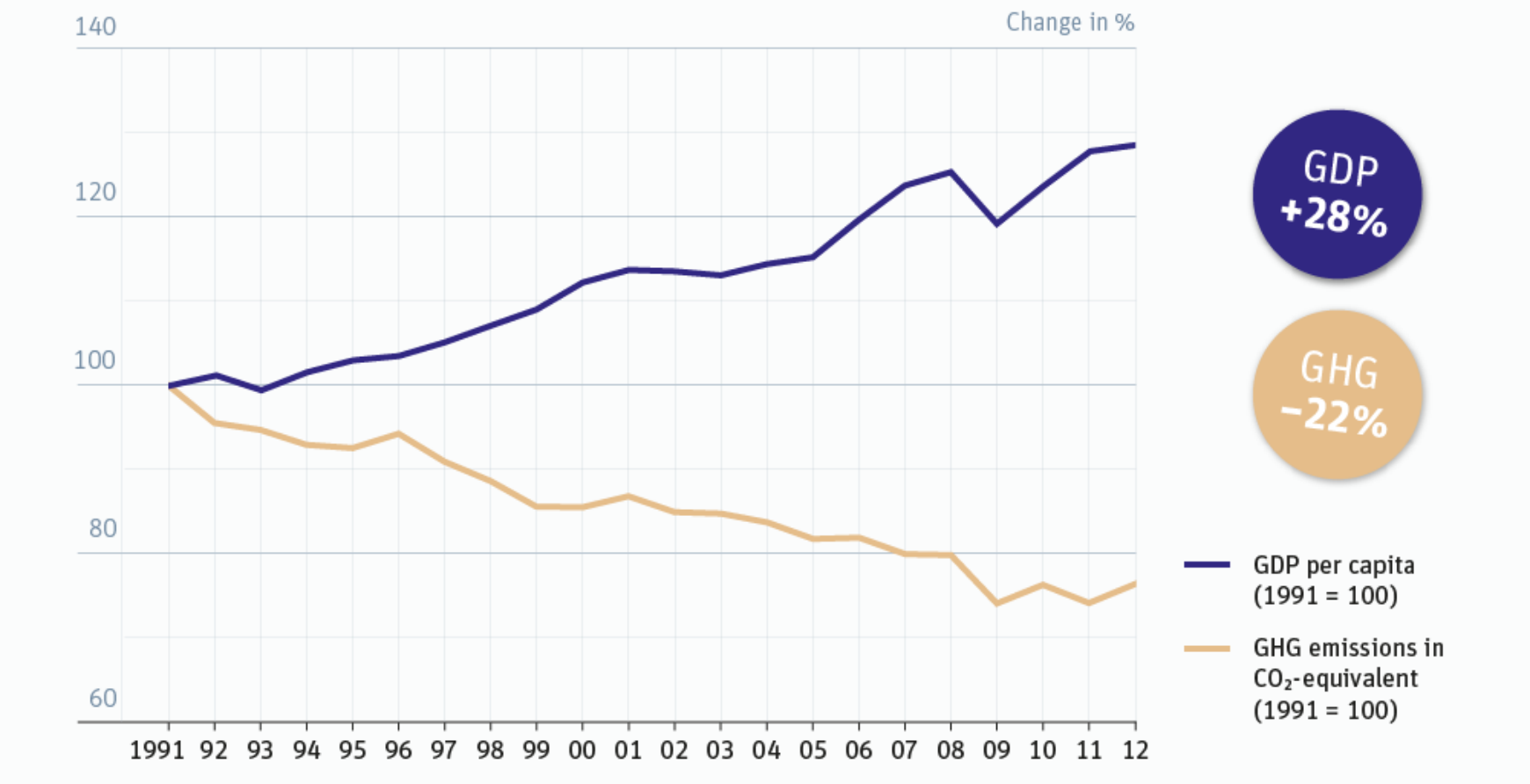
Germany: growing economy, declining emissions



Source: Heinrich Böll Stiftung 2013, BMU, BMWi, Destatis; energytransition.de

Right direction II

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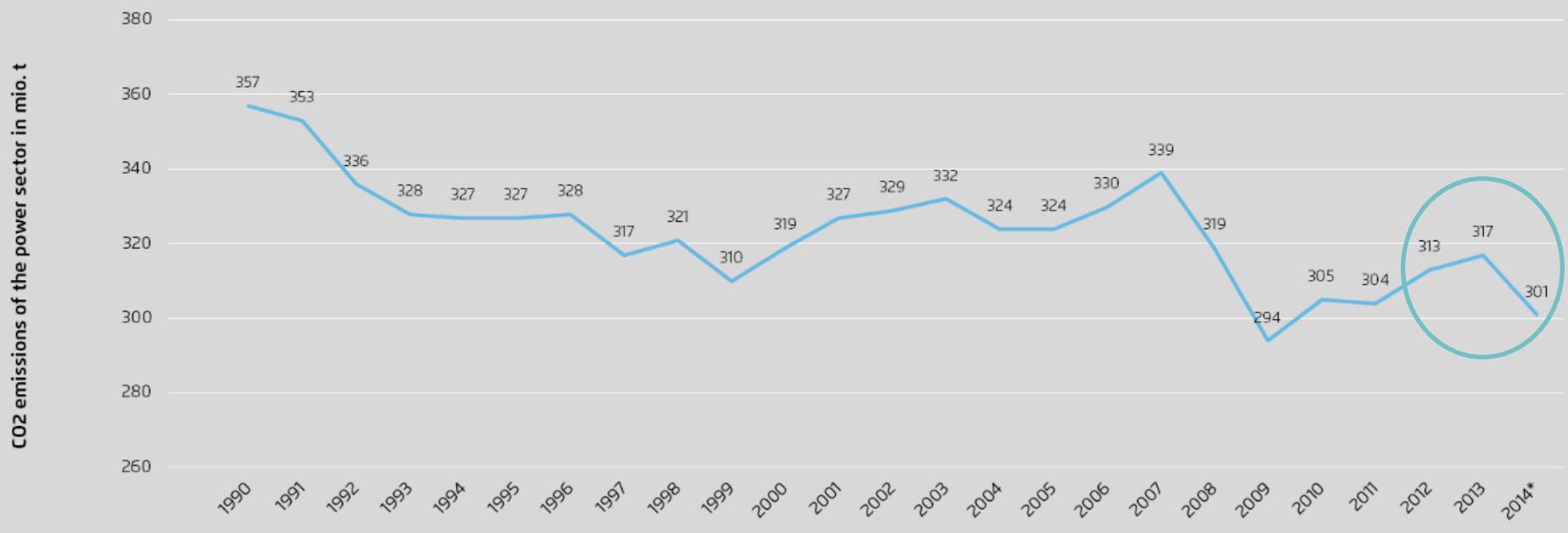
German CO_2-emissions in the power sector are still decreasing



Source: The Energiewende in the Power Sector : State of Affairs 2014, Agora Energiewende, 2015

Agenda

1. The “Energiewende”
2. Benefits of the Transformation
3. Challenges of the Transformation

Benefits of the Transformation

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The main benefits are…

- more climate protection with more RES
- more technological Innovations
- more support by the public
- more electricity generation in citizens' hands and more competition
- more jobs
- more energy security by less imports

Benefits of the Transformation

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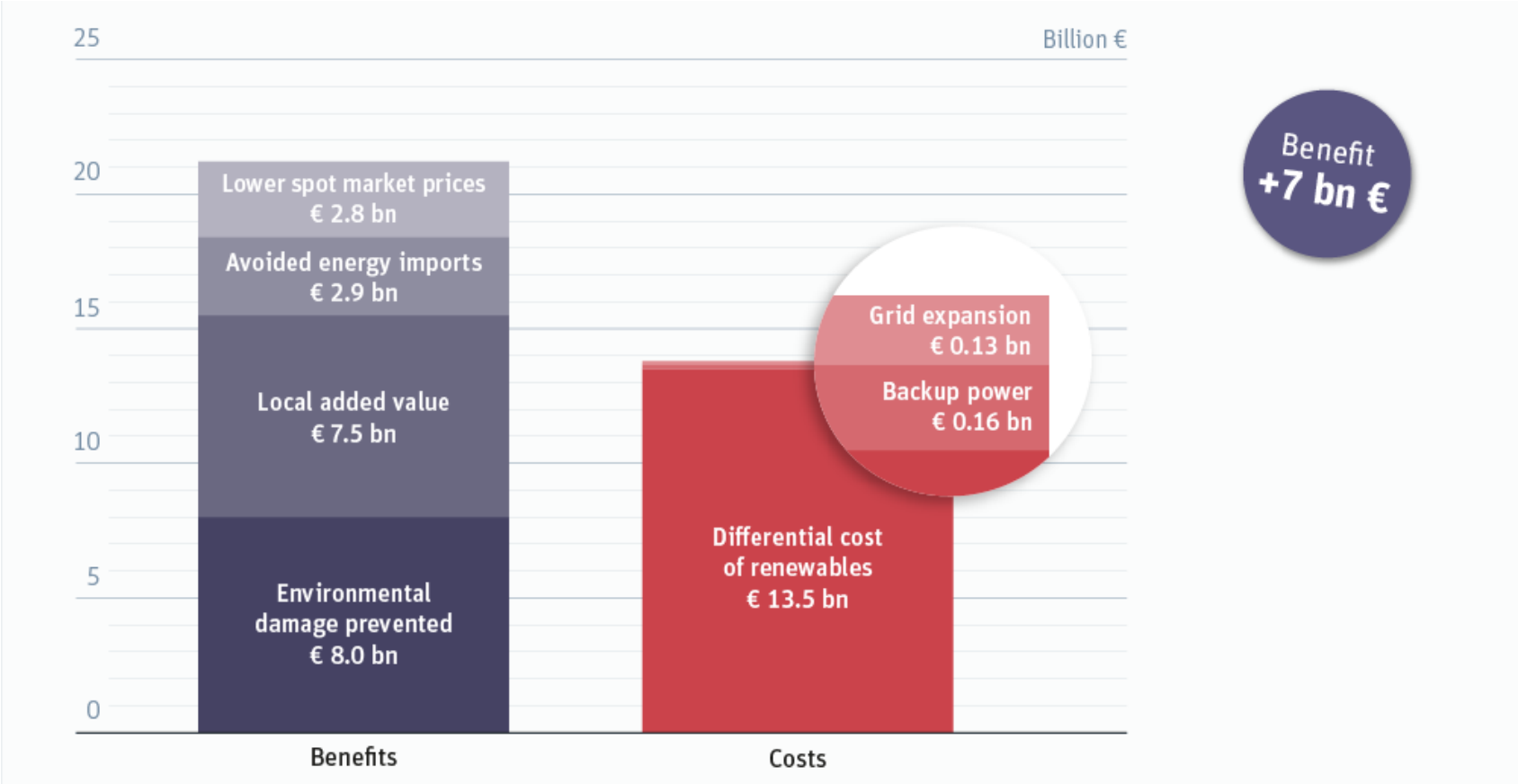
RES save Germany more than 7 billion euros per year

Costs and benefits of RES in energy use, Germany 2011



source: Heinrich Böll Stiftung 2013, AEE; energytransition.de

Benefits of the Transformation

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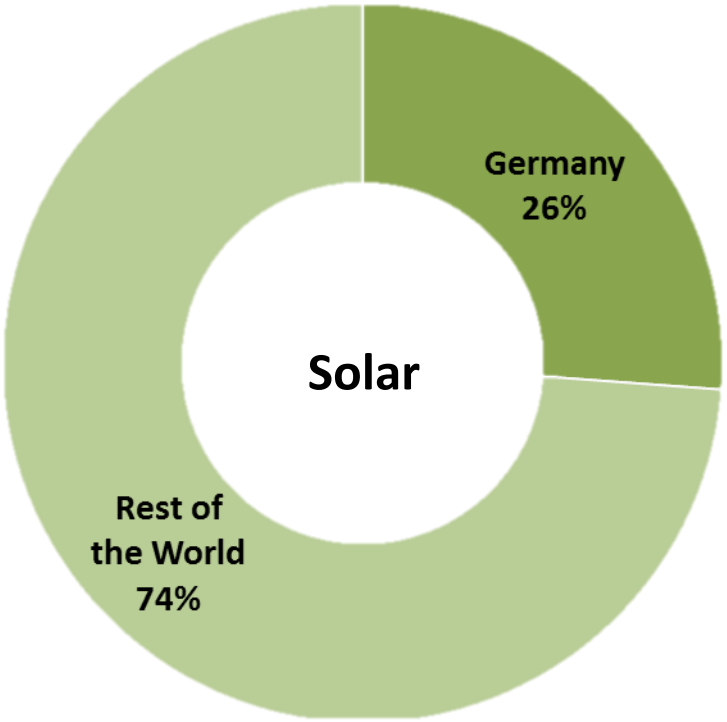
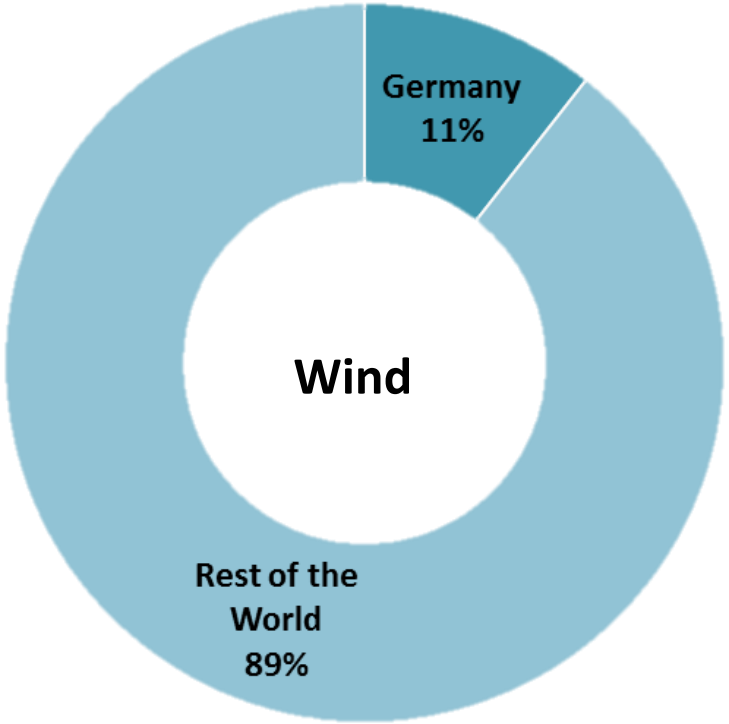
Germany is a global leader in wind and solar

Solar and wind operating capacity, Germany and rest of world, 2013





Sources: EPIA, BMWi, windmonitor.de, WWEA, own visualization

Benefits of the Transformation

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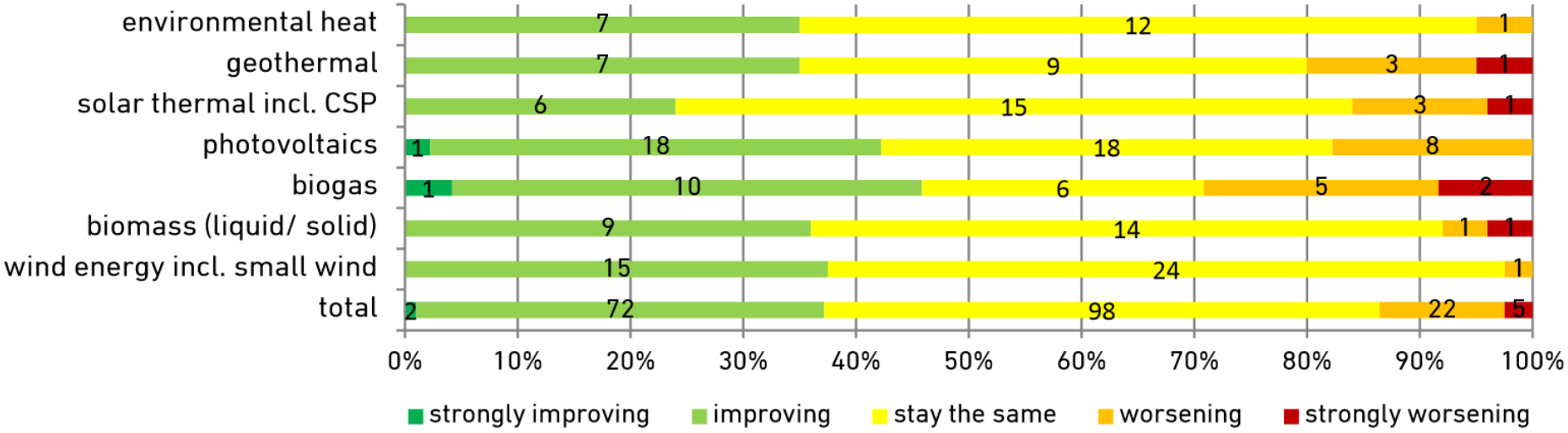
Export climate in the renewable energies sector - Business expectations for the next six months



Source: German Energy Agency (dena), 2014
absolute numbers and percent, interviews from Oct. 2014

Benefits of the Transformation

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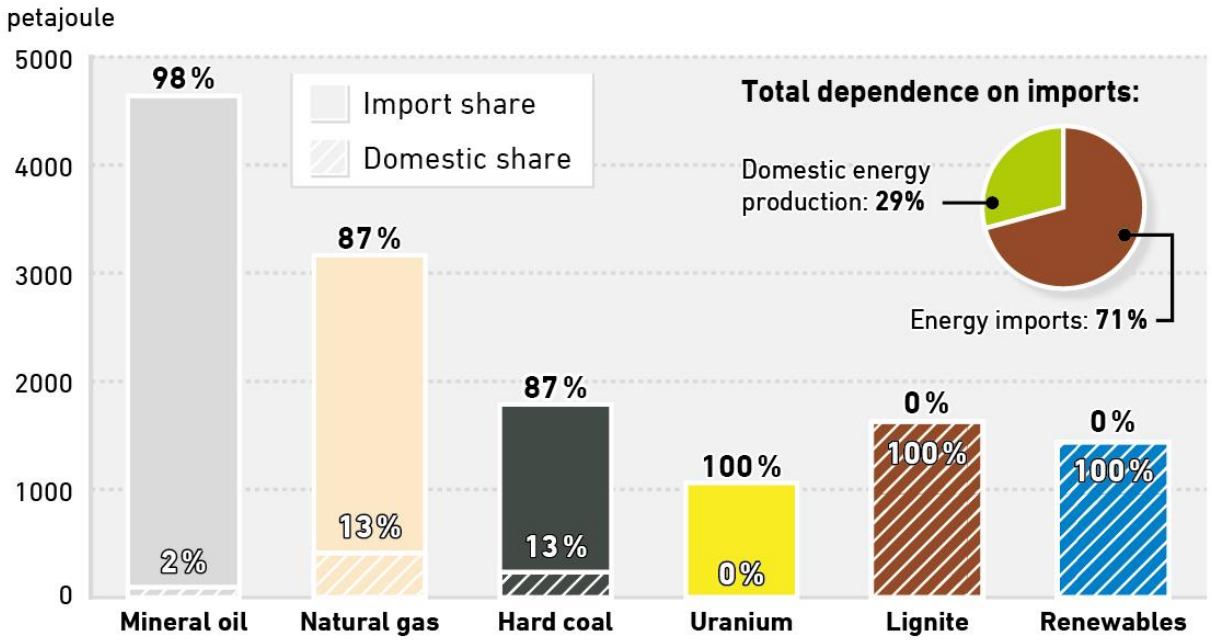
Primary energy consumption and dependence on imports of Germany's energy supply in 2013

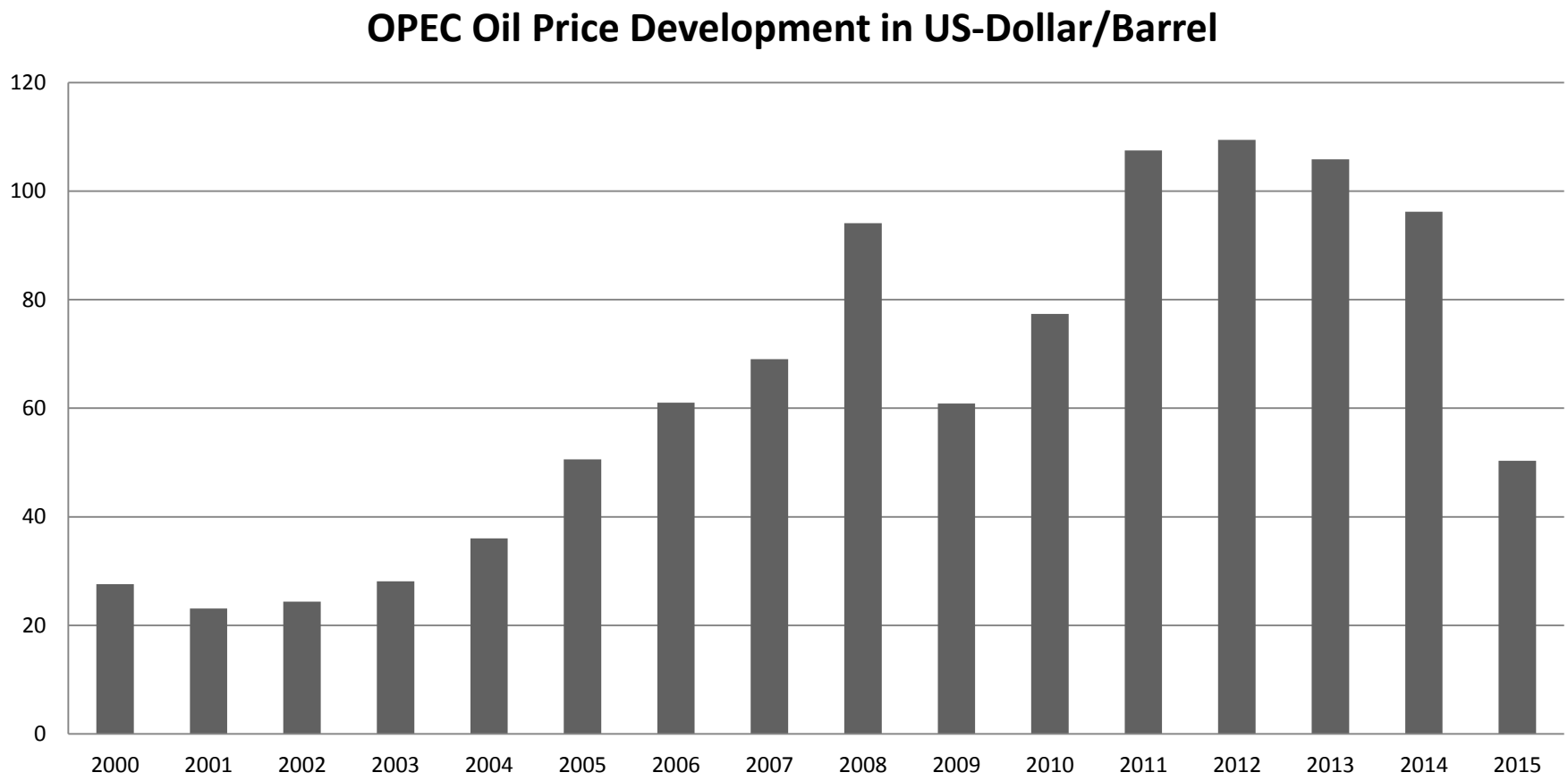
71 percent of the total primary energy consumption (13,828 petajoules) were imported.



Source: BMWi
As of: 8/2014

RENEWABLE ENERGIES AGENCY
renewables-in-germany.com

Renewables increase security of supply



Sources: OPEC, IEA, own visualization

Regional value from RE

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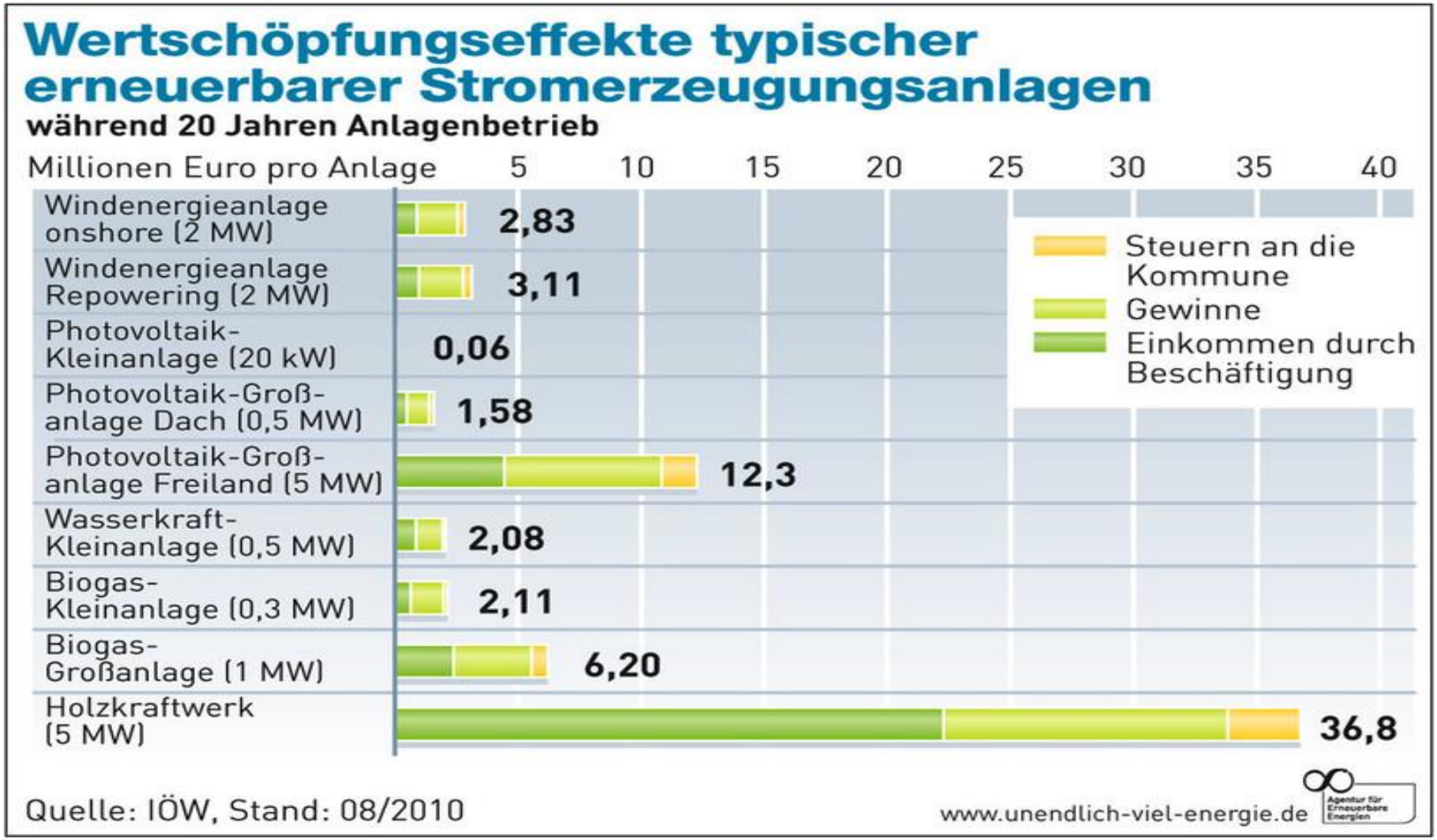

Agenda

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1. The “Energiewende”
2. Benefits of the Transformation
3. Challenges of the Transformation
    a. Costs and Prices
    b. Grid stability and Storage
    c. Acceptance and Participation

Total costs for Energiewende

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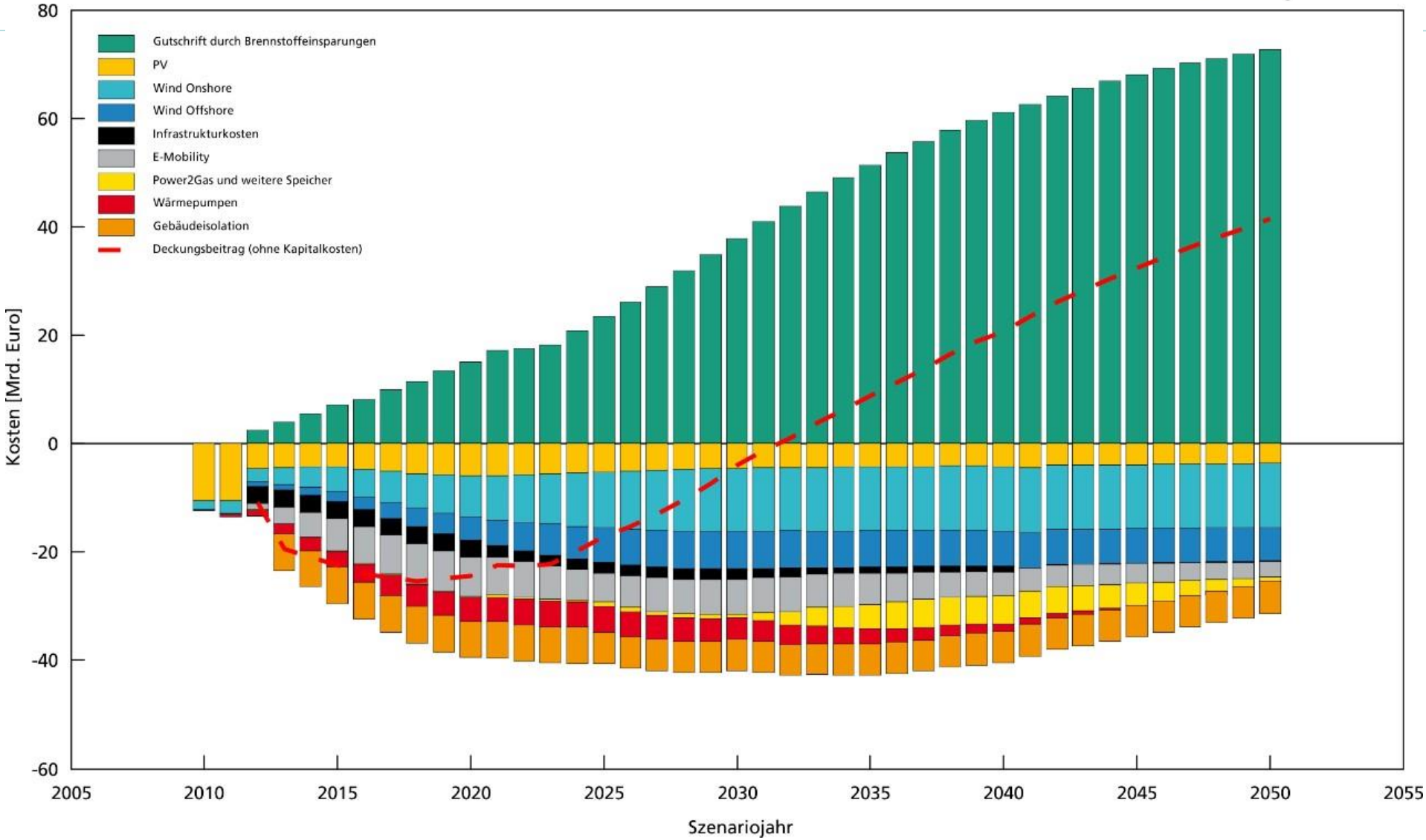
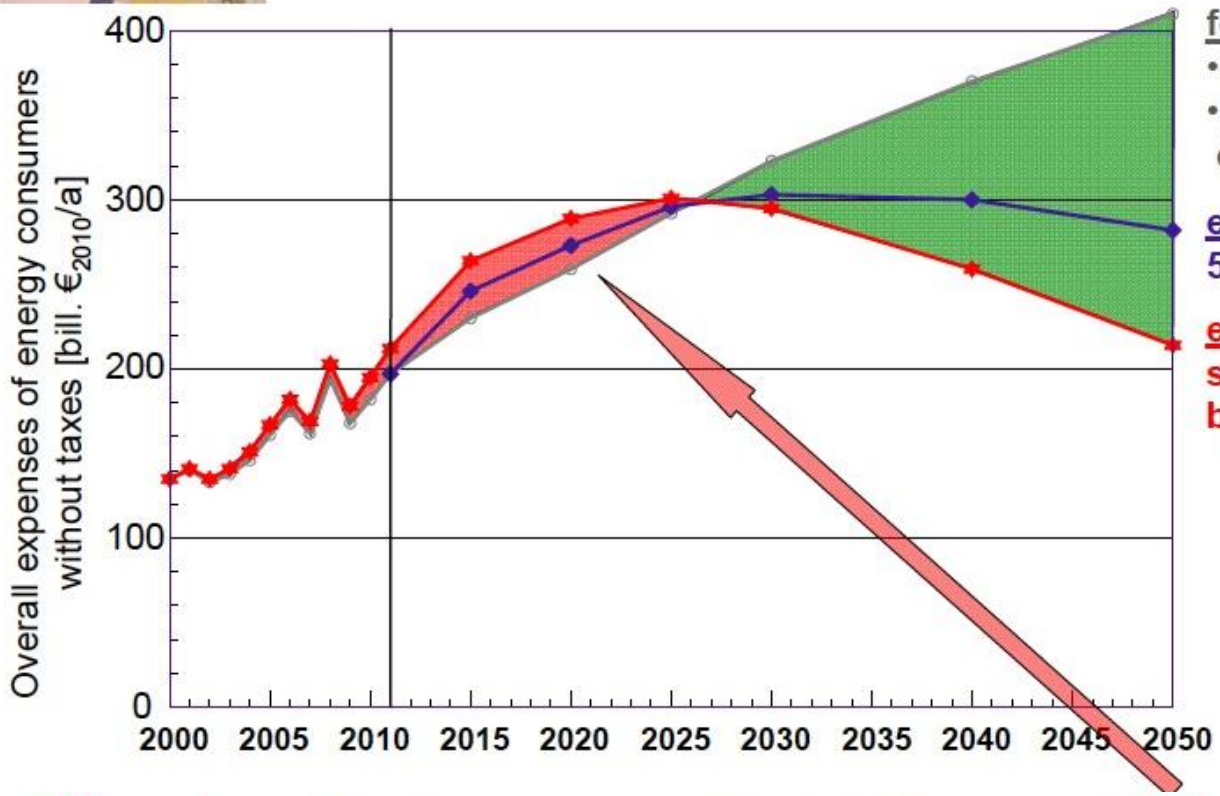


Return of Investment



forward projection of status quo:
- constant energy consumption
- no additional investment for energy effiency and renewable energy

energy transition, part 1
50% reduction of energy consumption

energy transition, part 2
substitution of fossil energy carriers by renewable energy

→ The extra cost for the energy transition is in the range of 5% to max. 8% of total energy expenses and will be needed until about 2025 (total: about 300 bill. €).

→ In the longterm this is profitable against a forward projection of the status quo.

Slide courtesy F. Staiss 2013, based on data from BMU

Challenges of the Transformation

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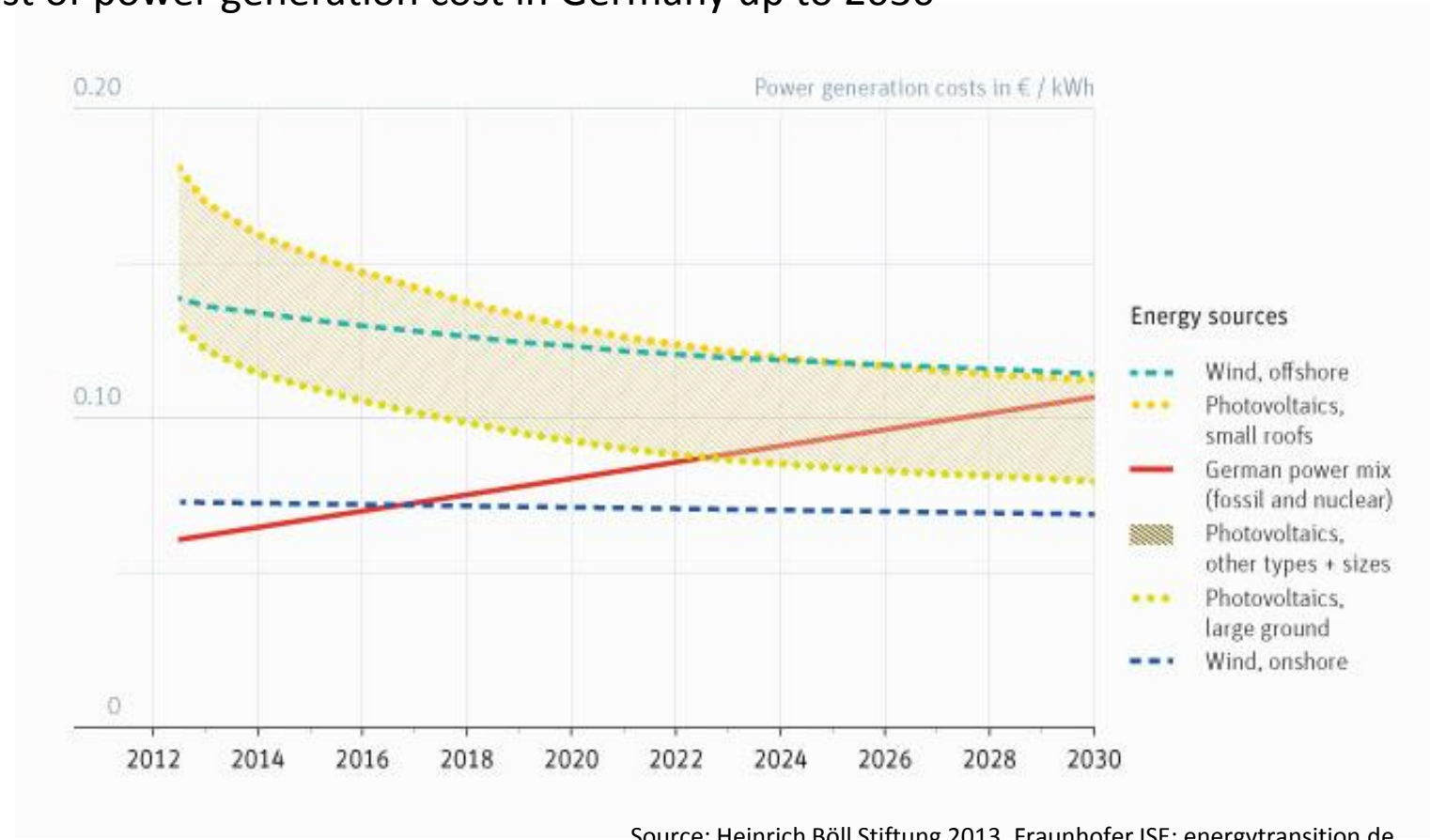
The RES are becoming competitive

Forecast of power generation cost in Germany up to 2030



Source: Heinrich Böll Stiftung 2013, Fraunhofer ISE; energytransition.de

Challenges of the Transformation

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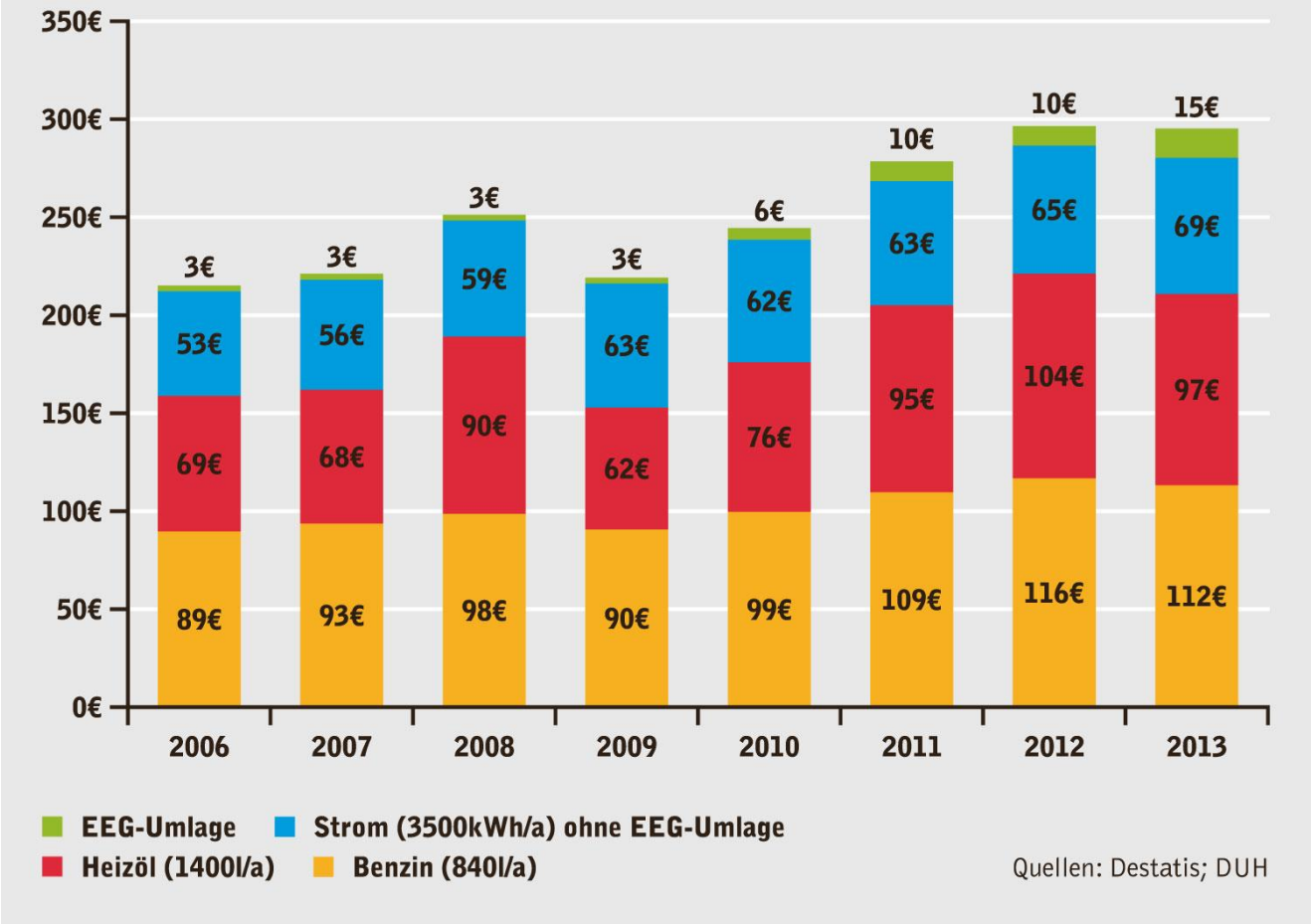
Example of monthly energy costs by household: minor share of EEG apportionment and electricity costs



Challenges of the Transformation

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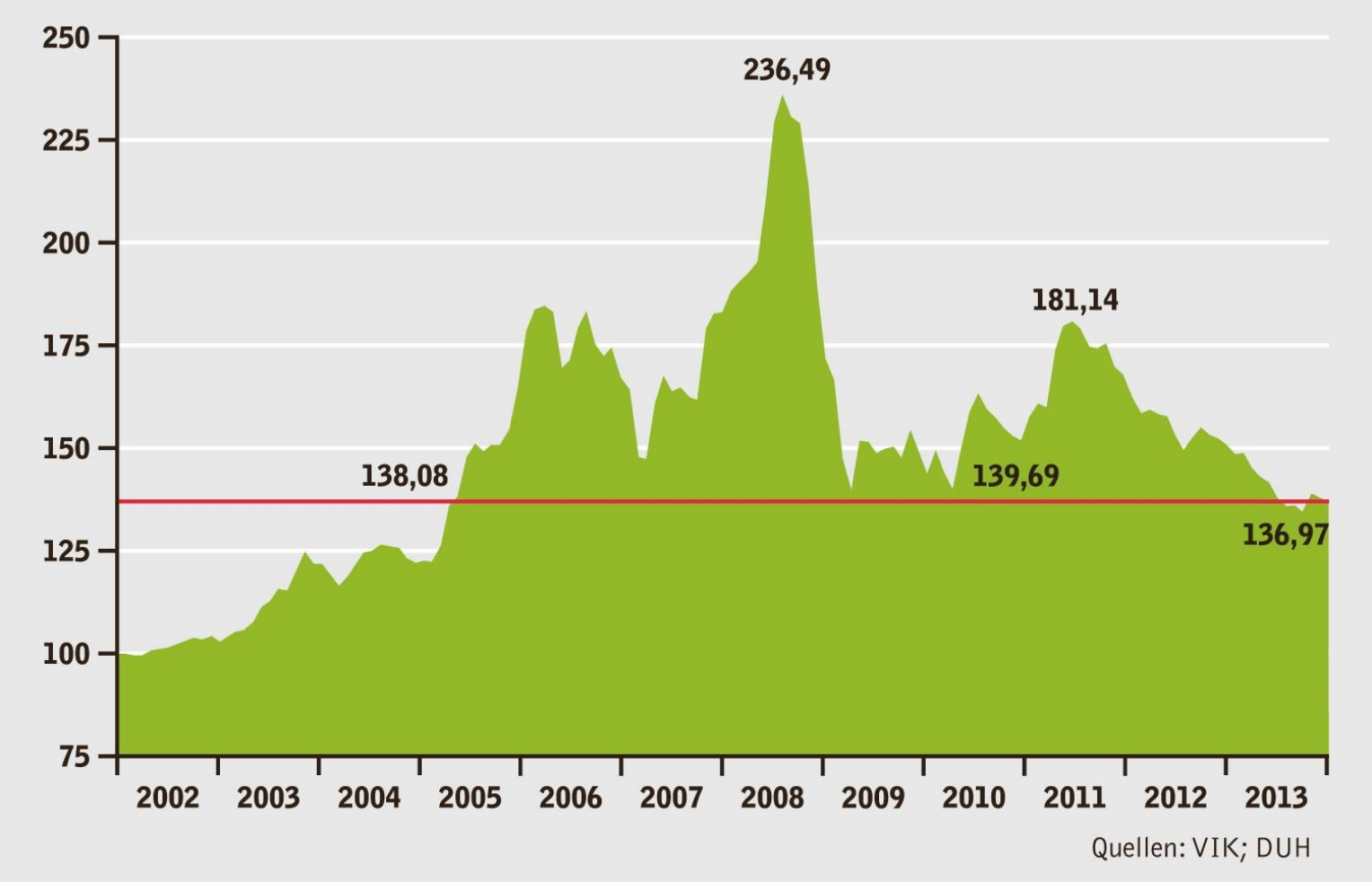
VIK-Electricity Price Index for industrial customers constantly drops



Challenges of the Transformation

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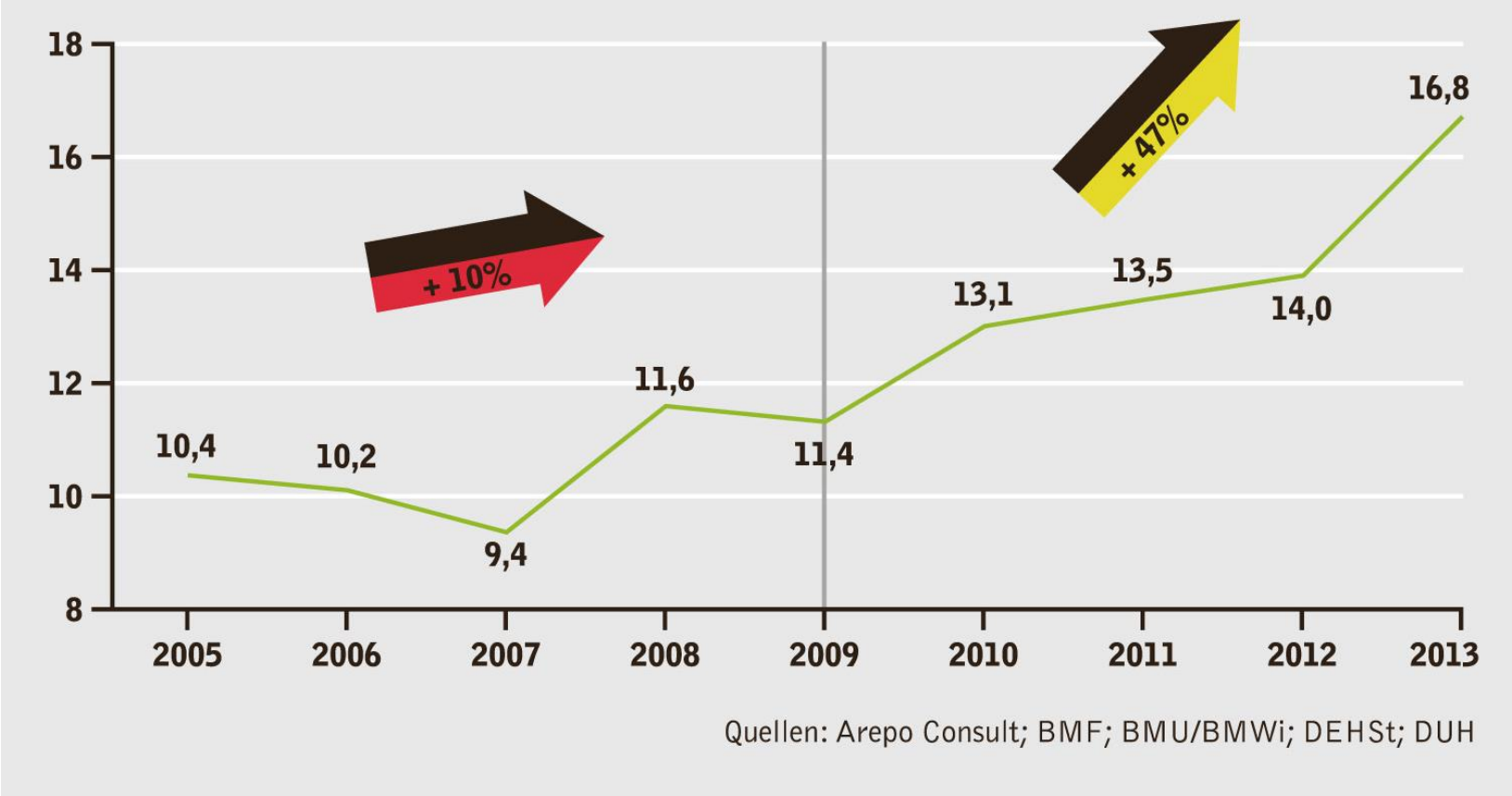
smaller EEG apportionments for industry customers → industry benefits rise, private customer's prices increase → deficit of regulation not due to higher costs for Renewables



Challenges of the Transformation

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RES are not the main driver for high energy prices in Germany

Trends of retail rates, spot market prices and renewable energy surcharge over the past 10 years in Germany

Source: Heinrich Böll Stiftung 2013, AEE; energytransition.de

German energy stock exchange rates lower than in neighbouring states

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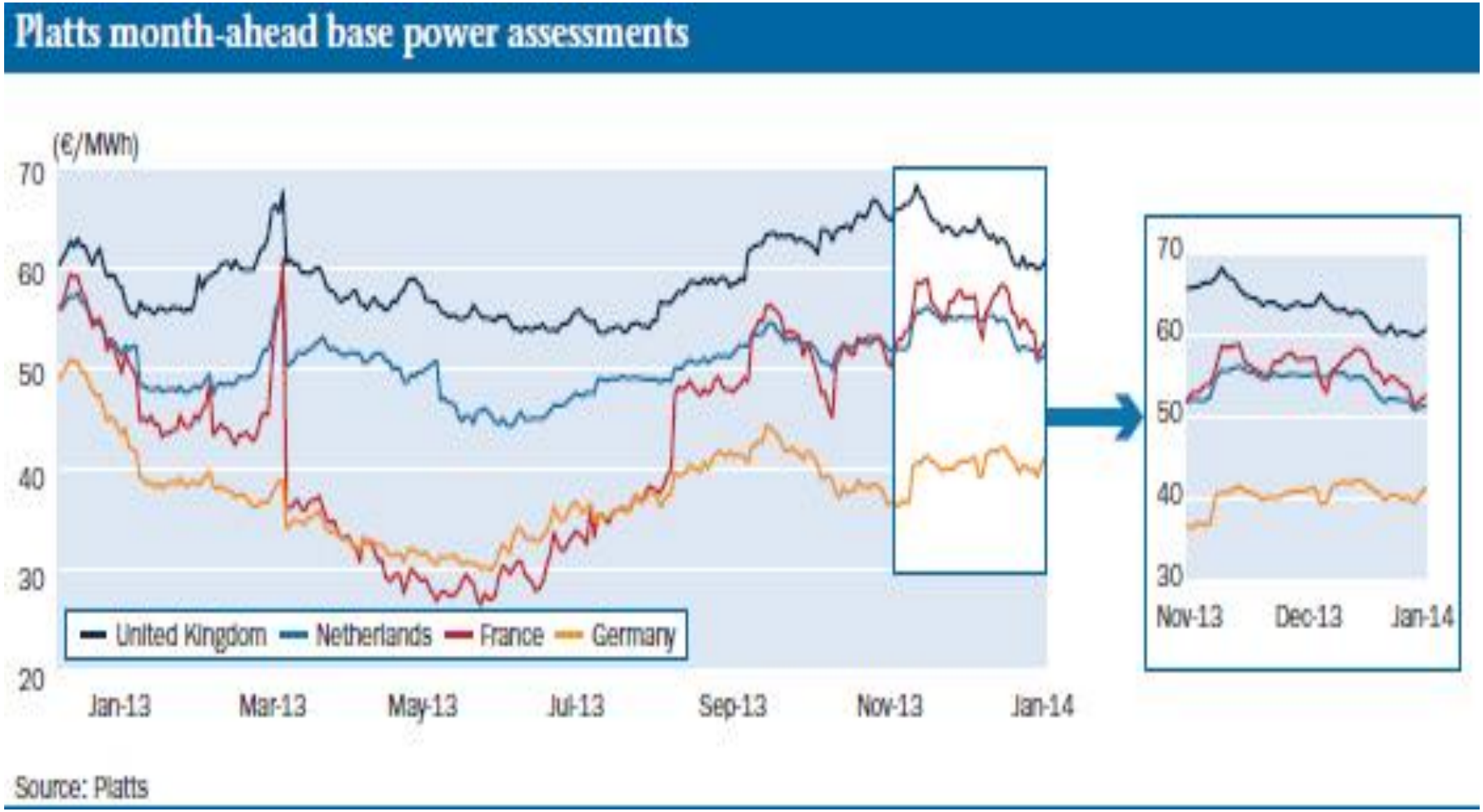

Challenges of the Transformation

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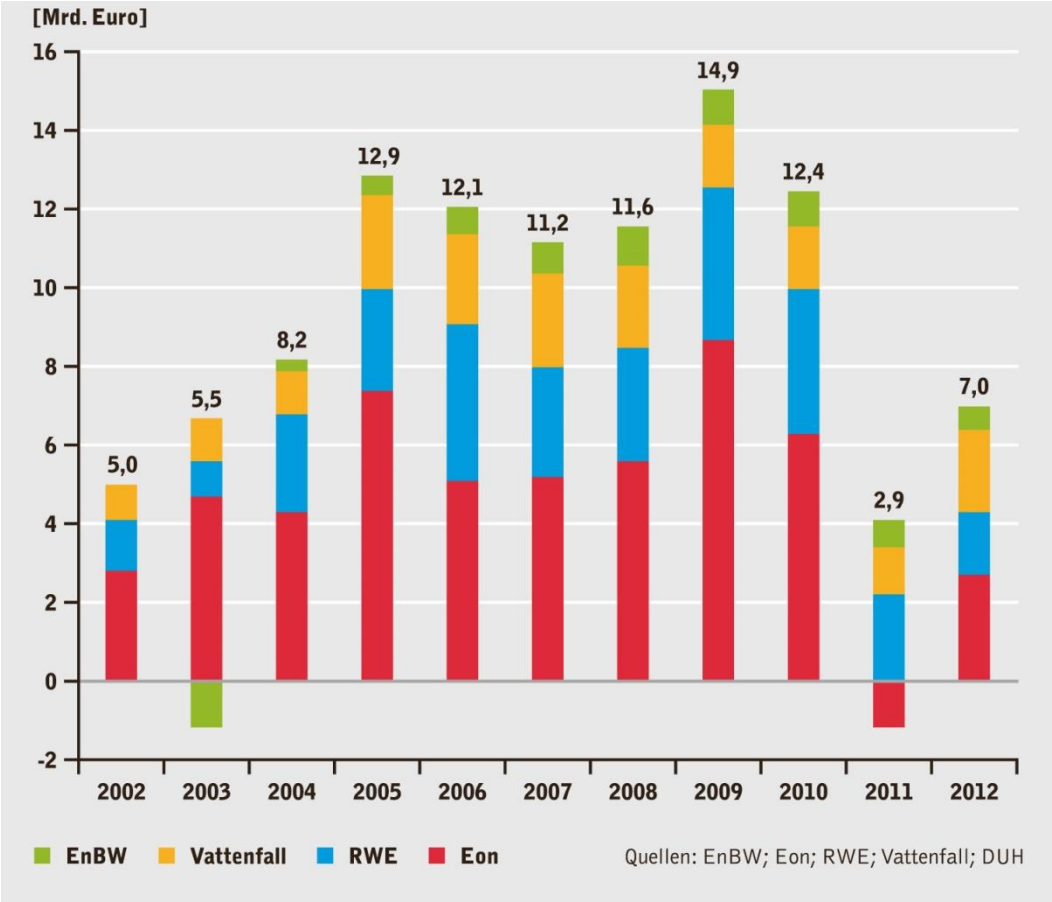
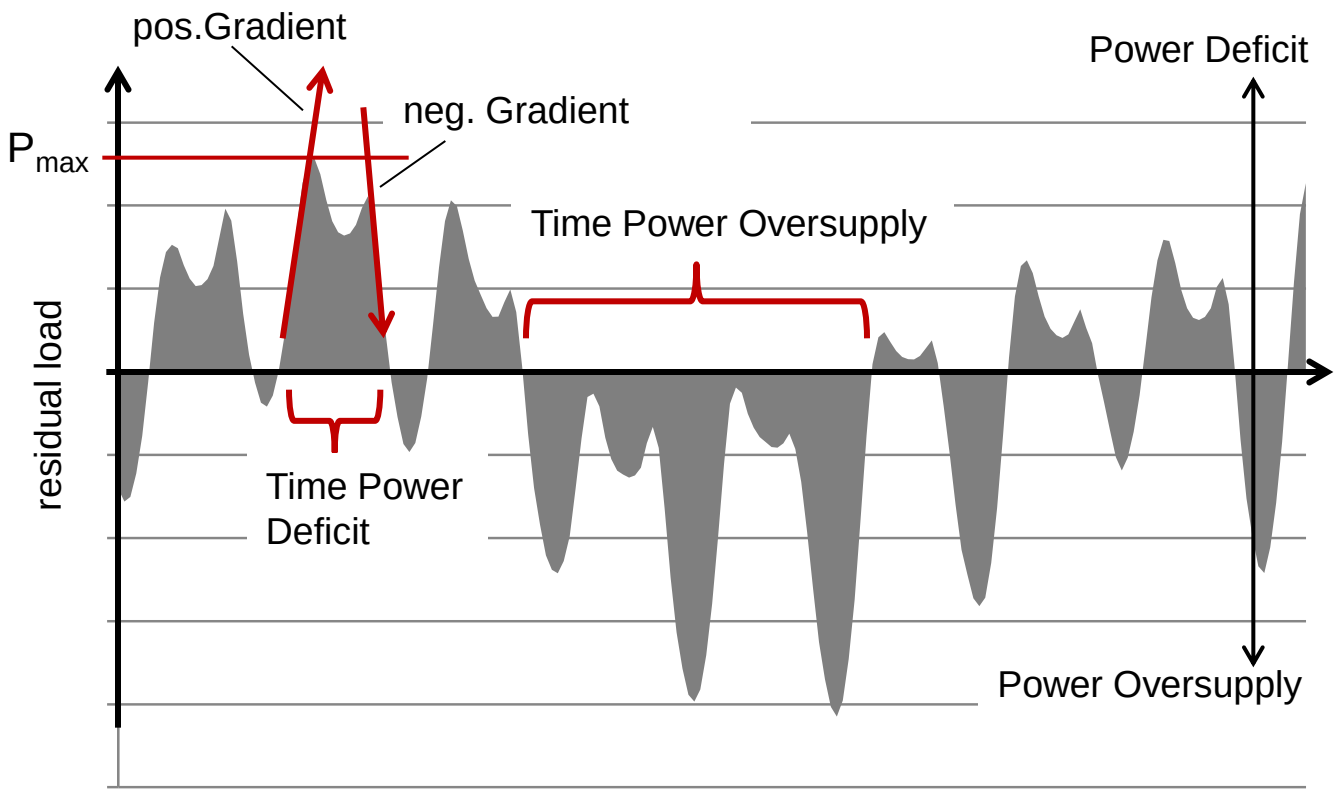
Conventional electricity suppliers gather up budget surplus of 100 Billion Euro from 2002 - 2012



Challenges of the Transformation

In the Future, more Flexibility is needed

residual load = load minus RES



Source: BET Aachen, Krzikalla, 03/2013

Challenges of the Transformation

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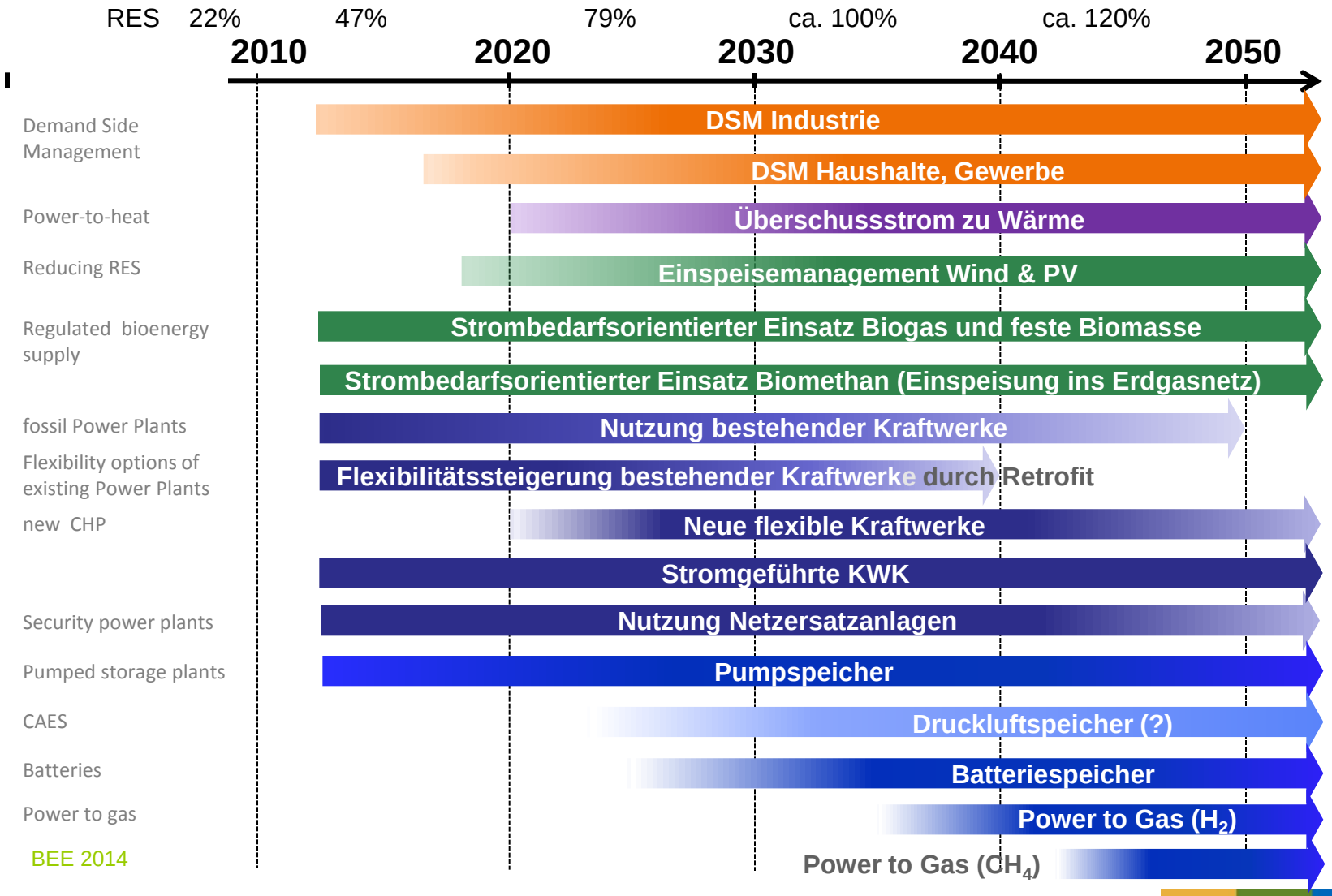
Study shows the rational use of the flexibility options

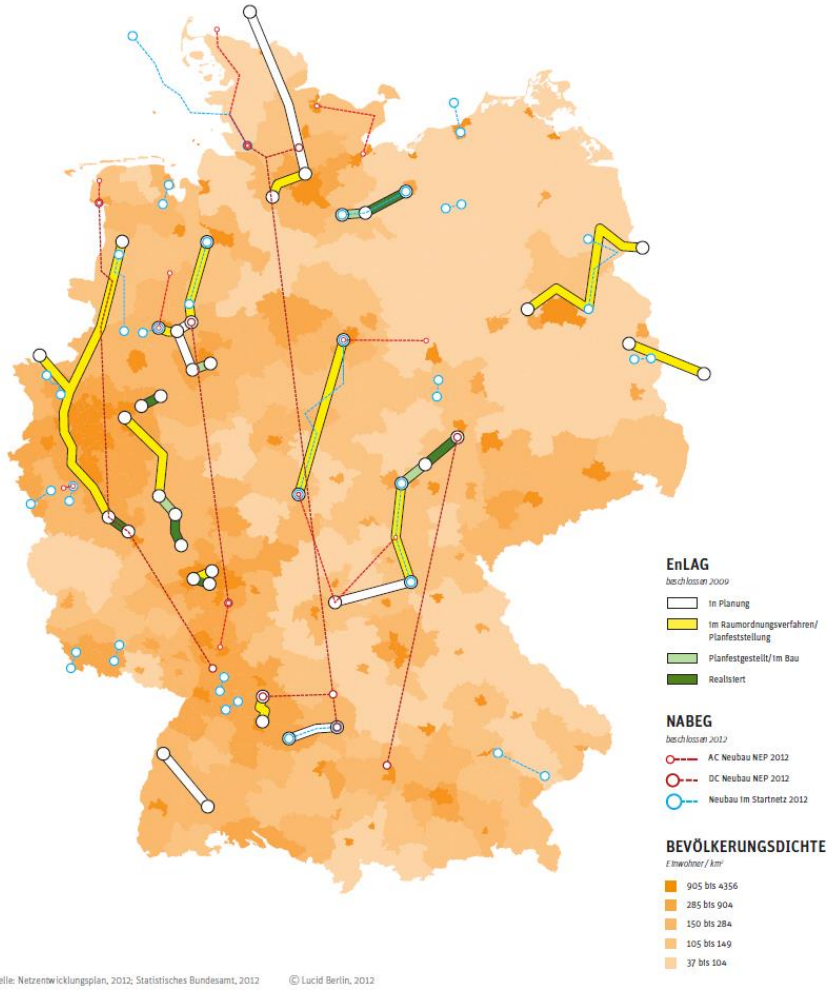


source: BET Aachen, Krzikalla, 03/2013

Challenges of the Transformation

BEE Bundesverband Erneuerbare Energie e.V.

Grid Expension Plan and Progress by the German Grid Agency



Challenges of the Transformation

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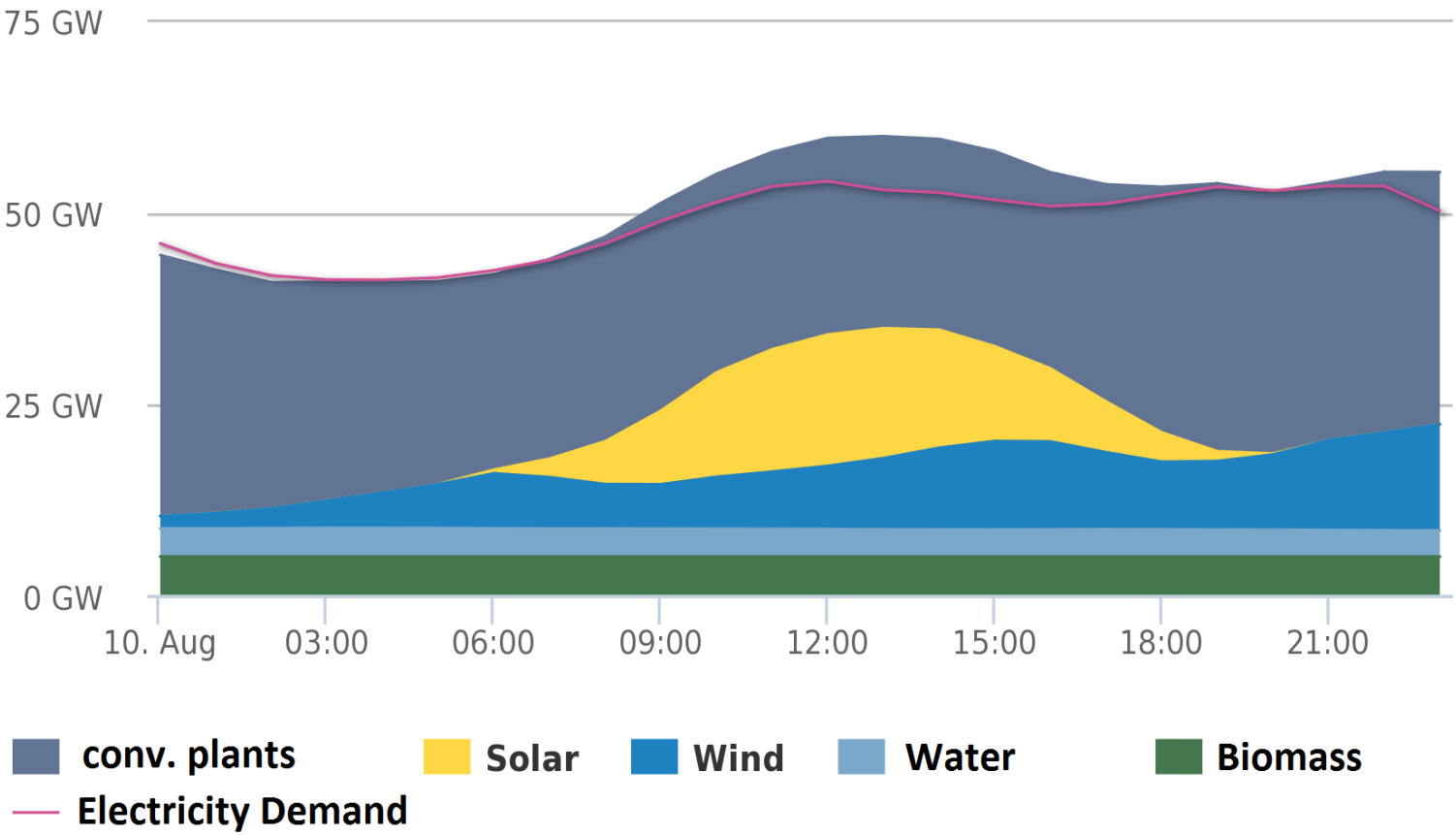
Granted security of supply even with high renewable generation



Source: Agora Energiewende 2015

Challenges of the Transformation

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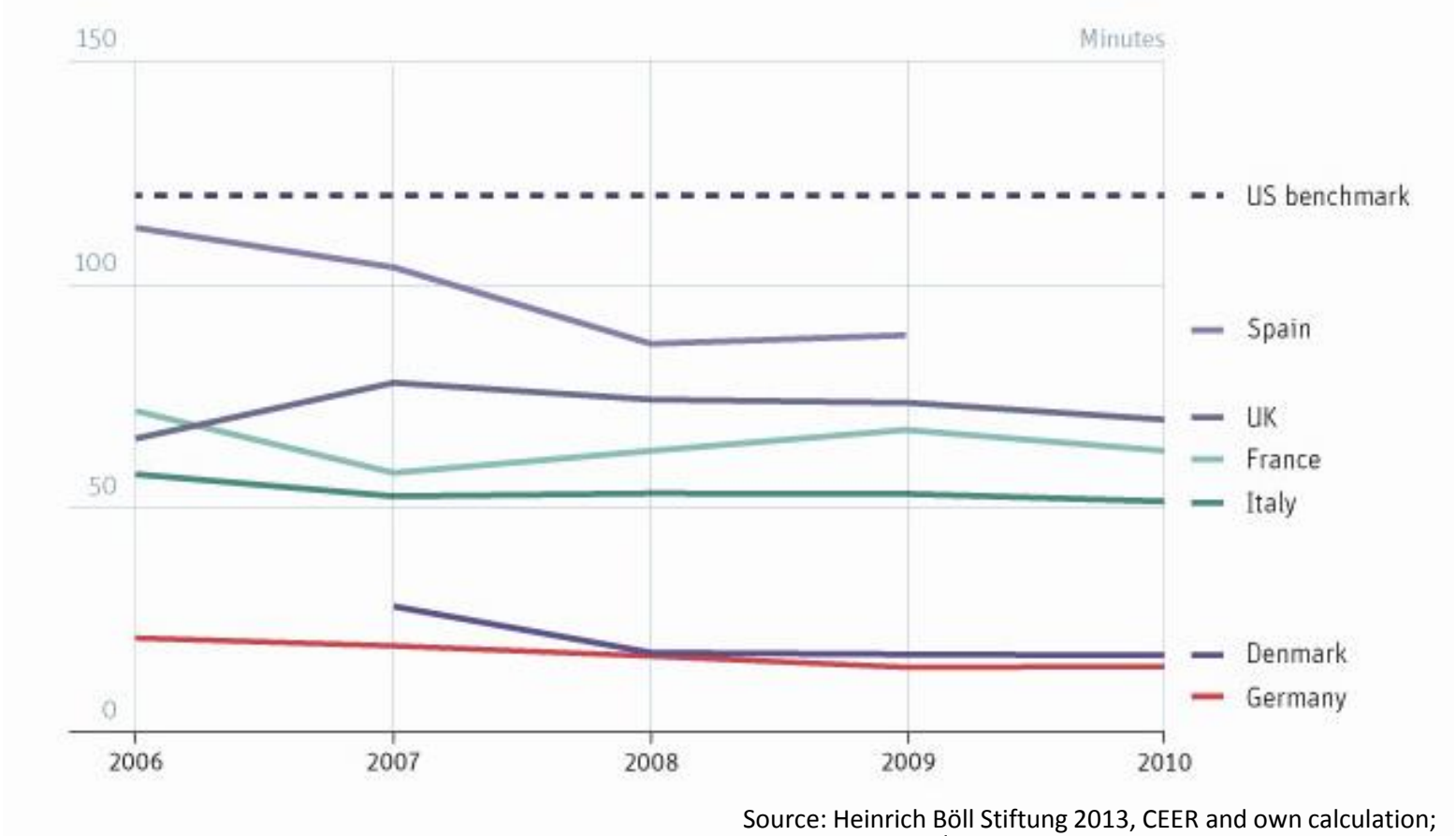
Grid reliability and renewable growth seem to go hand in hand

Minutes of power outages per year (excl. exceptional events), based on SAIDI



Source: Heinrich Böll Stiftung 2013, CEER and own calculation; energytransition.de

Benefits of the Transformation

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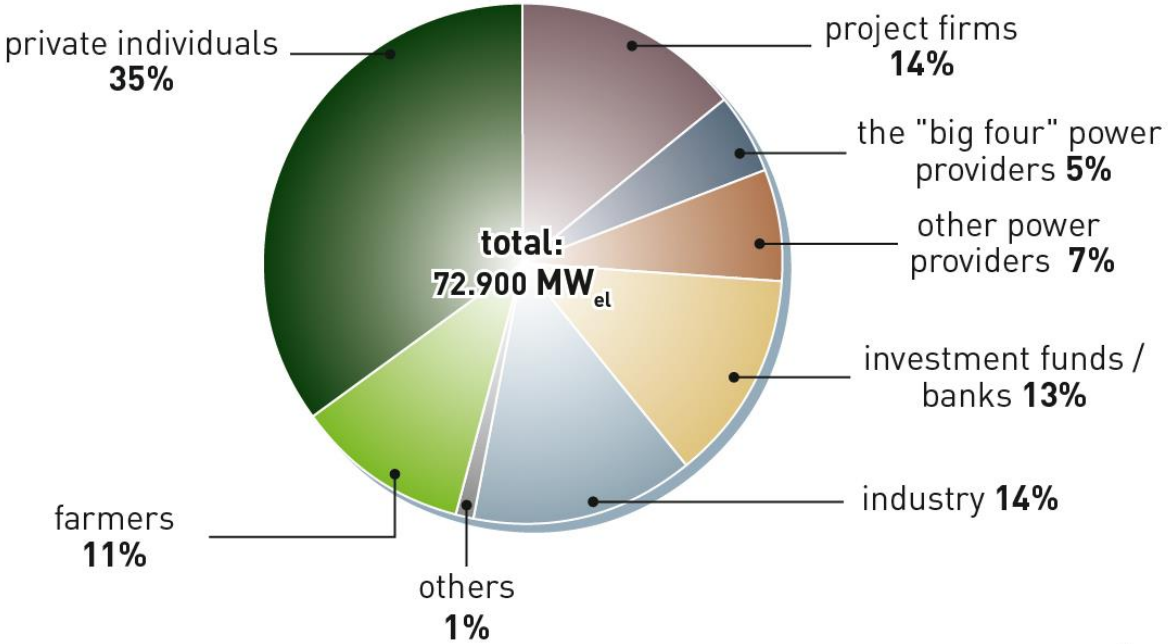
Half of the installed electr. capacity from RES is in citziens' hands

Distribution of the owner of the nationwide installed capacity for Electricity generation from RES installations 2012 (MW 72 900)



Source: trend research; as of: 04/2013

www.renewables-in-germany.de

→ **With the RES the variety of participants and the competition in Germany is rising**

Challenges of the Transformation

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Prospering Example: Energiegenossenschaft Odenwald eG

- 2.800 members
- 70 installed PV systems
- participation in 9 wind turbines
- overall capacitiy: 30 MW
- savings of more than 10.500 t CO2 emissions per year
- 36 million Euros invested nearby Odenwald region

Energie Genossenschaft Odenwald eG Cluster

Sources: ego-strom.de

Challenges of the Transformation

BEE Bundesverband Erneuerbare Energie e.V.

German Energy Cooperatives – 7 principles

1. Voluntary and Open Membership
   - open to all persons able to use their services and willing to accept the responsibilities of membership
2. Democratic Member Control
   - controlled by their members, who actively participate in setting policies and making decisions
   - each member has one vote
3. Member Economic Participation
   - Members contribute to the capital of their cooperative
4. Autonomy and Independence
   - self-help organizations controlled by their members
5. Education, Training, and Information
   - Cooperatives provide education so they can contribute effectively to the development of their cooperatives
6. Cooperation among Cooperatives
   - Cooperatives serve their members most effectively by working together
7. Concern for Community
   - cooperatives work for the sustainable development of their communities

Agenda

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1. The “Energiewende”
2. Benefits of the Transformation
3. Challenges of the Transformation
4. Conclusion

Transformation

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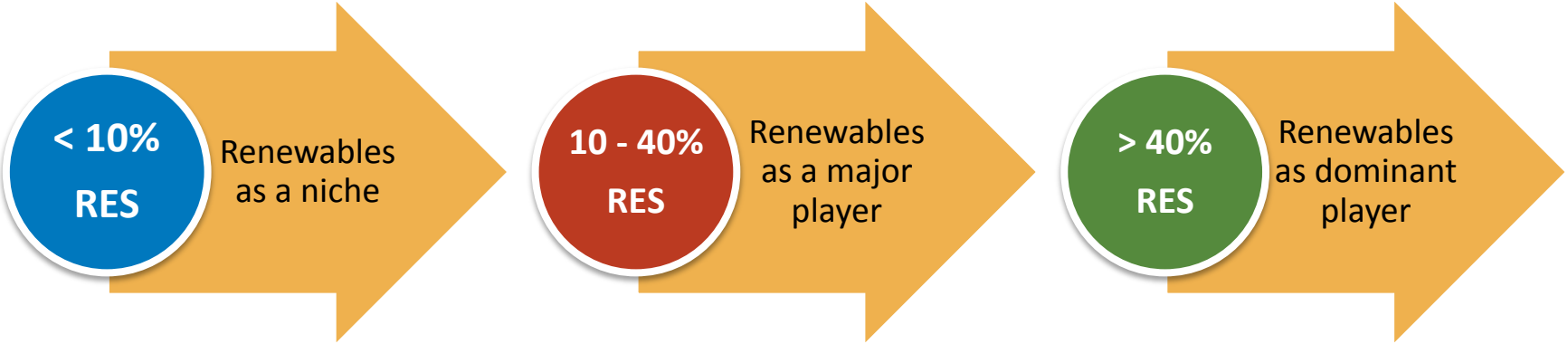
Rising share of RES leads to new demands and challenges (I)



→ **RES are evolving from a niche to a dominant source of energy leading to new challenges and requirements for the grid**

Transformation

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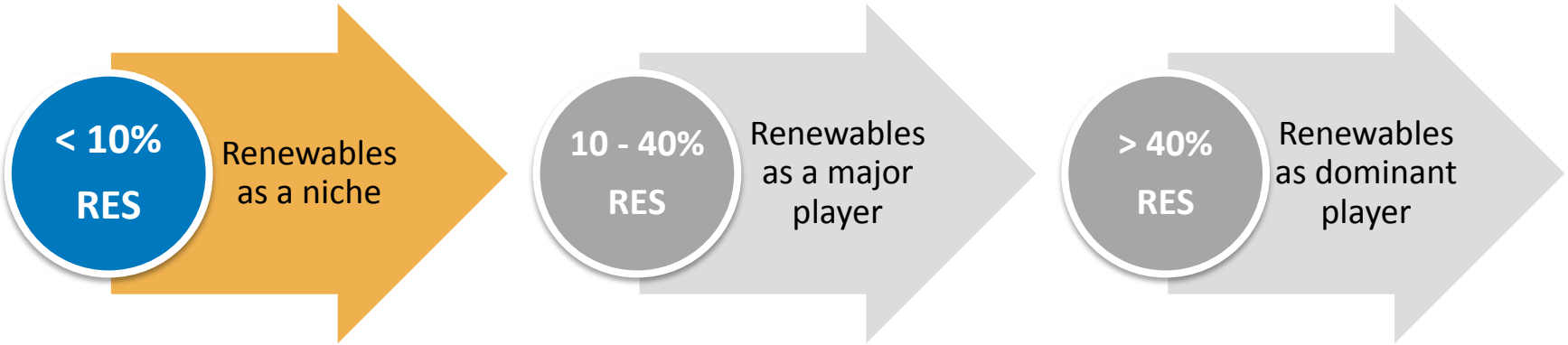
Rising share of RES leads to new demands and challenges (II)



No need for fundamental adaptations yet...

- Learn to develop and use forecasts
- Develop processes for information exchange, billing and accounting for RES
- Potential errors do not (yet) have a noticeable effect on system

Transformation

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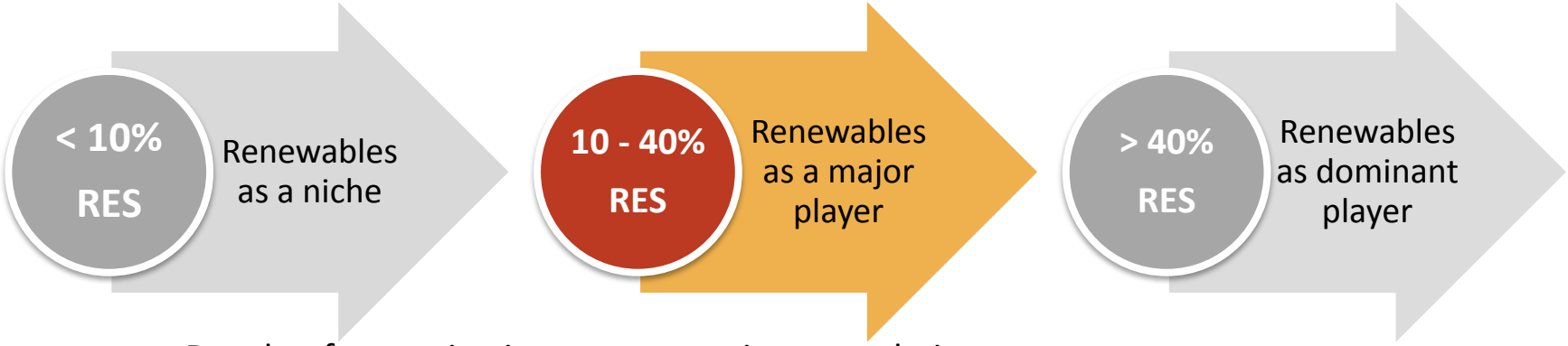
Rising share of RES leads to new demands and challenges (III)



- Develop forecasting instruments to improve their accuracy
- Develop grid infrastructure to meet new transport demands (due to new areas of generation) and as source of flexibility
- Investigate ways to reduce “must-run” capacities – RES to deliver ancillary services (integration into control power markets...)
- Implementation of real-time data exchange and direct steering of RES
- Harmonised European approach to RES policy

Transformation

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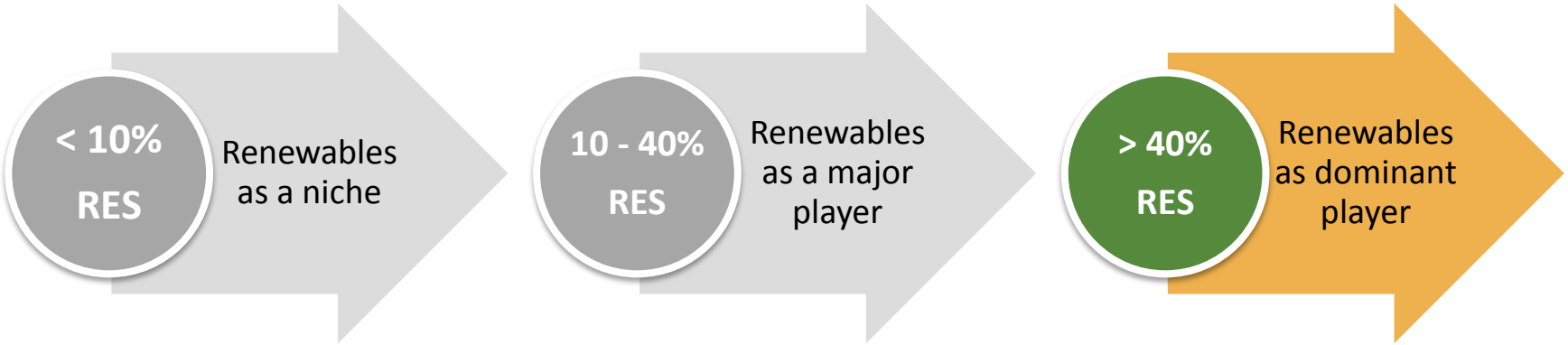
Rising share of RES leads to new demands and challenges (IV)



- Develop new market design bringing together RES and complementary conventional power plants and storage
- Full steering of conventional plants and RES in emergency situations
- Substantially develop demand-side response
- Enhance real-time cooperation between TSOs and DSOs: data exchange, review roles and responsibilities
- Develop new business models cross-linking electricity and other energy sectors

Thank you!

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Bundesverband Erneuerbare Energie e. V.

German Renewable Energy Federation

Reinhardtstrasse 18
10117 Berlin
Fon 030 / 275 81 70 – 0
Fax 030 / 275 81 70 – 20
www.bee-ev.de