WIDRC
wisconsin distributed resources collaborative

The Wisconsin Distributed Resources Collaborative, Inc. (WIDRC) is a voluntary collaborative committed to facilitating and promoting the successful deployment of economic, efficient and environmentally responsible distributed resources in Wisconsin.

To foster market-based development of distributed resources (DR) in Wisconsin, WIDRC, through its collaborative work, addresses five main issues that represent current and potential barriers to DR market development in Wisconsin.

These five issues are:

- Technical requirements
- Commercial requirements and business practices
- Siting
- Applied research and development and associated data collection
- Education and communication

U.S. – Germany
Renewable Energy International Exchange

Kenneth A. Walz, Madison College

Presentation for Wisconsin Distributed Resources Collaborative, July 11, 2014


Sweden
+Ken
Gulf of Bothnia
Norway
Finland
Saint Petersburg
Санкт-Петербург
Helsinki
Oslo
Stockholm
Tallinn
Estonia
Baltic Sea
Gothenburg
Latvia
Moscow
Москва
North Sea
Lithuania
United Kingdom
Denmark
Minsk
Мінск
Vilnius
Hamburg
Belarus
Ireland
Birmingham
Netherlands
Berlin
Poland
Kyiv
Київ
Kharkiv
Харків
London
Belgium
Germany
Prague
Krakow
Paris
Czech Rep
Ukraine
Munich
Bratislava
Slovakia
Dnepropetrovsk
Дніпропетровськ
Vaduz
Austria
Moldova
Hungary
France
Zagreb
Odessa
Одеса
Milan
Romania
Bay of Biscay
Croatia
Turin
Serbia
Bucharest
Black Sea
Marseille
Italy
Rome
Barcelona
Bulgaria
Madrid
Istanbul
Ankara
Portugal
Tyrrhenian Sea
Spain
Greece
Izmir
Turkey
Lisbon
Algiers
الجزائر
Tunis
تونس
Athens
Αθήνα
Antalya
Aleppo
حلب
Oran
وهران
Syria
Casablanca
الدار البيضاء
Mediterranean Sea
Lebanon
Tunisia
Alexandria
الأسكندرية
Israel
Morocco
Google
Tripoli
طرابلس
Jordan

Germany

80 Million people

16 states

~138,000 sq miles

~500 miles N to S

~400 miles E to W

4th largest economy in the world (behind U.S., China, and Japan)

Germany's Relative Size?

Roughly the same land area as California, but double CA's population

June 1 – Berufsschule Gross-Gerau
June 2 - Darmstadt Univ.
June 2- Hessian State Office for Technology Training
June 3 - Berufsschule Butzbach
June 3 - Wallerstädten Biogas Plant
June 4 - Insheim ORC Geothermal Plant
June 5 - RENAC
June 5 - Life e.V.
June 6 - BMWi (Federal Ministry of Economic Affairs and Energy)
June 6 - German Association of Solar Energy (DGS)
June 6 - Agora Energiewende
June 7 – Feldheim Renewable Village
June 8 – Bundestag (The Reichstag building)
June 10 – BZEE Wind Training Facility
June 10 - Senvion (formerly REpower)
June 11 – Folkecenter Renewable Energy Education Center

Goals of the learning exchange

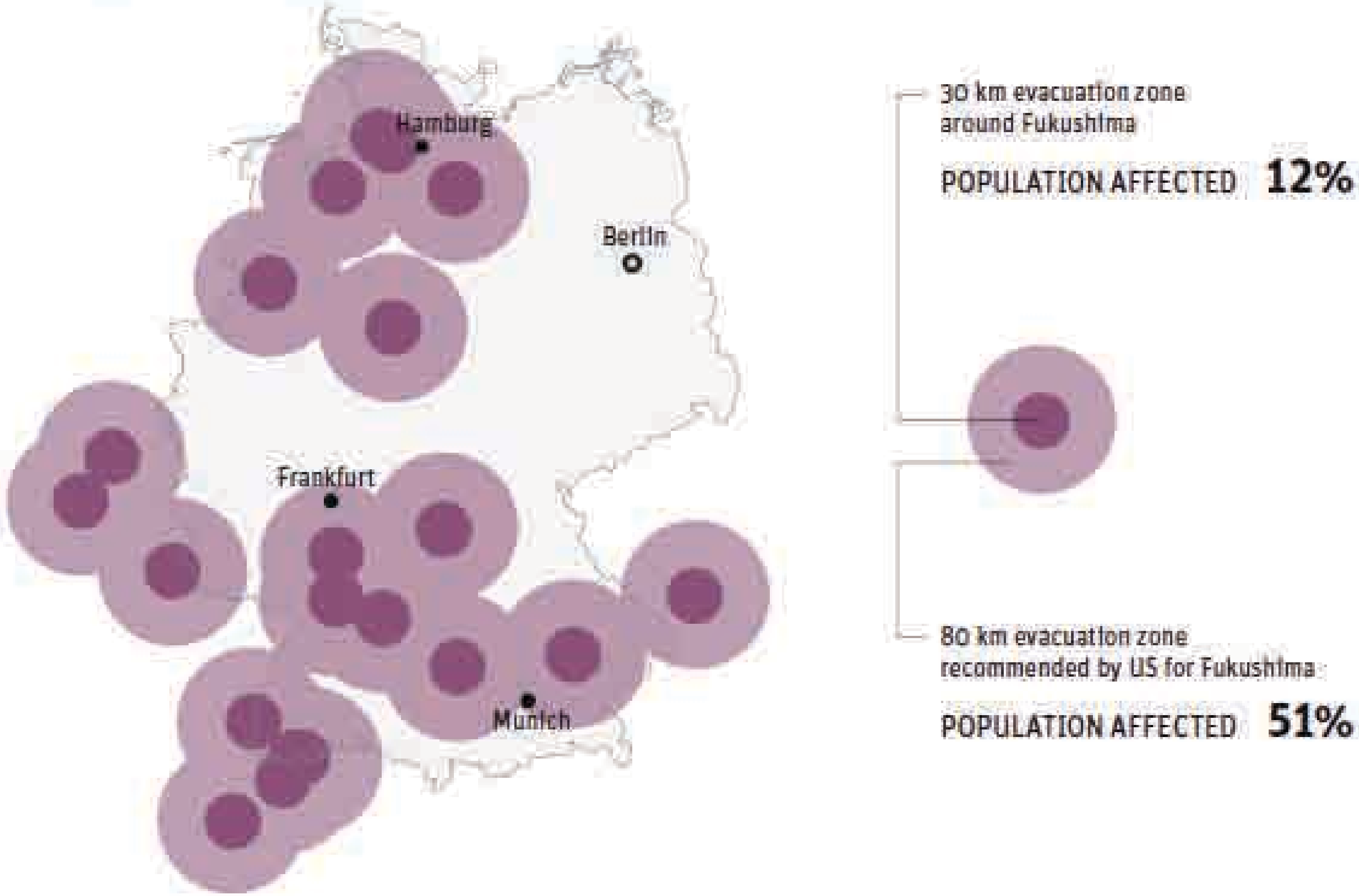
- Learn about German energy policy
- Visit multiple schools in the German system
- See examples of training programs in RE
- Industry visits highlight German technology
- Foster relationships for future collaboration

[illegible]

- 1990 • Stromeinspeisungsgesetz
- 1997 • 21% Kyoto target
- 2000 • Erneuerbare-Energien-Gesetz
- 2002 • Energieeinsparverordnung
- 2002 • Atomgesetz
- 2007 • Integriertes Energie- und Klimaprogramm (Meseberg)
- 2010 • Energy Concept of the Government
- 2011 • Fukushima nuclear disaster causes reconsideration of the energy transition strategy
- 2012 • Nuclear energy to be phased out by 2022; policy measures for a faster transition
- 2012 • The first annual monitoring report on the energy transition released

Recognizing the danger of nuclear power

30/80 km zones around nuclear reactors in Germany and nearby reactors of neighbouring countries



First Impressions?


HOTEL ADLER
Kirchstraße


ARAL
ultimate
SuperWash


EXPO
GYORSBÜFÉ


ecoTAXI
Sauber fährt besser.
ADAC


GALERIA
Lindnerfood


birdy


Energie-
wende
Energie-
wende
Fossile
Brennstoffe


Energiewende
Fukushima


Souvenirs

German Education System

- Traditional academic path through university
- “dual-system” of vocational apprenticeships
- Education is free to all who pass entrance exams
- Funds provided by central government, but all of the execution is done by states
- In 2005 an experimental 50 Euro/semester fee was tested, but it met fierce opposition and was repealed

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Universities / Institutes
All Degree Programs in Hessen
Programs in English
Degree Programs Taught Partially in English
Short-Term Study Abroad Programs in Hessen
Downloads

Degree Programs Taught Partially in English

In the following courses both German and English are required as courses are held in German and/or English.

Frankfurt University of Applied Sciences

- **Biological Process Engineering** (Bachelor)
- **International Business Information Systems** (Bachelor)
- **International Finance** (Bachelor)
- **Electrical and Information Engineering** (Bachelor)
- **Computer Science** (Bachelor)
- **Negotiating and Designing Contracts** (LL.M.)

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News

October 2013

Economists Ranking 2013

Professors at Hessen universities reach top ten positions in all categories of the 2013 Handelsblatt ranking. It lists more than 300 professors on basis of their publication record.

>> Further Information

New part-time education form
Additional qualifications
Acquisition of qualifications
Special education programs (BVJ)
Inclusion in the professional and working world (YEW)
Part-time vocational school
Technical college
Vocational school
Higher Vocational School

Types of schools

Overview of the types of schools and the respective professional fields

Vocational training

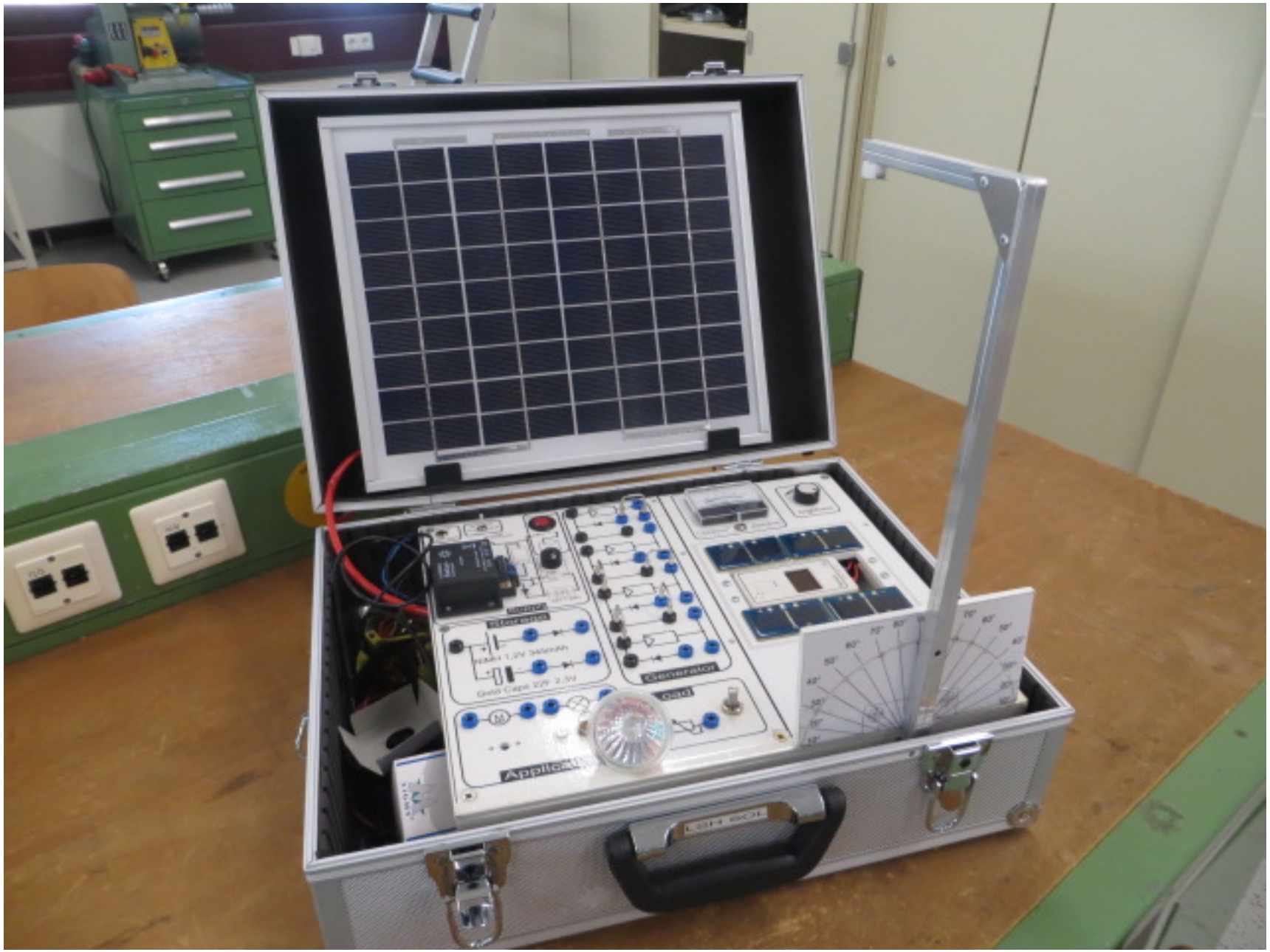
State-certified technicians

- in the field of mechanical engineering - focus on mechanical engineering
- in the subject area M aschichine technology - focus on automation technology
- in the field of food technology - emphasis on process engineering
- in the field of environmental technology - focus on Sustainable Energy Technologies
- in the field of mechanical engineering - specializing in energy management and energy efficiency
- in the field of mechanical engineering - focus on technical business

Initial vocational training

Automation & Metal

- Industrial Mechanic / in
- Plant mechanic / in
- Construction Mechanic / in

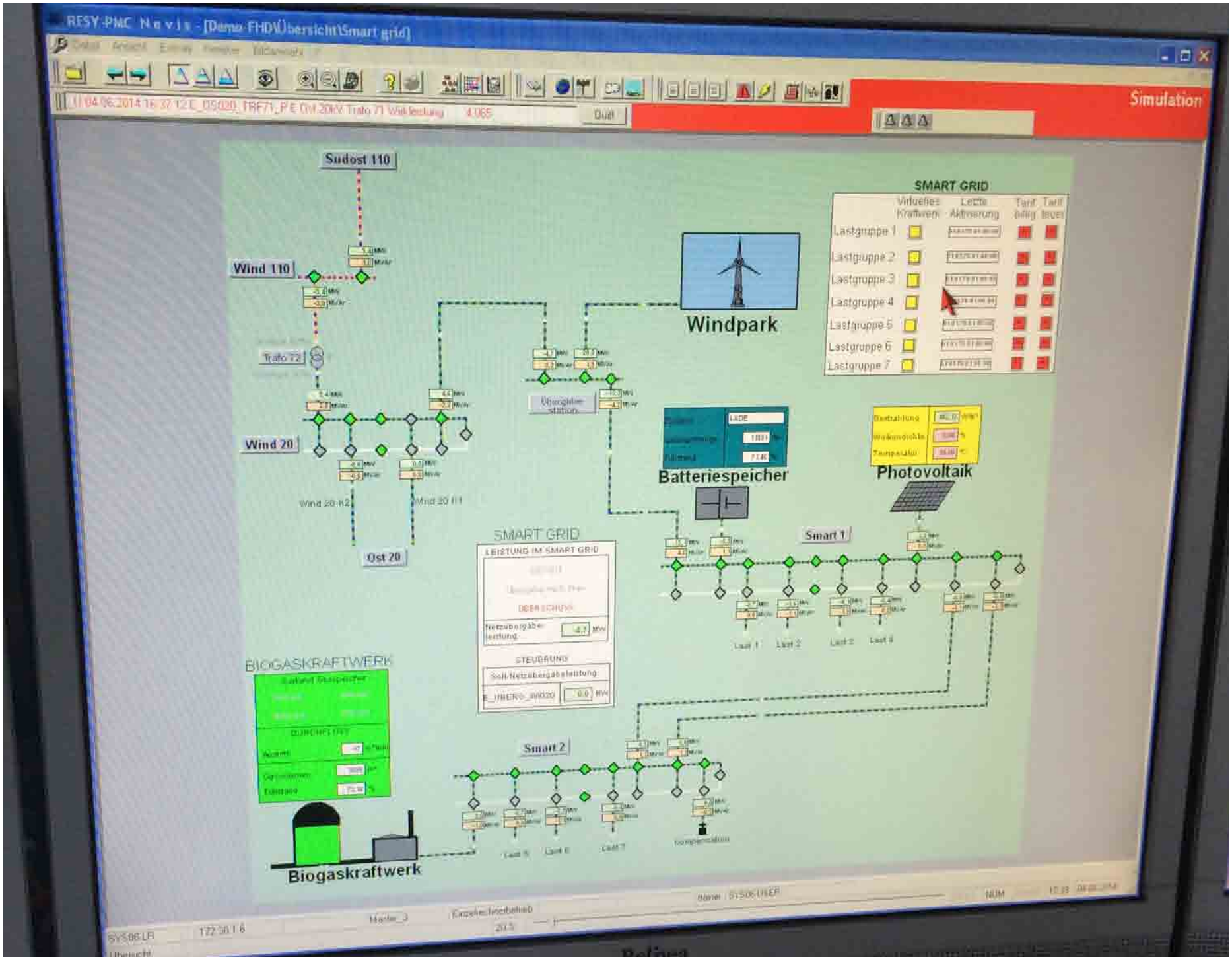

Generation

h_da

HOCHSCHULE DARMSTADT
UNIVERSITY OF APPLIED SCIENCES

TECHNISCHE
UNIVERSITÄT
DARMSTADT

International Program in Electrical Power Engineering


RESY-PMC Nevis - [Demo-FHD\Übersicht\Smart grid]
Simulation
Sudost 110
Wind 110
Trafo 72
Wind 20
Ost 20
Windpark
SMART GRID
Virtuelles Kraftwerk
Letzte Aktivierung
Tarif billig
Tarif teuer
Lastgruppe 1
Lastgruppe 2
Lastgruppe 3
Lastgruppe 4
Lastgruppe 5
Lastgruppe 6
Lastgruppe 7
Batteriespeicher
Photovoltaik
Smart 1
SMART GRID
LEISTUNG IM SMART GRID
STEUERUNG
Soll-Netzübergabeleistung
BIOGASKRAFTWERK
Smart 2
Biogaskraftwerk

German Energy Policy


Distribution of seats in the 18th German Bundestag
631 seats
CDU/CSU
311 seats
SPD
193 seats
The Left Party
64 seats
Alliance 90/
The Greens
63 seats
DIE LINKE.
SPD
BUNDESTAGS
FRAKTION

Broad political consensus that nuclear is not an option anymore

85% of Parliamentarians voted for Energiewende in Parliament in 2010 (the remaining Parliamentarians voted for a quicker phase-out)

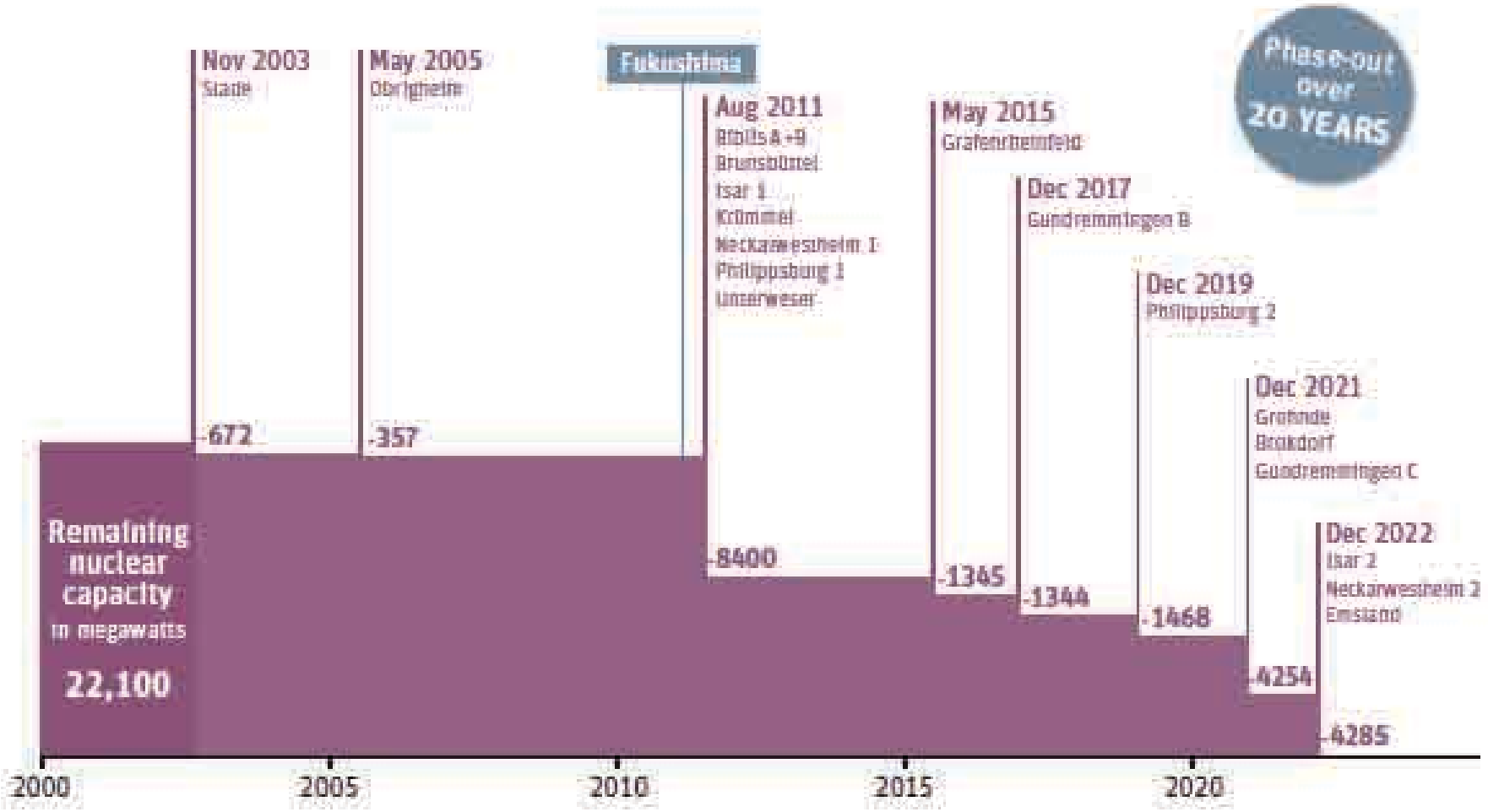
100% of political parties in parliament agree that there will be no lifetime extension of nuclear power plants

A reversal of the phase out decision is not impossible, but highly unlikely as politically very unpopular.

Germany is gradually shutting down all nuclear power plants

Declining nuclear energy installed capacity in Germany, 2000–2022

Source: Institute of Applied Ecology, BMU [illegible]



III What is the Energiewende about: Three Pillars of the *Energiewende*

RENEWABLE ENERGY SOURCES

- Rapid, continuous expansion
- Cost-efficient and environmentally friendly

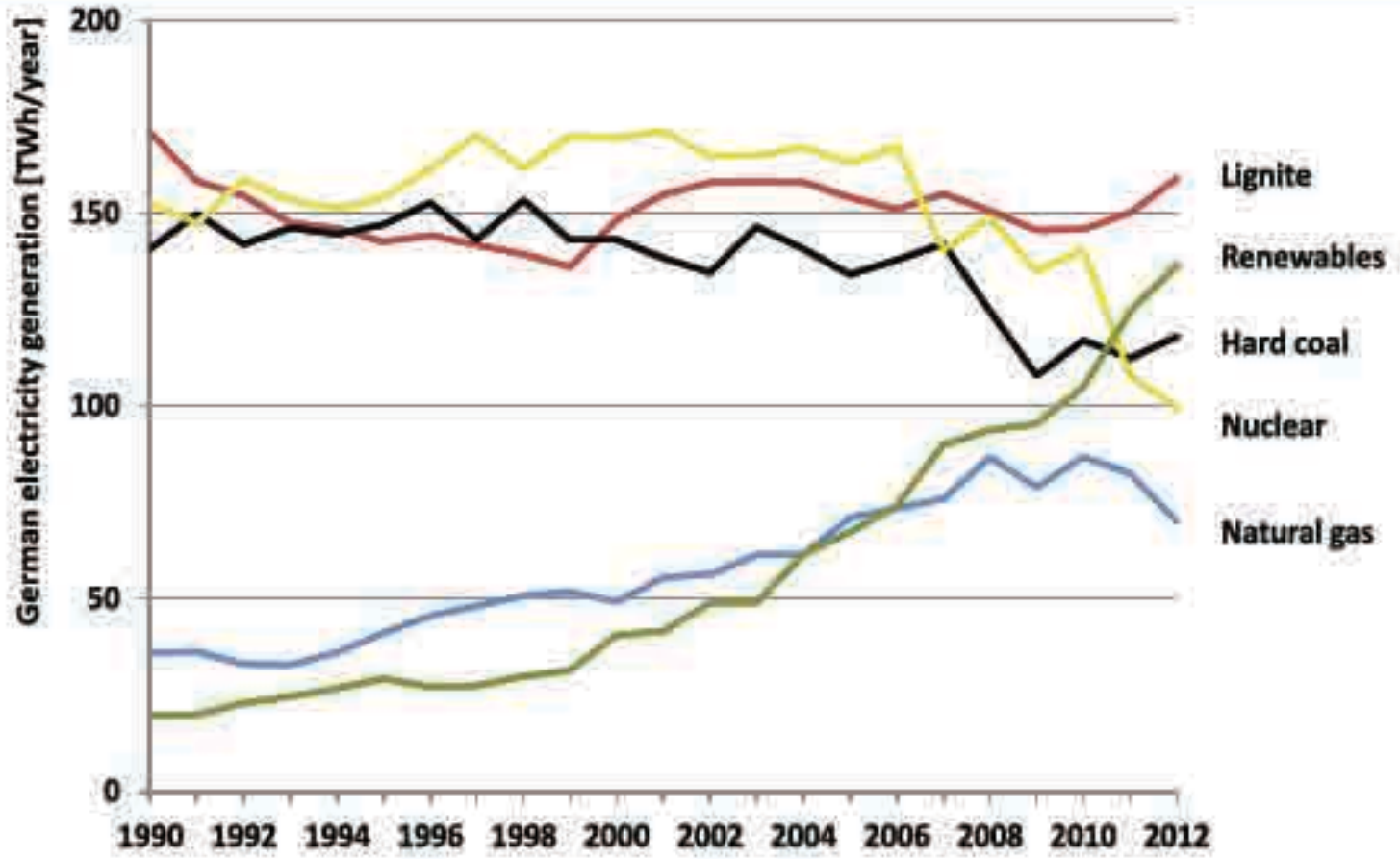
ENERGY EFFICIENCY

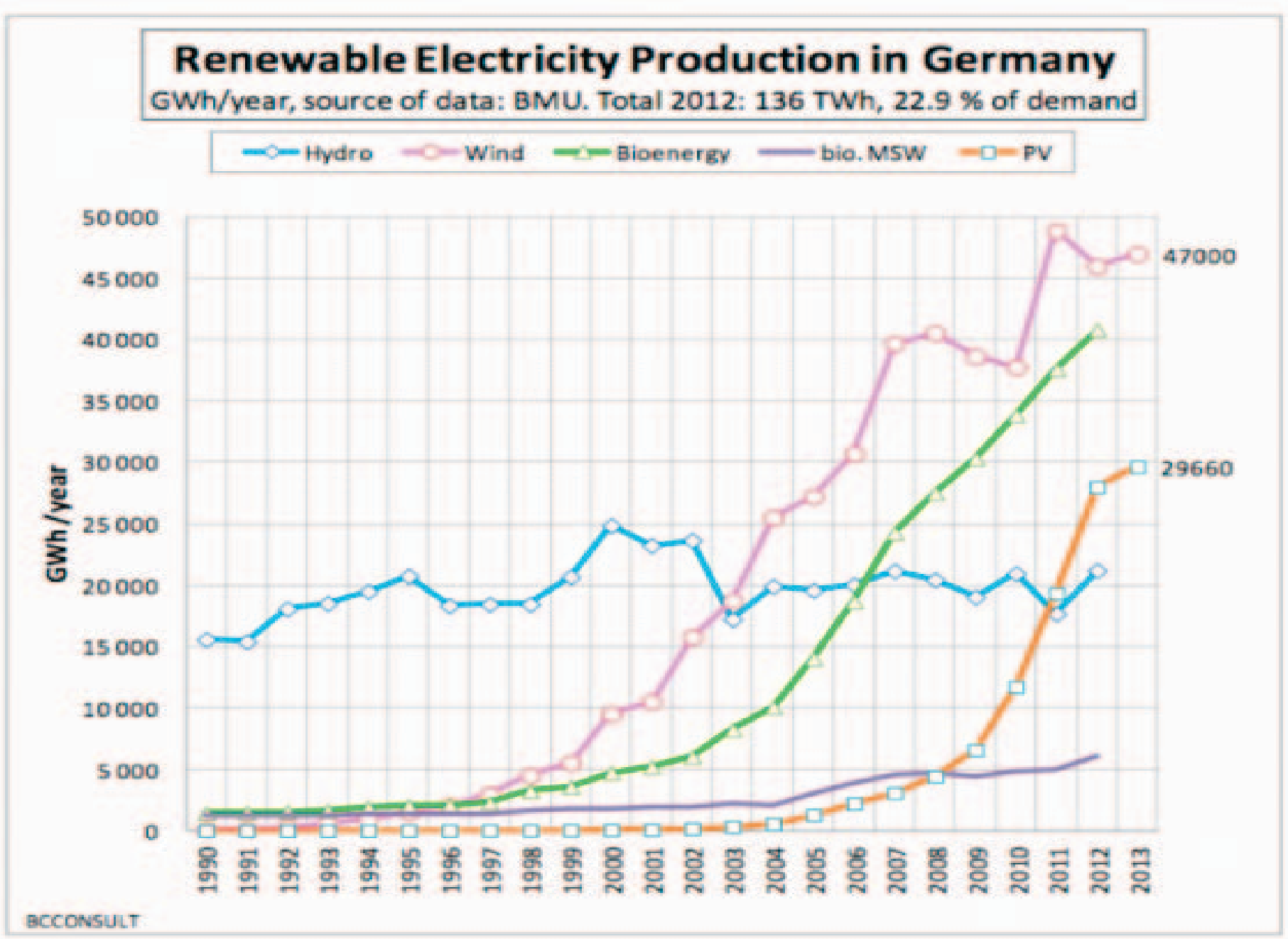
- Reduce energy consumption
- Ensure efficiency

FLEXIBILITY AND FUTURE GRID NETWORK

- Flexible grids and high capacity
- Integration of electricity from renewable sources

Electricity Generation: Fuel mix since 1990
Trends: continuous RE growth; less fossils/nuclear




Renewable Electricity Production in Germany
GWh/year, source of data: BMU. Total 2012: 136 TWh, 22.9 % of demand
Hydro
Wind
Bioenergy
bio. MSW
PV
GWh /year
50 000
45 000
40 000
35 000
30 000
25 000
20 000
15 000
10 000
5 000
0
47000
29660
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
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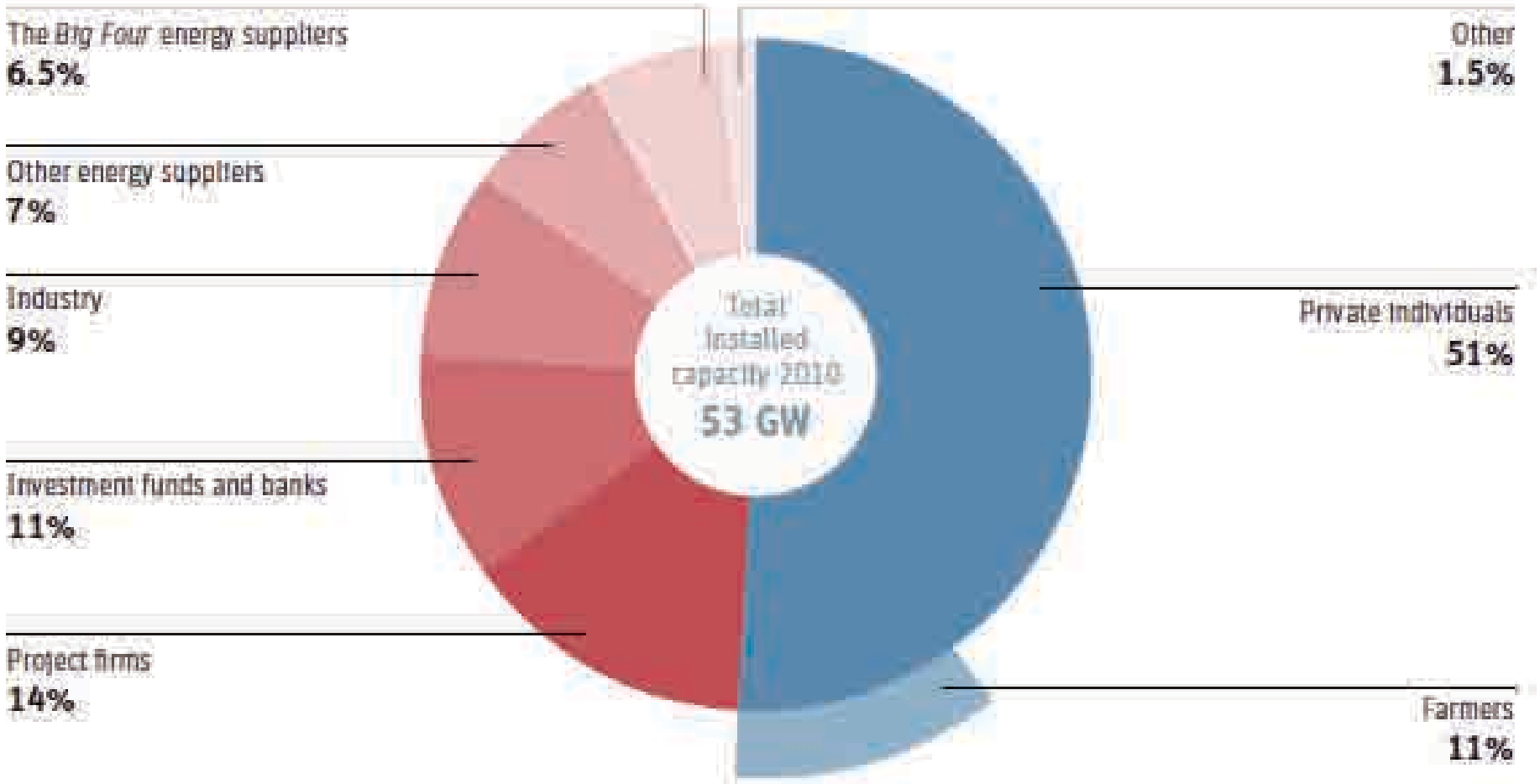
2007
2008
2009
2010
2011
2012
2013
BCCONSULT

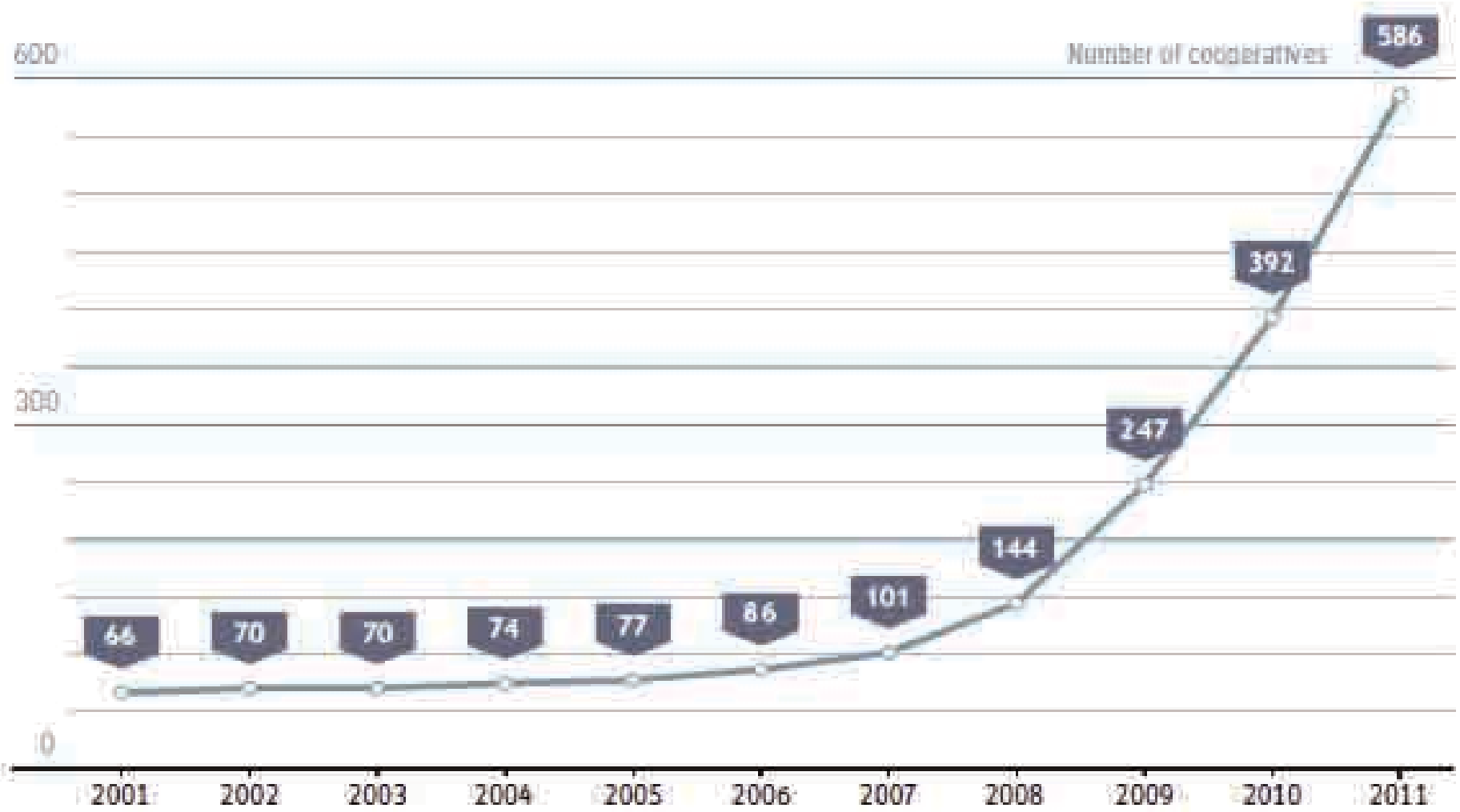
Renewables in the hands of the people

Ownership of renewables installed capacity in Germany, 2010



Citizens form cooperatives to drive the energy transition

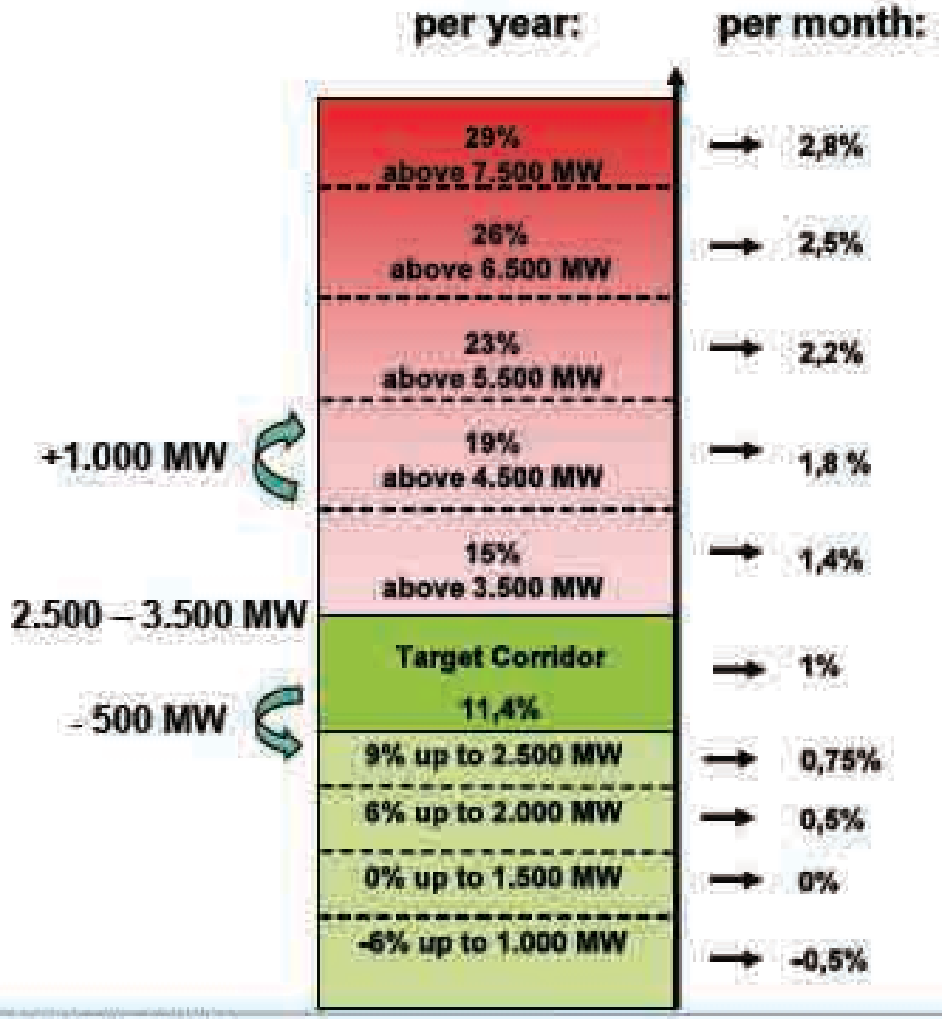
Number of energy cooperatives in Germany, 2001–2011



Conventional power generators have struggled to adapt

"Conventional power generation, quite frankly, as a business unit, is fighting for its economic survival." *Chief Financial officer for Germany's second largest utility, RWE, whose income has fallen by a third since 2010.*

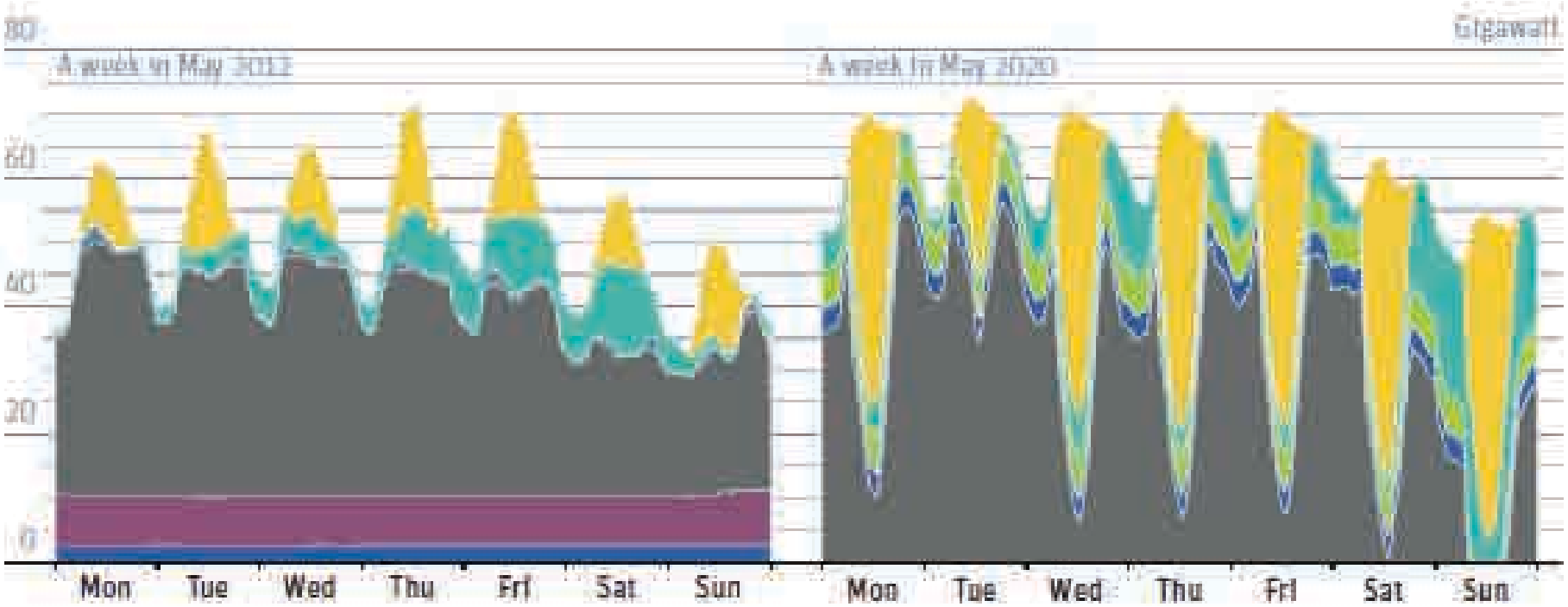
Renewable Feed In Tarrif



- Automatic degression linked to newly installed capacity
- Basic annual degression: 11,4% until 3.5 GW newly installed
- + 4% automatic degression for each 1 GW installed on top of 3.5 GW
- Degression come into affect monthly
  - To avoid „season sales"
  - Based on growth in the last 12 months
- Overall cap of 52 GW Solar PV:
  - Expiration of EEG PV support
  - But: continuation of priority feed-in
- Degression Feb-April 2013: 2,2 %

Renewables need flexible backup, not baseload

Estimated power demand over a week in 2012 and 2020, Germany



Key technologies?

-Better and Smarter Grids

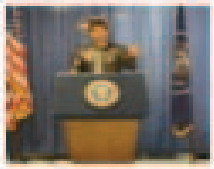
-Smart inverters an interconnections

-Storage

-Demand side management

-Wind and solar curtailment

ENERGY



Germany Was Powered by 74% Renewable Energy Last Weekend

by Timon Singh, 05/21/14

filed under: energy efficiency, News, Renewable Energy

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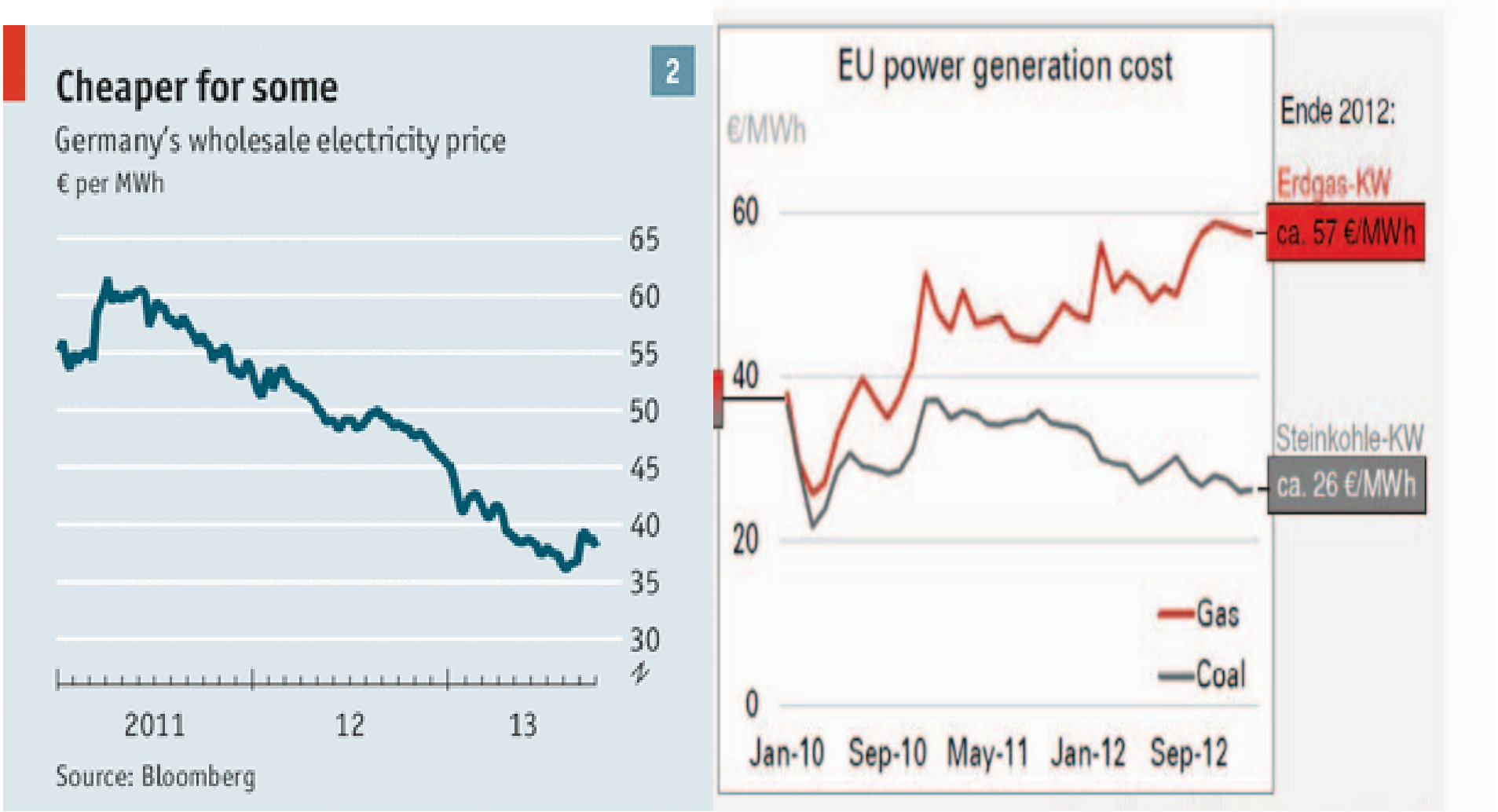
But, wholesale electricity prices drop, making it hard for gas turbines to profit– their only value now is as peaking plants



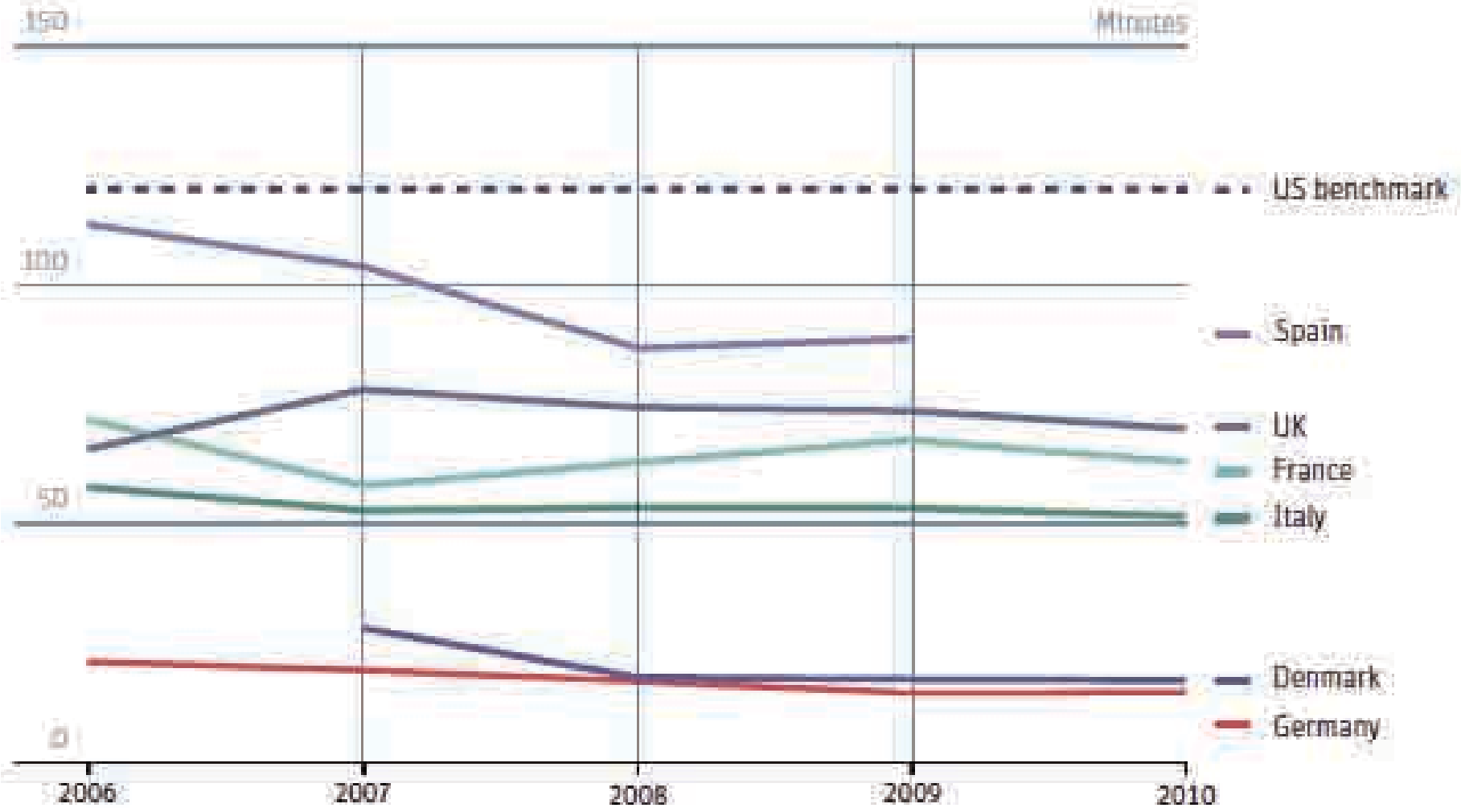

Energiewende
Energieende
Es ist Zeit für eine neue Wahl.
Erdgas macht's möglich.

2nd Pillar of the Energiewende: Future Grid Network Policies and German Network Development

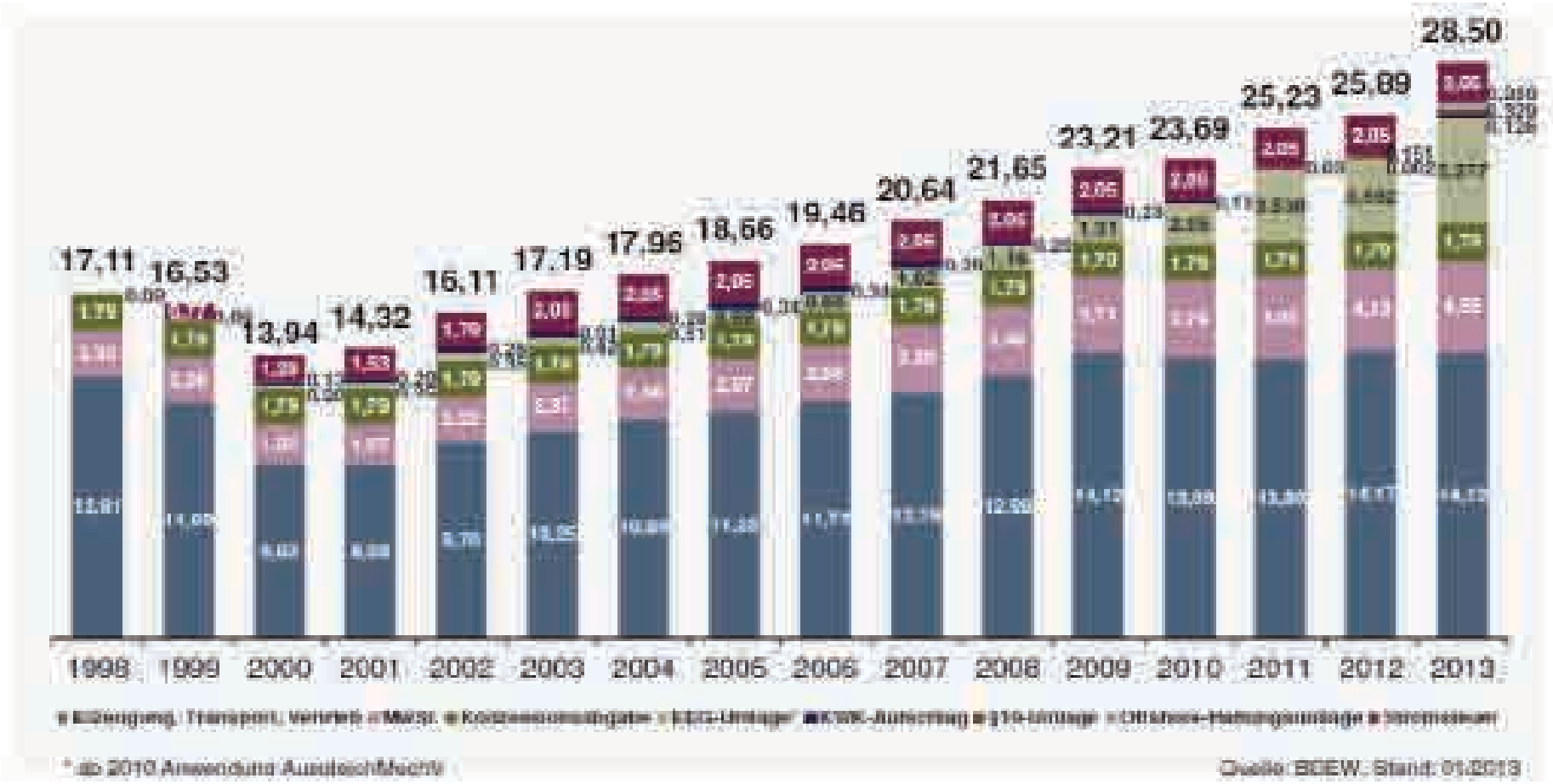
- 2013 Network Development Plan led by Federal Network Agency
  - Identified need for over 3800 km of new transmission (HVDC)
  - Financing mechanisms in development
- Grid Expansion Acceleration Act (NABEG)
- Additional efforts on energy storage:
  - Pumped hydro
  - Power to gas
  - EU electricity grid interconnection
  - Research funding
- Smart Grid and E-Energy pilot communities
- Demand-side management

Grid reliability and renewable growth seem to go hand in hand

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



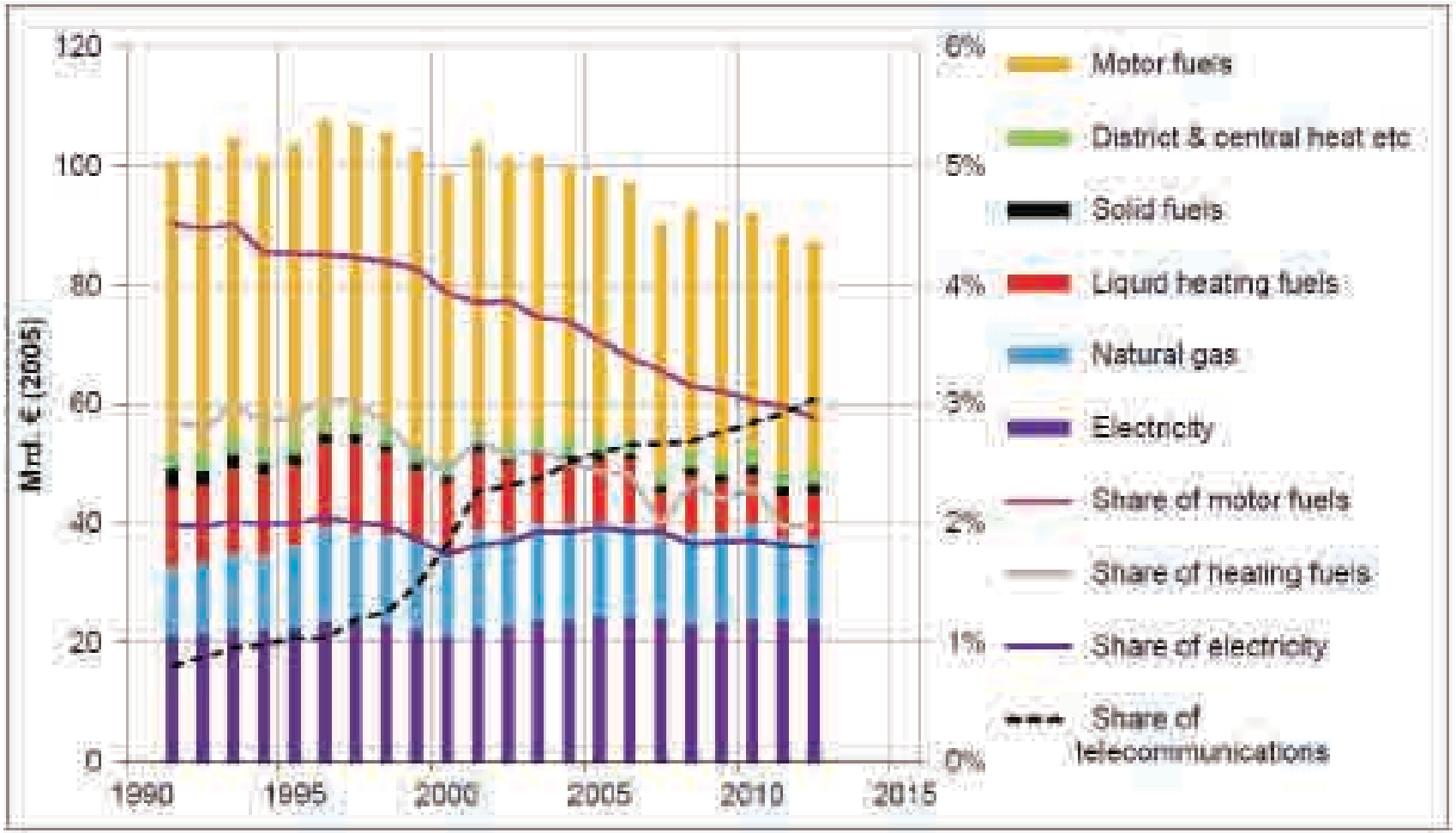
(4): While nominally the household prices for electricity are rising and receive a lot of media attention…



* ab 2010 Anwendung Ausgleichsmechn

Quelle: BDEW, Stand: 01.2013

(4) …the share of electricity in household consumption expenditures is constant at 2% (with telecommunication cost at 3%).



German Industry Innovations

Wallerstadt Anaerobic Digester and Feedstock Storage


Energieautarker Ortsteil
Feldheim
Stadt Treuenbrietzen

Take Home Thoughts & Lessons Learned

- The Energiewende is for real - broad public support
- German companies are investing strongly in RE
- German schools export RE technology and brands worldwide

- Electric baseload is being eliminated
- Flexible generation from hydro and gas is needed
- Better Grids and storage are needed
- Conventional power generators will likely continue to struggle

-For integrated U.S. utilities, transmission and distribution assets may be more valuable than some generation assets if we follow Germany's path

-If electric providers are too conservative, individuals and communities will organize to take energy production into their own hands (e.g. Wallenstadt and Feldheim)

Thanks for your attention! Questions?