Wuppertal Institute
for Climate, Environment
and Energy

Paris Climate Agreement and Beyond

Prof. Dr. Peter Hennicke
Wuppertal Institute

5th International Convention of the Environmental Laureates
Governance for real sustainability
Freiburg, Germany, 10-13 March 2016

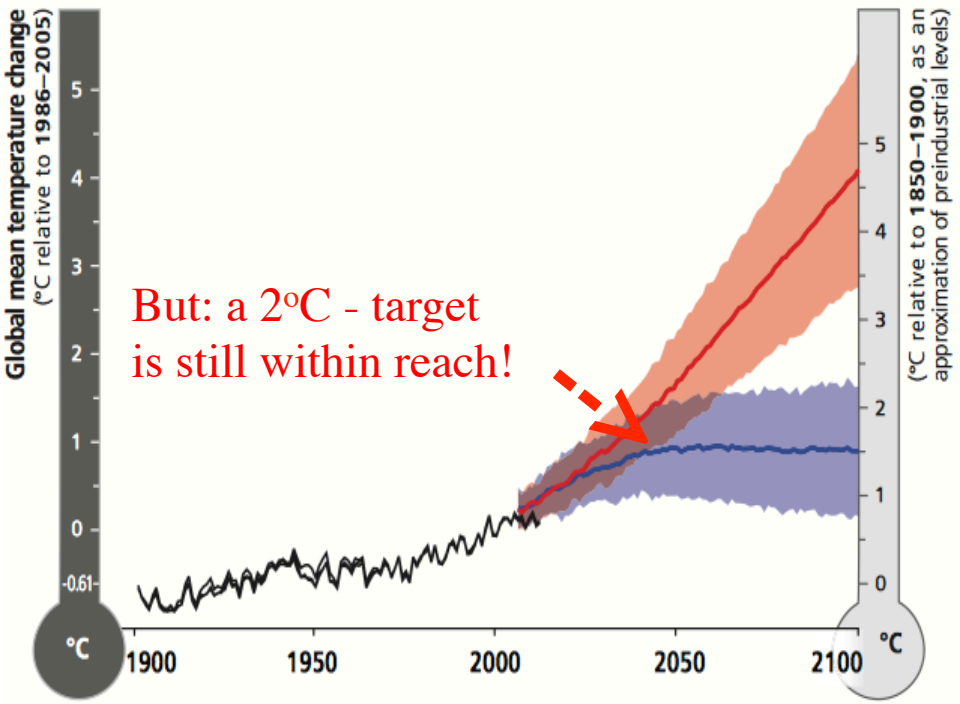
Topics

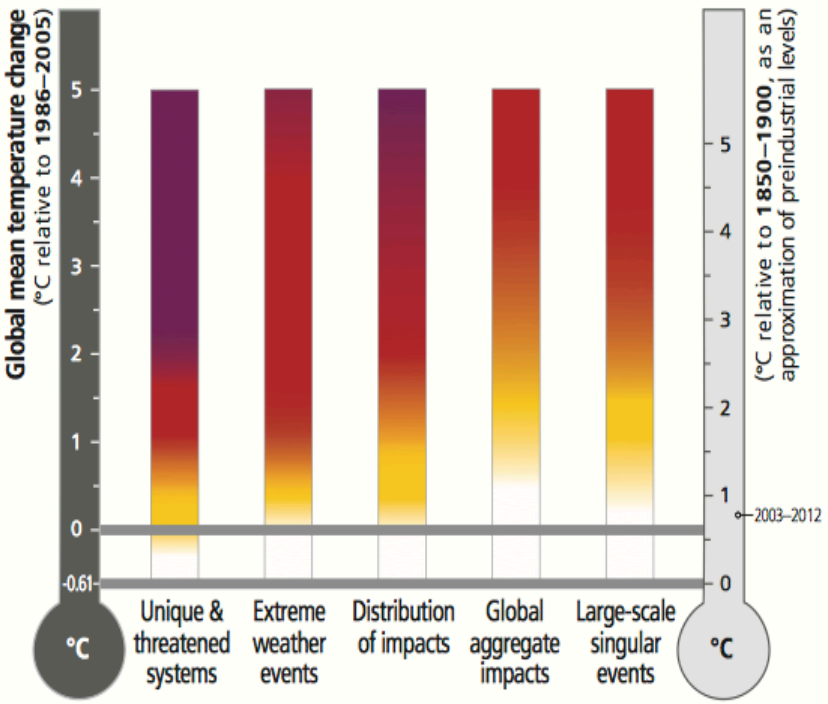
- **The main message of the Paris Agreement is: The age of fossil fuels is over!**
- **"Scaling up", "speeding up" and "tightening up" is necessary and possible!**
- **Focus on positive narratives: opportunities, economic benefits, success stories!**

Examples:

- **New narrative: Global benefits instead of "burden sharing"**
- **Non climate drivers/co-benefits of mitigation policies**
- **Reduction of economic risks by divestment from fossil fuels**
- **Surprising cost degression of PV and wind power**
- **Efficiency ("first fuel") on top of the agenda combined with sufficiency policies**
- **Disempowerment of monopolies by decentralisation and democratisation**

Without additional mitigation, global mean surface temperature is projected to increase by 3.7°C to 4.8°C over the 21st century.





Working Group III contribution to the
IPCC Fifth Assessment Report

COP 21: Starting the end game of fossil fuels

But when: Decarbonising the world economy up to 2050, 2080, 2100?

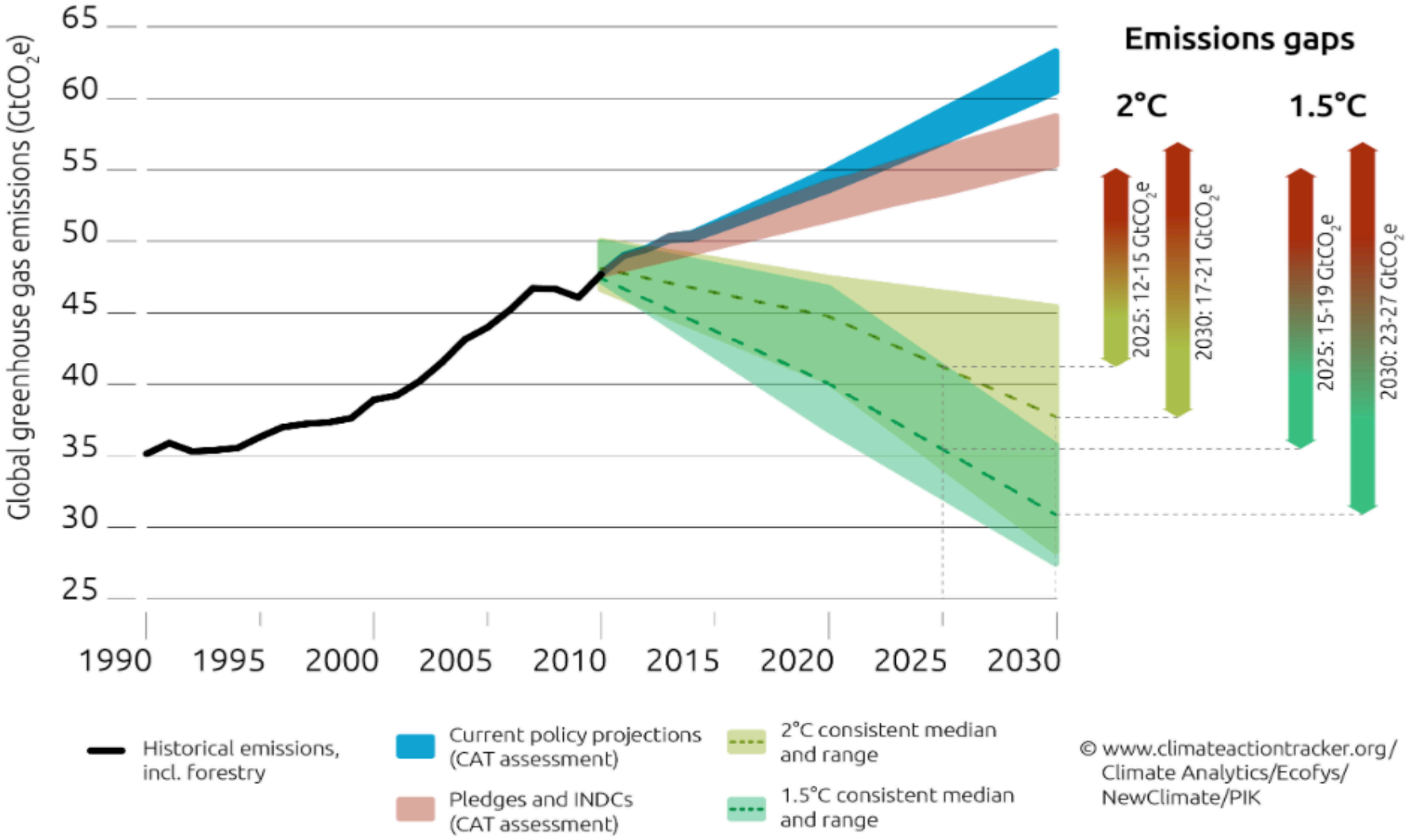
Klimakonferenz in Paris

Einigung auf Abkommen

Staaten beschließen Weltklimavertrag

Scaling up, speeding up (peak 2020) and tightening up!

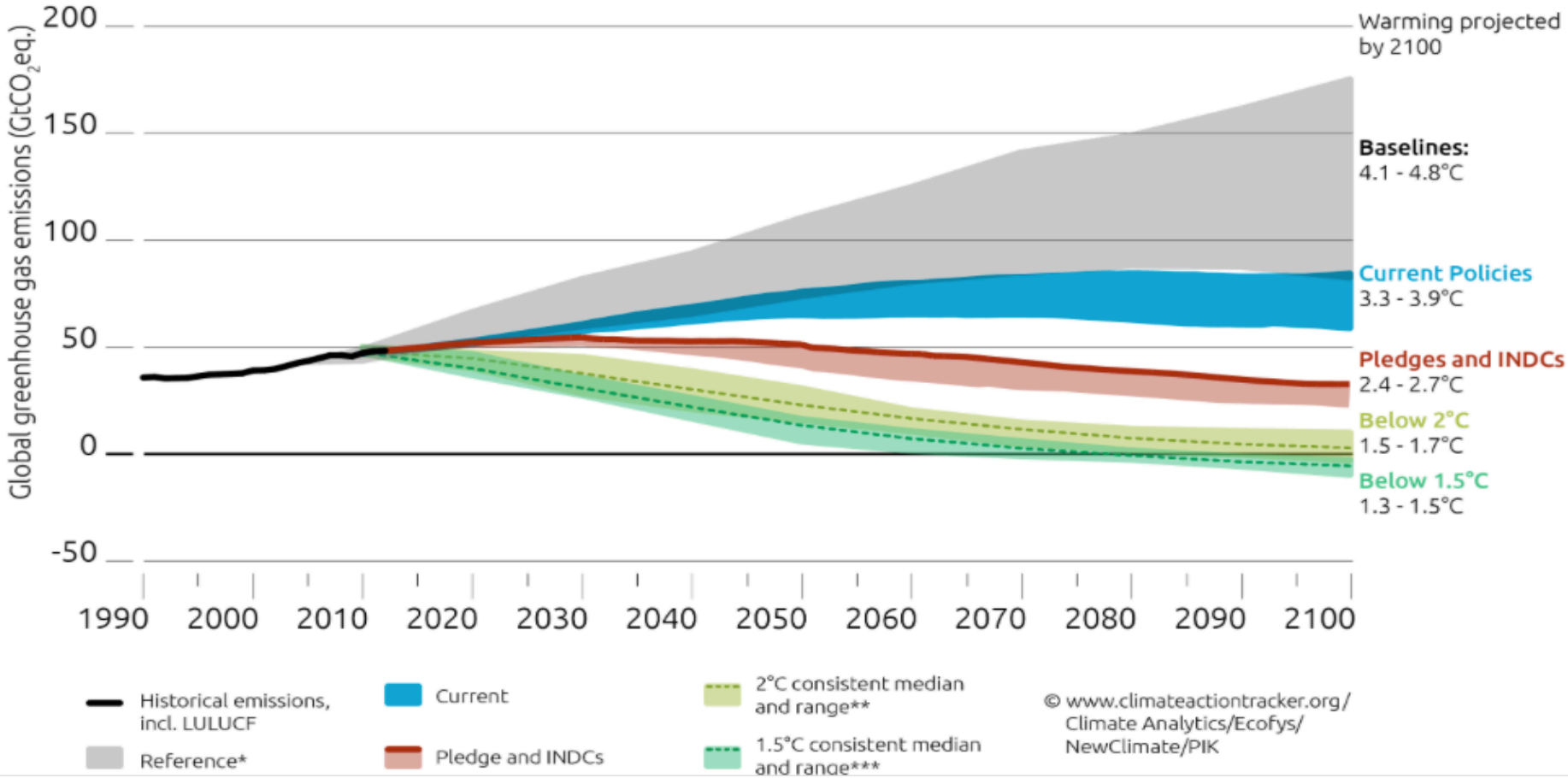
But: The challenges are huge!



Reduction of all GHG to zero up to 2080?

Negative emissions! Beyond decarbonisation of the energy sector!

Effect of current pledges and policies on global temperature



A new narrative after COP 21 is needed: Let`s talk about “benefit sharing” instead of “burden sharing”

The traditional perception of climate protection is “burden sharing”

But:

The global costs of climate mitigation are marginal (IPCC AR 5):

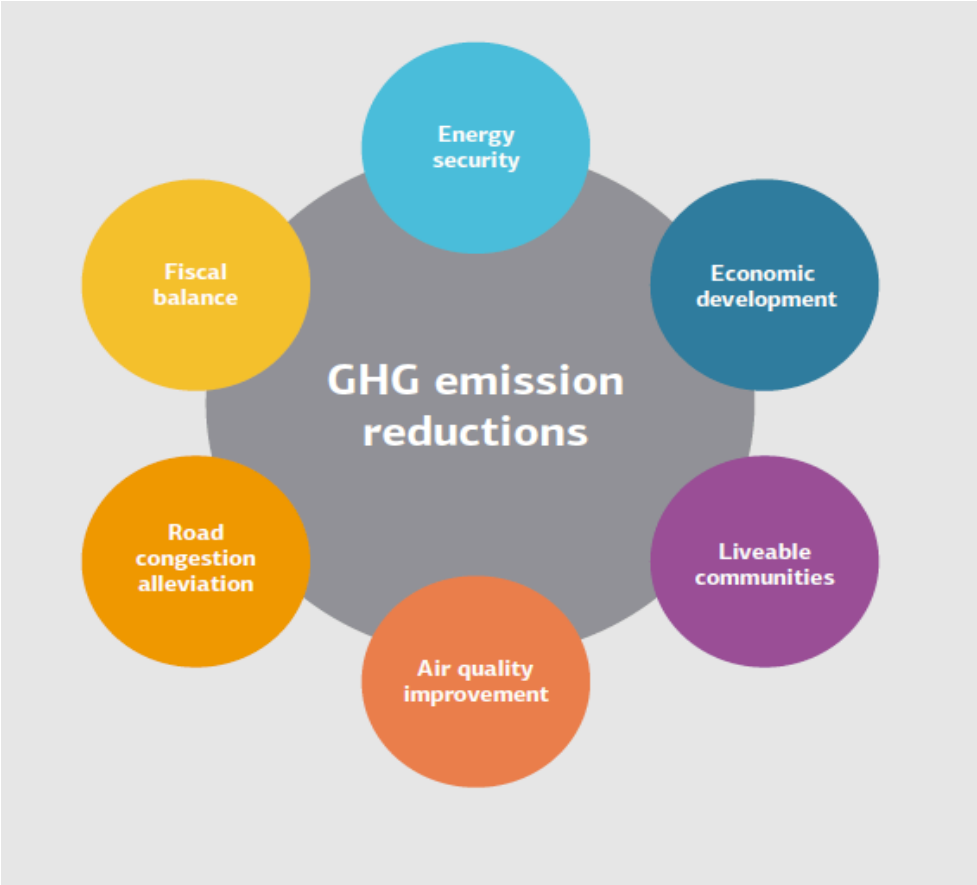
- **0.06% reduction of 1.6 - 3% growth of consumption p.a.!**
- ***Globally the* avoided damage costs of climate change are huge**
- **In 2050 more than threefold the costs of climate mitigation!**

Thus:

Add the *country specific* benefits and co-benefits to get a strong economic rationale for climate mitigation policies!

As awareness on “co-benefits” is rising, national self-interest in climate mitigation is strongly encouraged

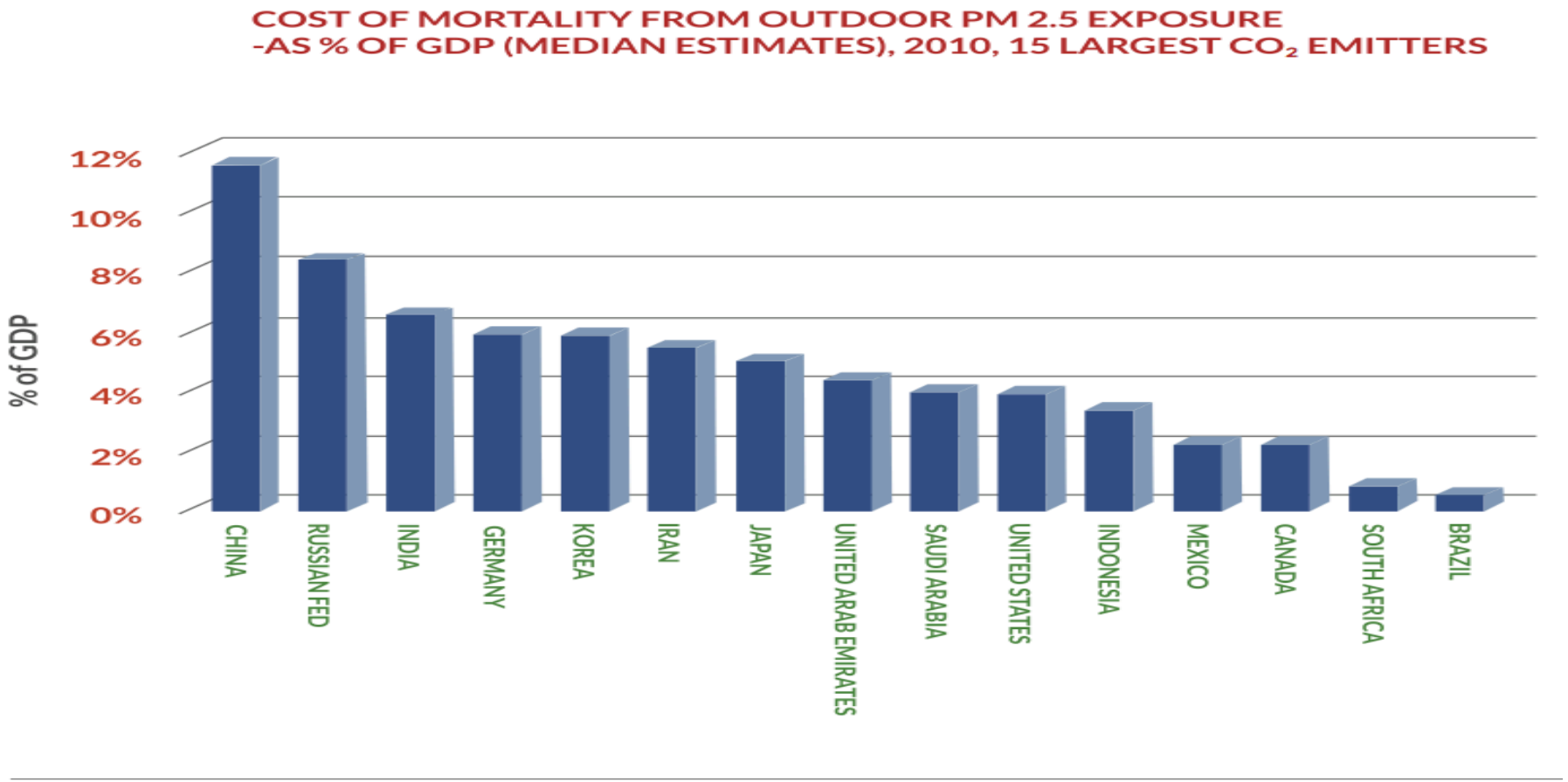
IEA: “Non-climate drivers” for GHG emission reductions



„Between 350,000 and 500,000 Chinese die prematurely each year because of the country's disastrous air pollution, says China's former health minister“. The Telegraph, 9. 3. 2015

Quelle: IEA 2014

Cost of mortality from outdoor PM 2.5 exposure
% of GDP, 2010, 15 largest emitters

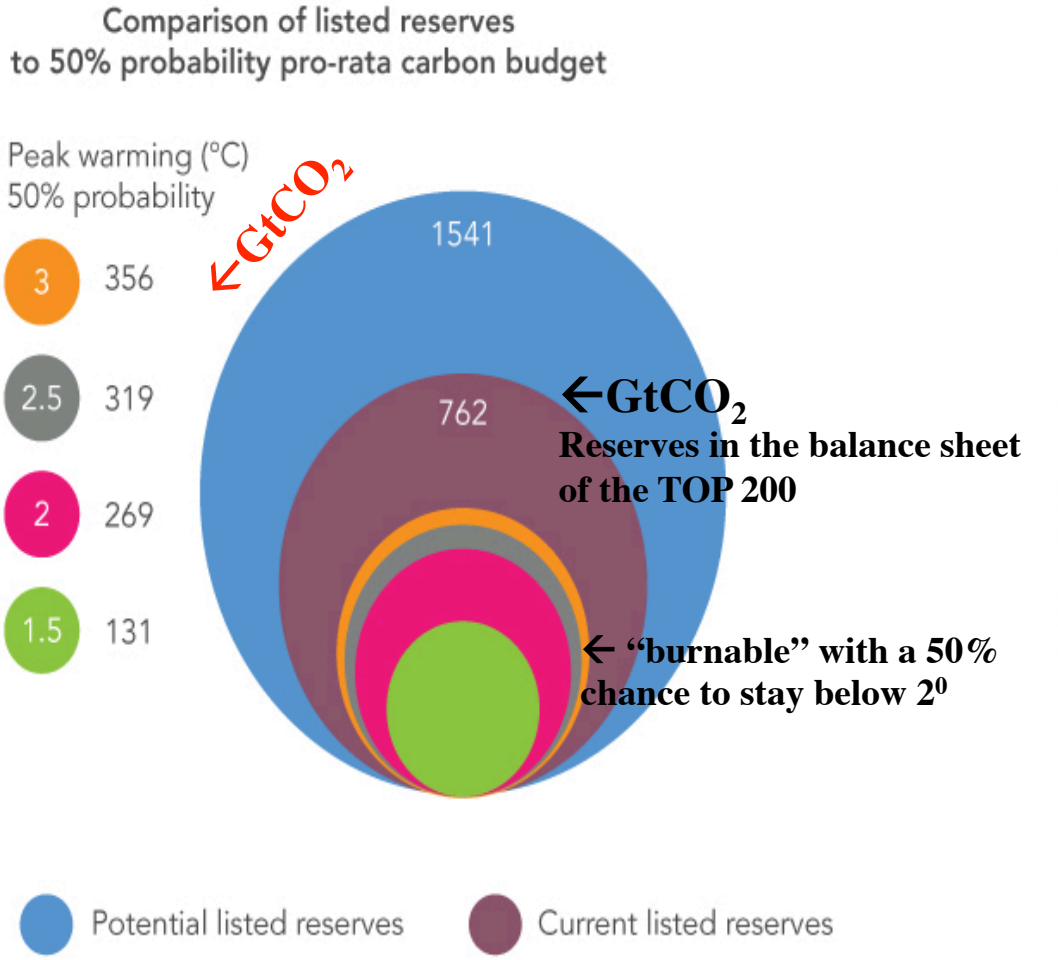


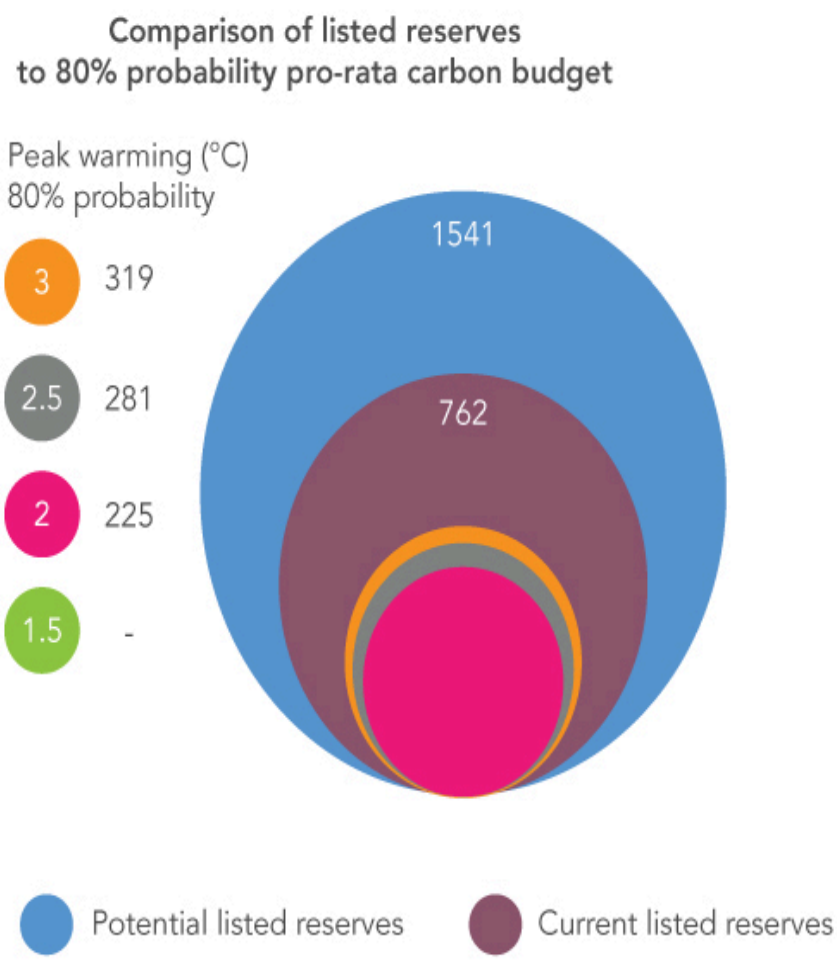
Note: The estimate is for mortality from particulate matter ($PM_{2.5}$) exposure in particular, which was also the focus of recent World Health Organization mortality estimates. Source: Hamilton, 2014.[42]

Source: Taken from: The Global Commission on the Economy and the Climate, 2015

Divestment and growing concerns on a “carbon bubble” = Stranded investment

Carbon Bubble: 70% of fossil assets of TOP 200 "unburnable",
if a 2 degree target would be implemented globally





German television (19.1.2016): A story on capital perspectives

Short-run: Speculation → Long-run: Divestment from coal

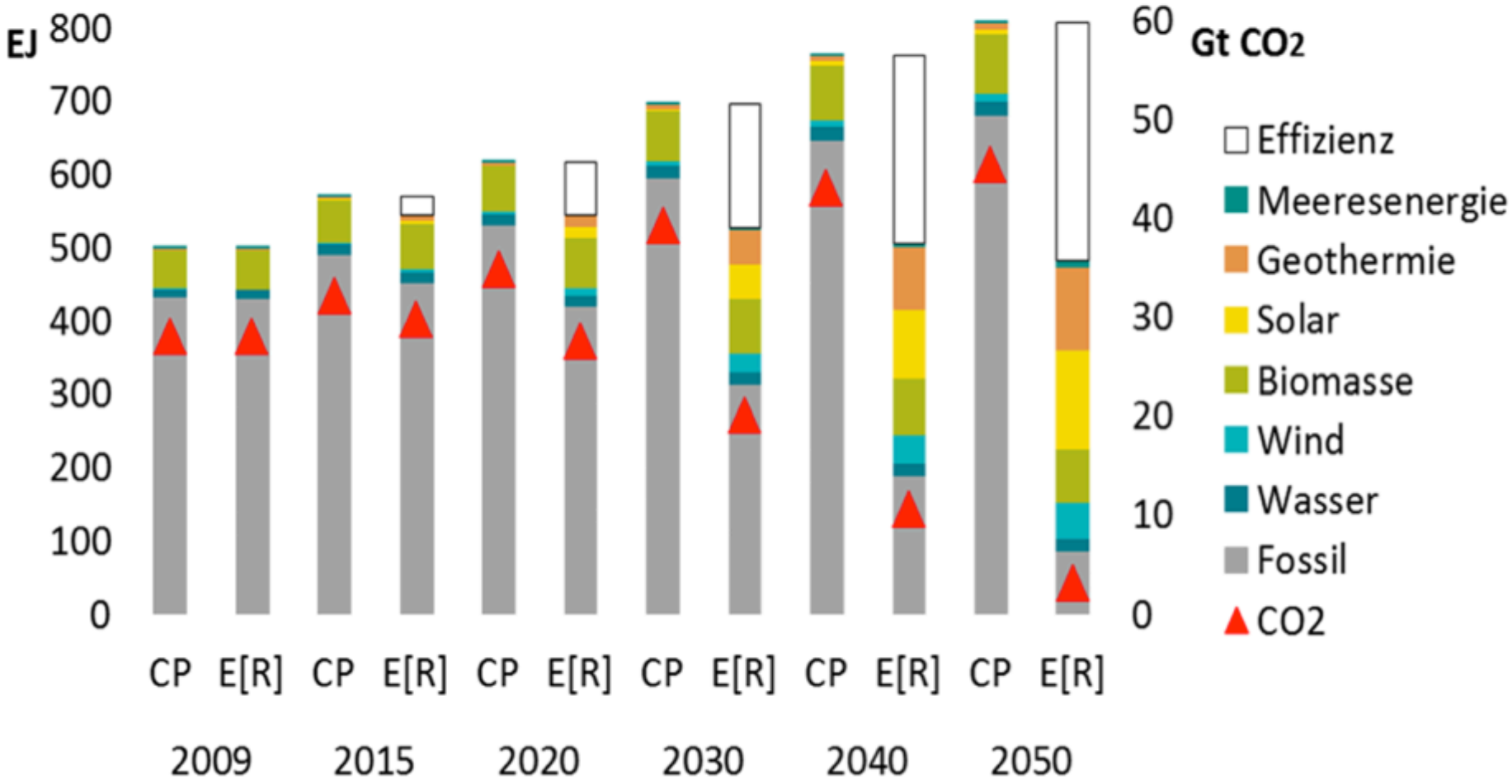
Is a “Global Energiewende” feasible, contributing to the 2°C – target?

Yes!

By combining the energy efficiency revolution with the rapid deployment of renewables

Global: Primary Energy and $C0_2$-Emissions

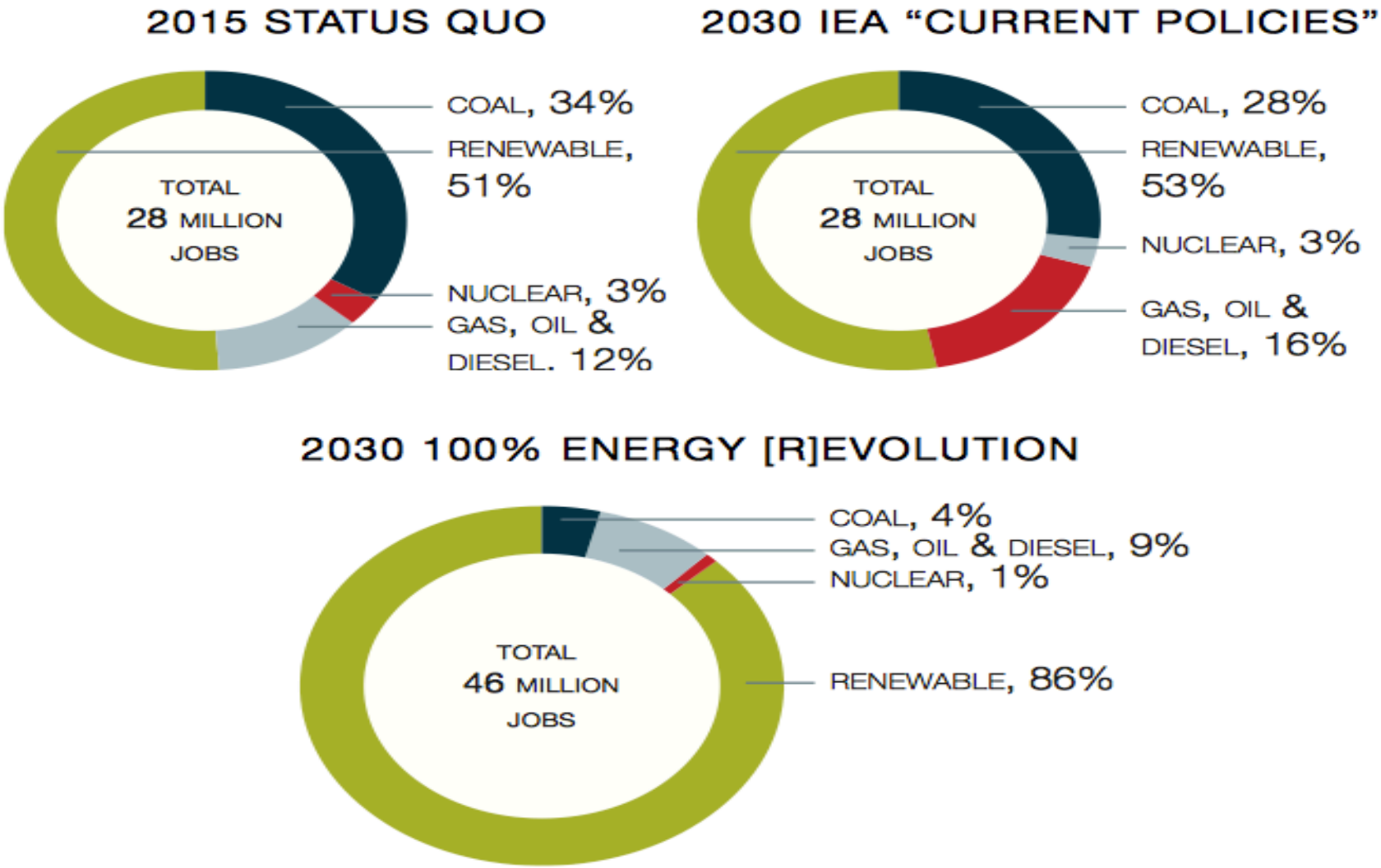
IEA (WEO) Current Policy (CP) vs. Energy (r)evolution (E(R))



Quelle: DLR 2015

Global: Employment in the energy sector (2015 vs. 2030)

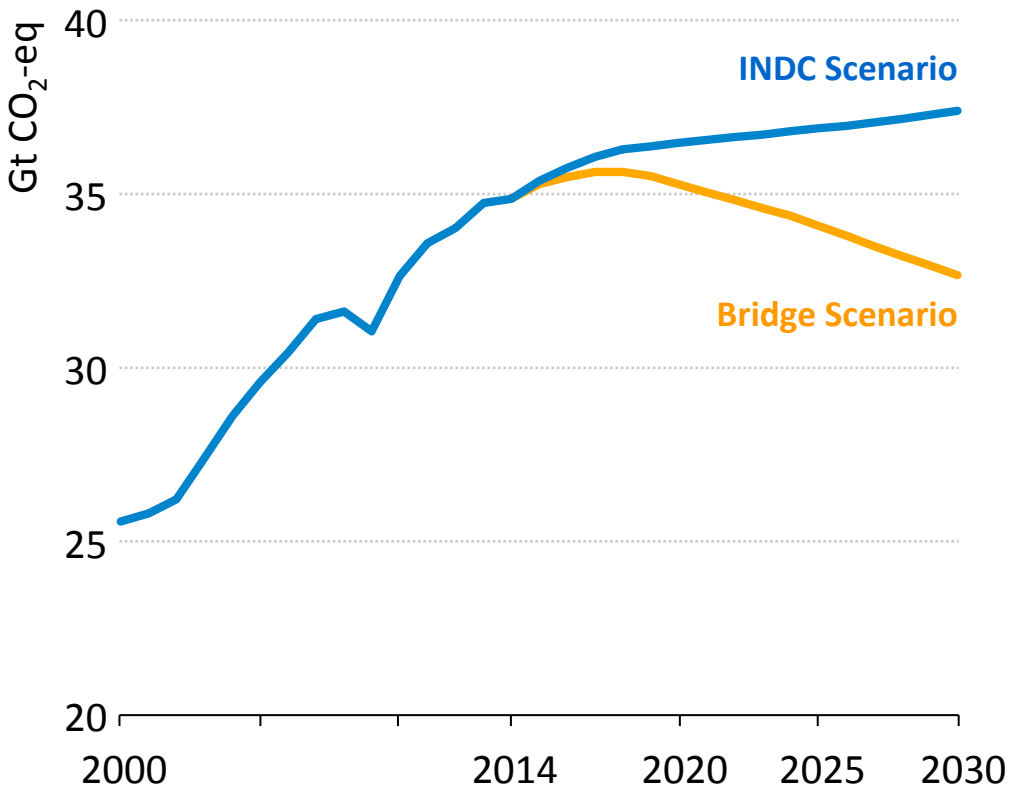
100% Energy (r)evolution vs. IEA "Current Policy"



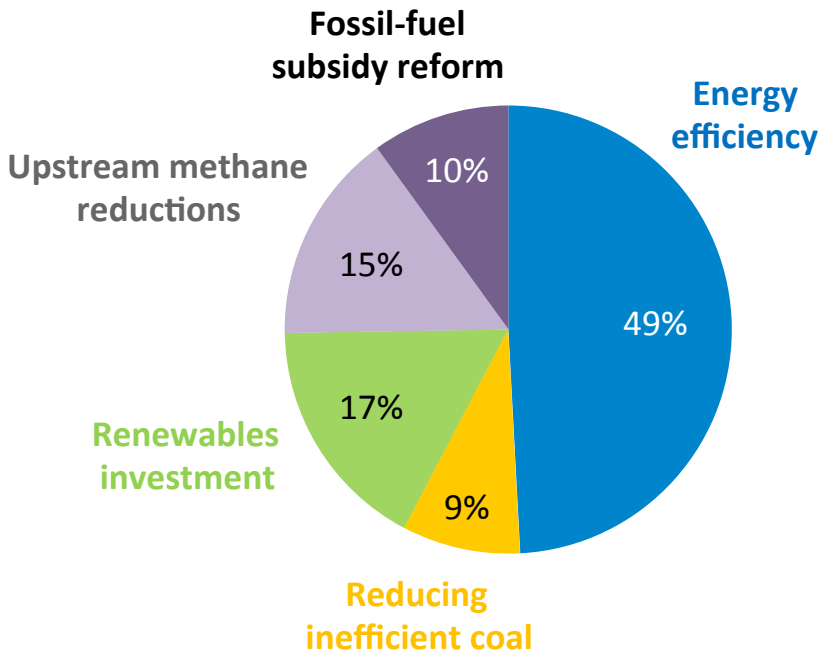
Source: Greenpeace (ed.)/DLR, Energy (r)evolution, 2015

IEA-Bridge Scenario (2015)
Peak in emissions around 2020

Global energy-related GHG emissions



Savings by measure, 2030



INDCs: Intended Nationally Determined Contributions

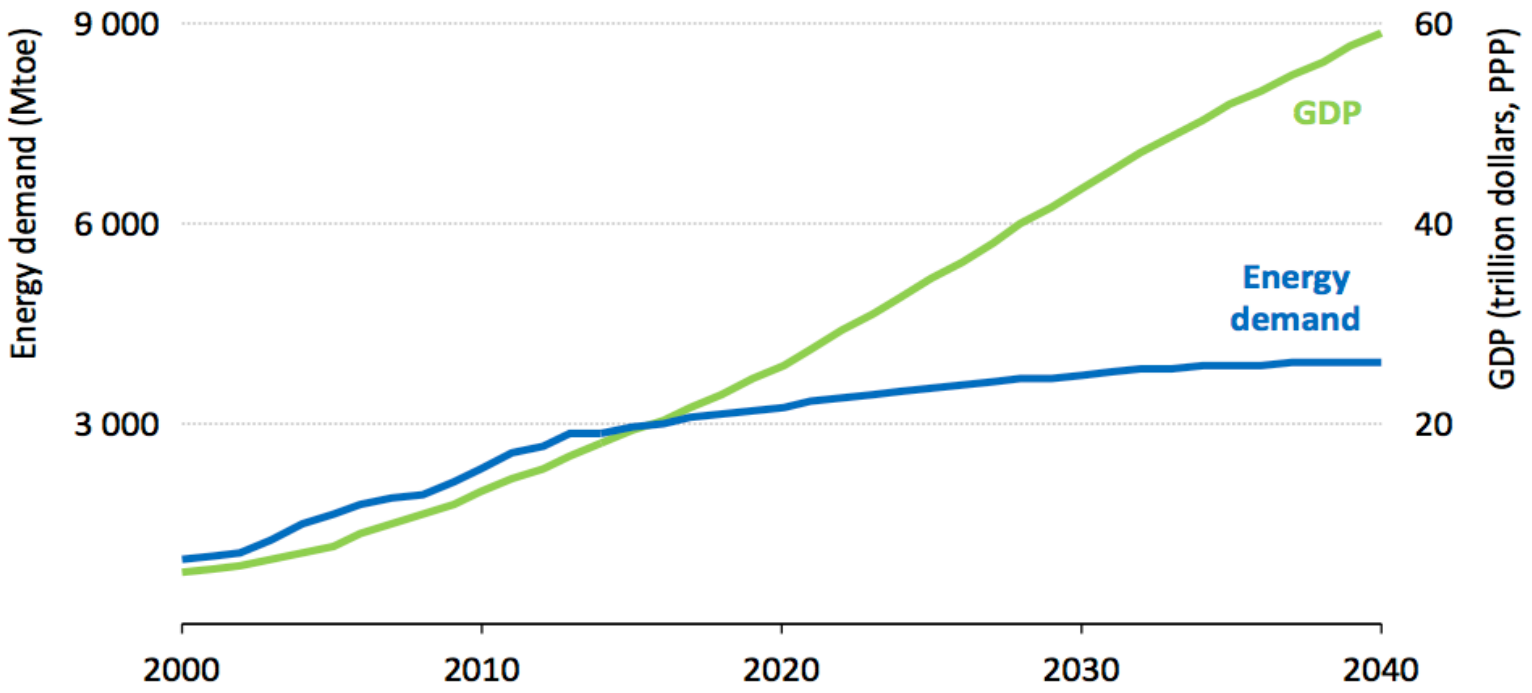
Source: IEA, Energy and Climate 2015

Five measures – shown in a "Bridge Scenario" – achieve a peak in emissions around 2020, using only proven technologies & without harming economic growth

A new chapter in China's growth story

World Energy Outlook 2015

Energy demand in China



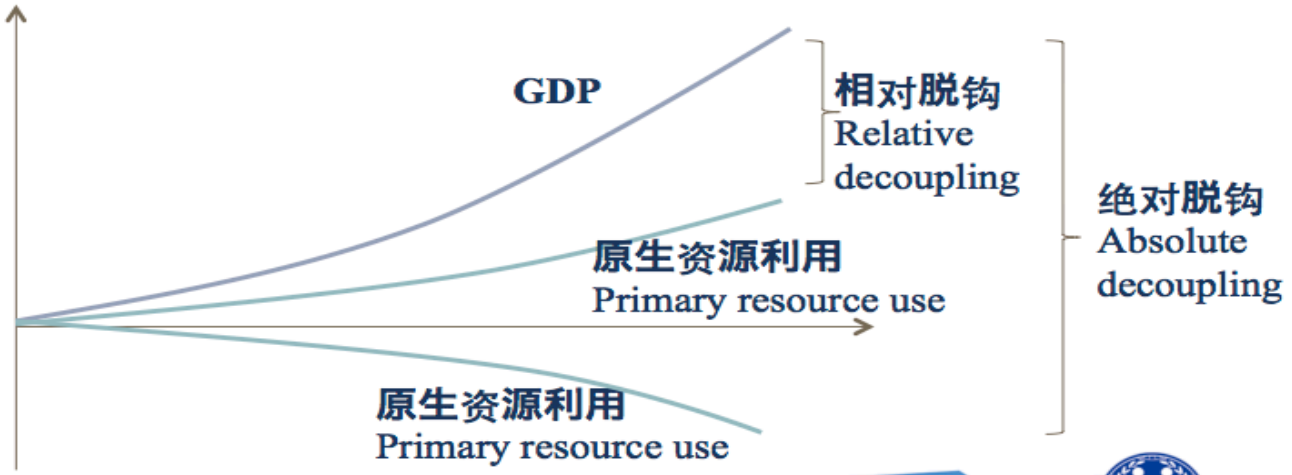
Along with energy efficiency, structural shifts in China's economy favouring expansion of services, mean less energy is required to generate economic growth

National Governance Capacity for Green Transformation

"Decoupling": A topic for the China Council (CCICED) 2015 as well

绿色转型 Green Transformation

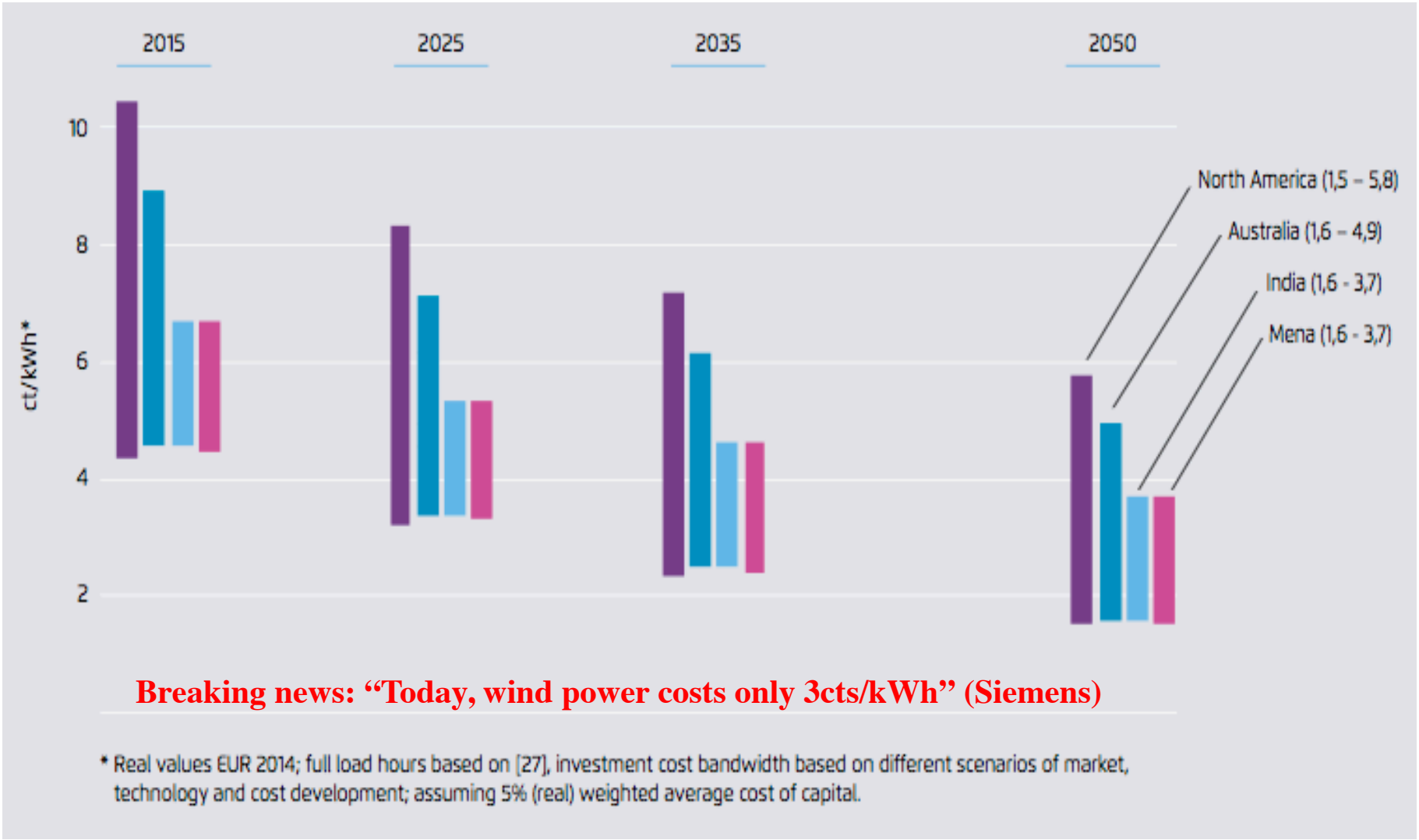
- 经济增长与资源利用脱钩
  Resource decoupling
- 经济增长与环境影响脱钩
  Impact decoupling



CCICED WWW.CCICED.NET

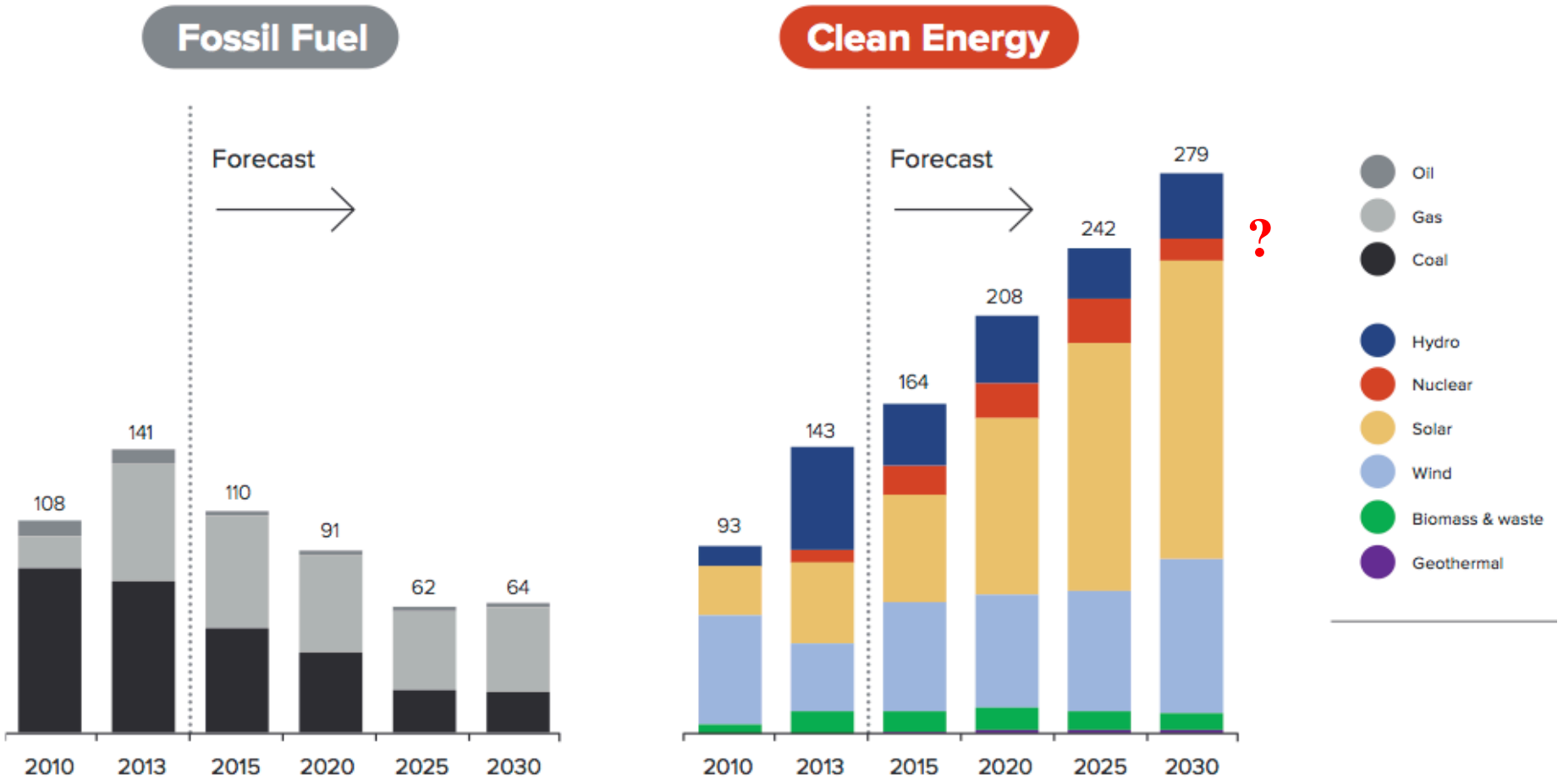
Cheap renewable power for the world
- is becoming a reality!

Forecasted cost degression of electricity from new PV
- in North America, Australia, India and Mena region (in cts/kWh)



Source: Agora, Current and Future Cost of PV, 2015

The perspectives of renewable electricity are bright
A factor of four more additional power than fossil fuels

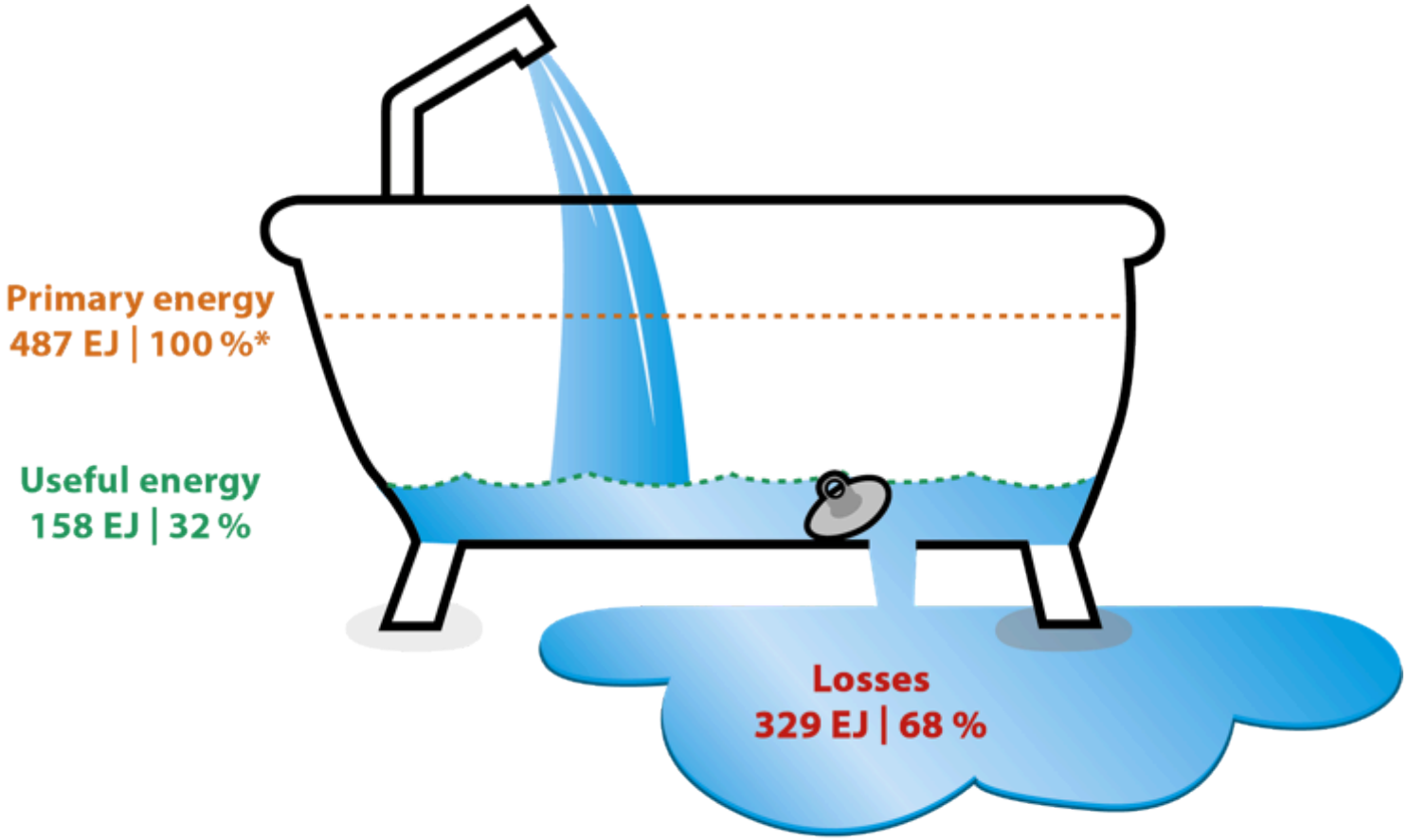


Source: Bloomberg New Energy Finance, 2015.[13]

Make the efficiency revolution happen – The “Power” of the “Negawatt”

To stop the losses of the global energy system…

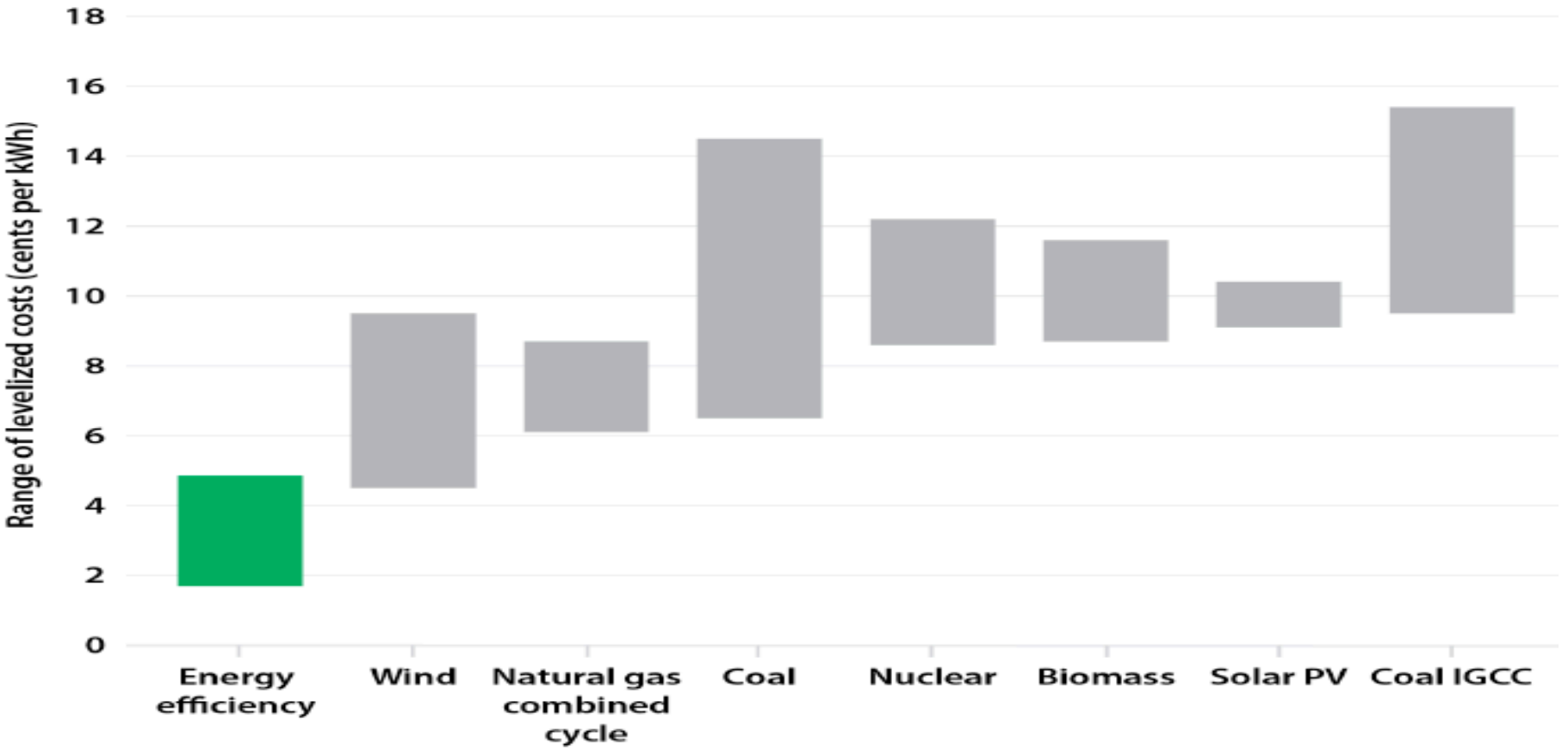
the energy efficiency revolution (end use + decentralised power) is a must!



*Total primary Energy 519 EJ less 32 EJ non energetic consumption
Source: Hennicke/Grasekamp 2014; based on Jochem/Reize 2013; figures from IEA/OECD/IREES

US: Cost of utility efficiency programs (average 2.8 cents per kWh)

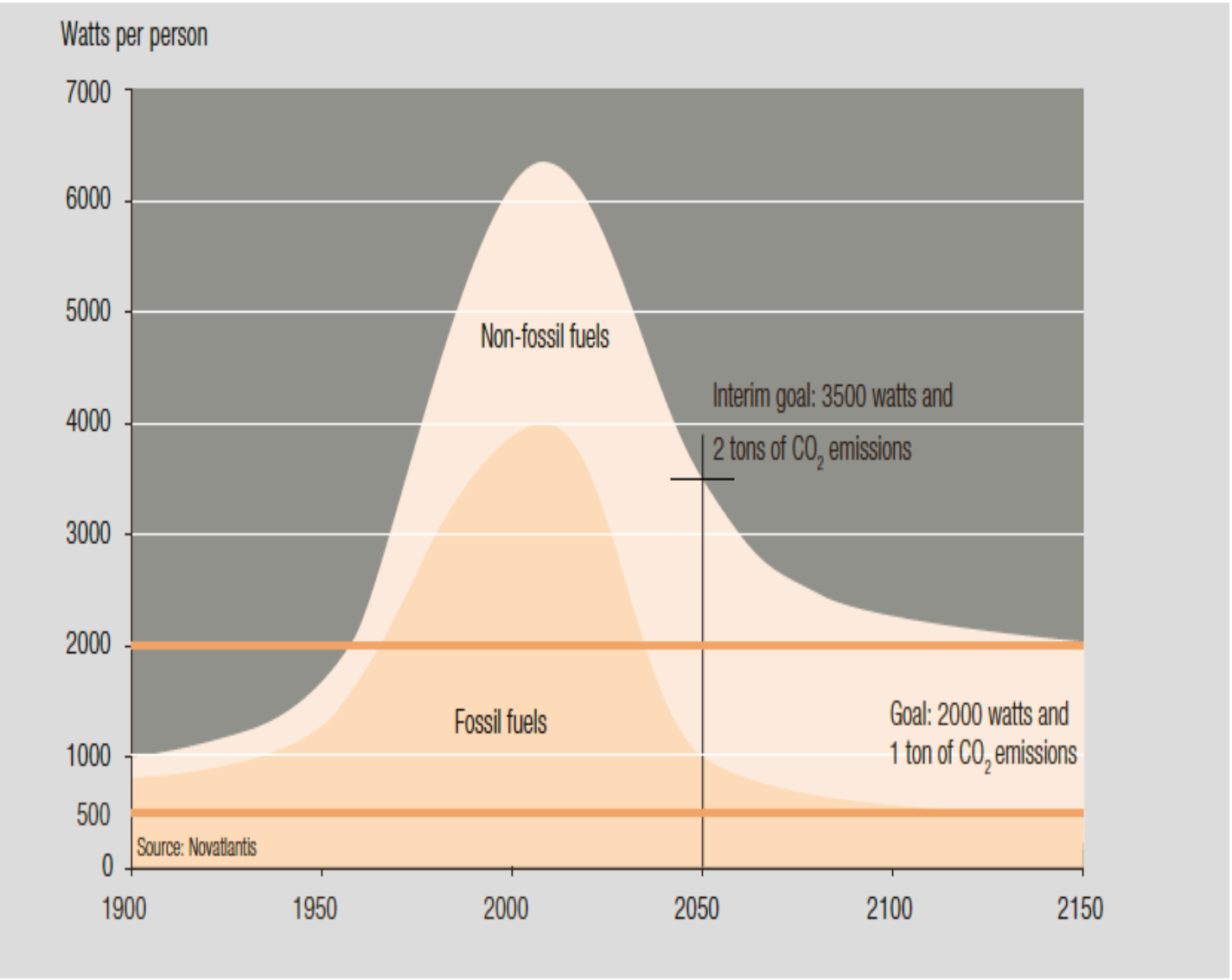
A factor of 50-75% less than levelized cost of new electricity resource options

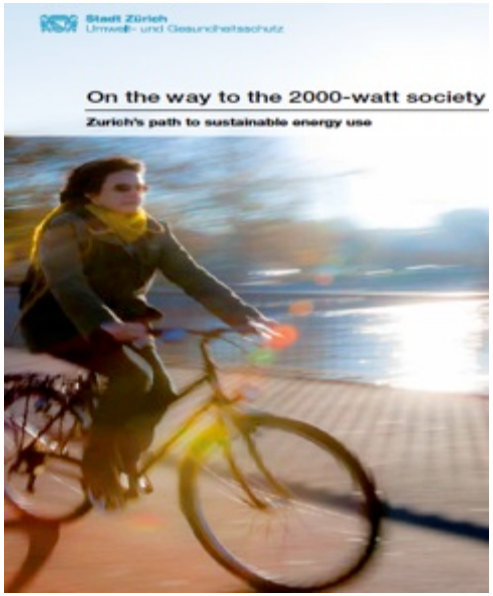


The high-end range of coal includes 90 percent carbon capture and ompression. PV stands for photovoltaics. IGCC stands for integrated gasification combined cycle, a technology that converts coal into a synthesis gas and produces steam.
Source:ACEE 2014. Energy efficiency portfolio data from Molina 2014; all other data from Lazard 2013.

The Swiss formula: Efficiency+sufficiency+renewables

340 Swiss "Energy Cities" on the way to a "2000-Watt Society"





On 30 November 2008, the City of Zurich made a groundbreaking decision. Over three quarters of the electoral roll voted in favour of Zurich doing the following:

- Committing to sustainable development.
- Reducing its energy consumption to 2000 watts per person.
- Reducing its annual CO_2 emissions to one tonne per person by 2050.
- Promoting renewable energies and energy efficiency.
- Not renewing its investments in nuclear power plants.

With this strategy, Zurich wants to contribute to combating human-induced climate change, but there are also social, economic and ethical arguments which speak in favour of lower energy consumption. As a 2000-watt society, Zurich is better equipped for times of scarce and expensive energy resources, but the fact that the goals are set in the municipal code does not mean that they have yet been achieved. This requires effort on the part of the city administration, the residents and the local economy, but also good cooperation with political bodies at higher levels, namely the canton and the Federal Government.

The missing link:
“Act locally to change globally”

Opportunities and challenges of the German Energiewende

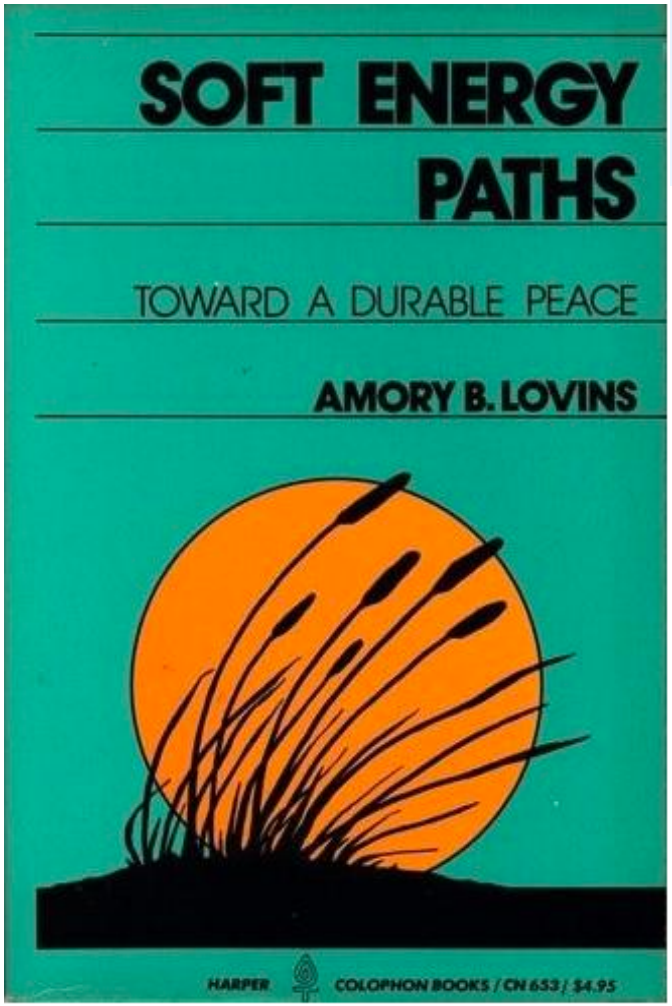
A long way from research to “soft energy paths”

A. Lovins (1976): Substitute the “hard” by the “soft” energy path → Energiewende

Coexistence of the “old” and the “new” energy world?

“This new world, which is emerging around customers and their changing needs, is fundamentally different from the conventional energy supply system which is based on large-scale systems.”

Johannes Teyssen (CEO/E.ON)
Press Conference,
December 1, 2014



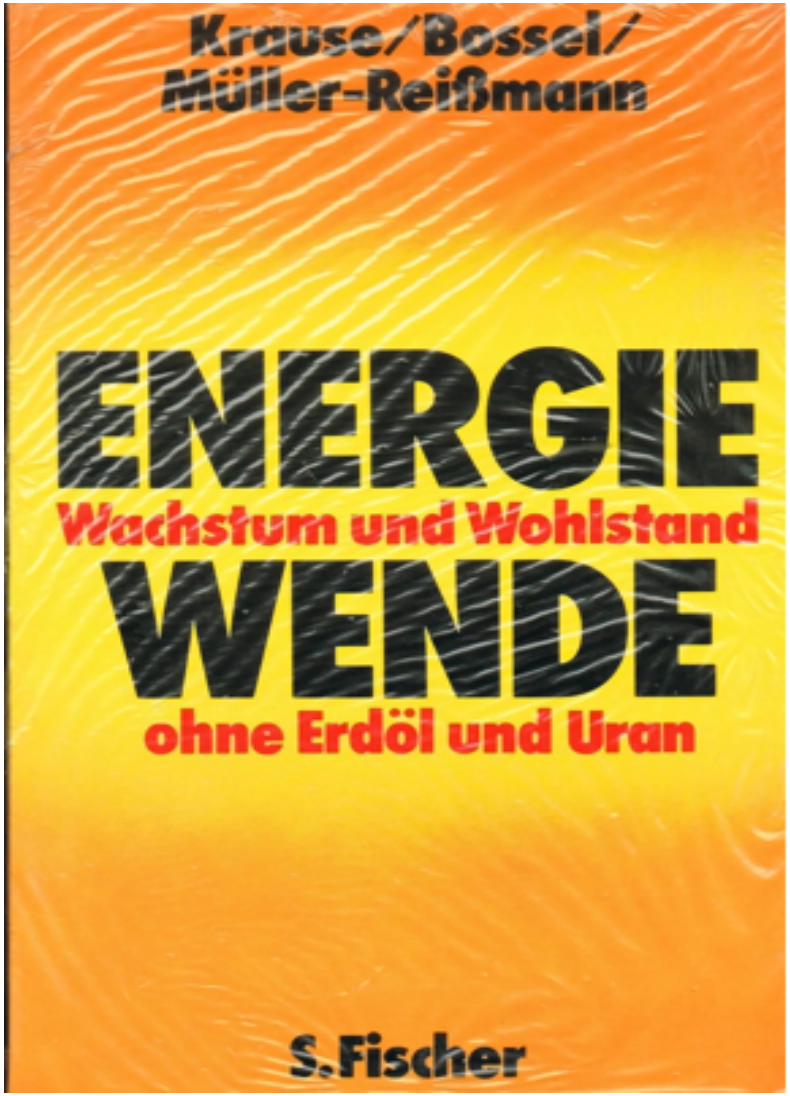
FOREIGN AFFAIRS
Published by the Council on Foreign Relations

Lovins, Amory B.: The road not to be taken, 1976.

Lovins, Amory B.: *Soft Energy Paths: Towards a Durable Peace*.
Pelican Books 1977;
Harper & Row, 1979.

Öko-Institute/Krause/Bossel/Müller-Reißmann (1980):

"Energiewende: Growth and prosperity without oil and uranium"



Hennicke/Johnson/Kohler/Seifried (1985): "The Energiewende is possible" – the local level is key!

1985 - 2011:

The long march to make the Energiewende happen!

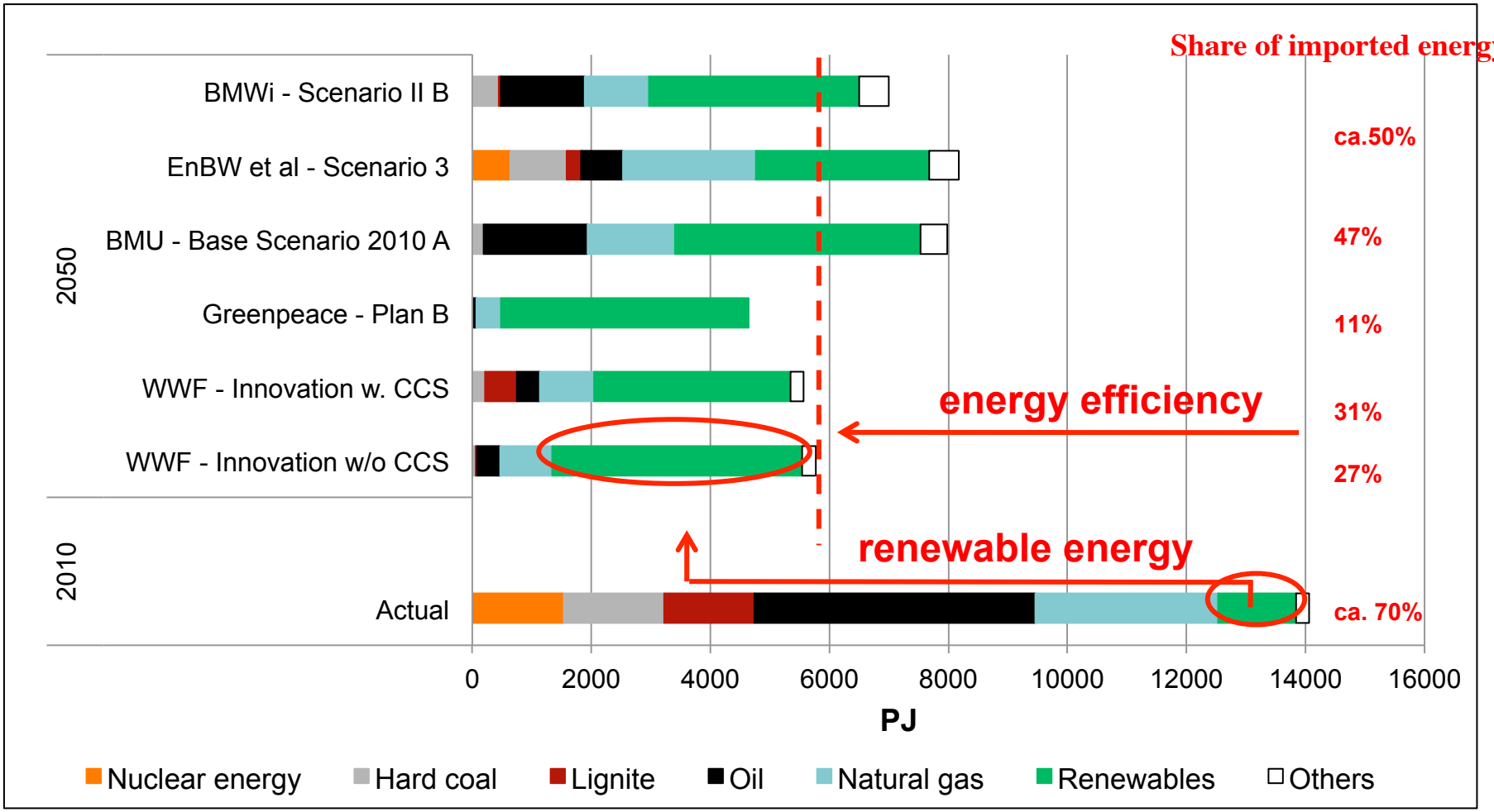
“Revolutionary Targets” (Chancellor Merkel)
Energy Concept, Federal German Government, 28 September 2010

Development Path	2020	2030	2040	2050
Greenhouse Gas Emissions	- 40%	- 55%	-70%	- 80 bis 95%
Share of renewable energies in relation to the gross final energy consumption	18%	30%	45%	60%
Electricity generated from Renewable Energy Sources in relation to gross final energy consumption	35%	50%	65%	80%
Primary Energy Consumption [base year 2008] / annual average gain in energy productivity of 2.1 %, based on final energy consumption.	-20%			-50%
Electricity Consumption [base year 2008]	-10%			-25%
Doubling the Building Renovation Rate from the current figure of less than 1 % a year to 2% of the current building stock ; reduction				-80%
Reduction of the **Final Energy Consumption** in the **Transport Sector** [base year 2005]	-10%			-40%

Research consensus: “Energiewende” technically feasible

Decoupling and reducing energy import dependency (2012: import costs 105 bn€)

Primary energy in Germany in 2010 and in 2050 according to typical energy scenarios



Source: Samadi 2011, based on data from AG Energiebilanzen 2011 and scenario studies cited

A scenario for a greenhouse gas-neutral Germany
Transforming all sectors to (nearly) GHG neutral

Distribution of GHG emissions in the UBA THGND* 2050 Scenario

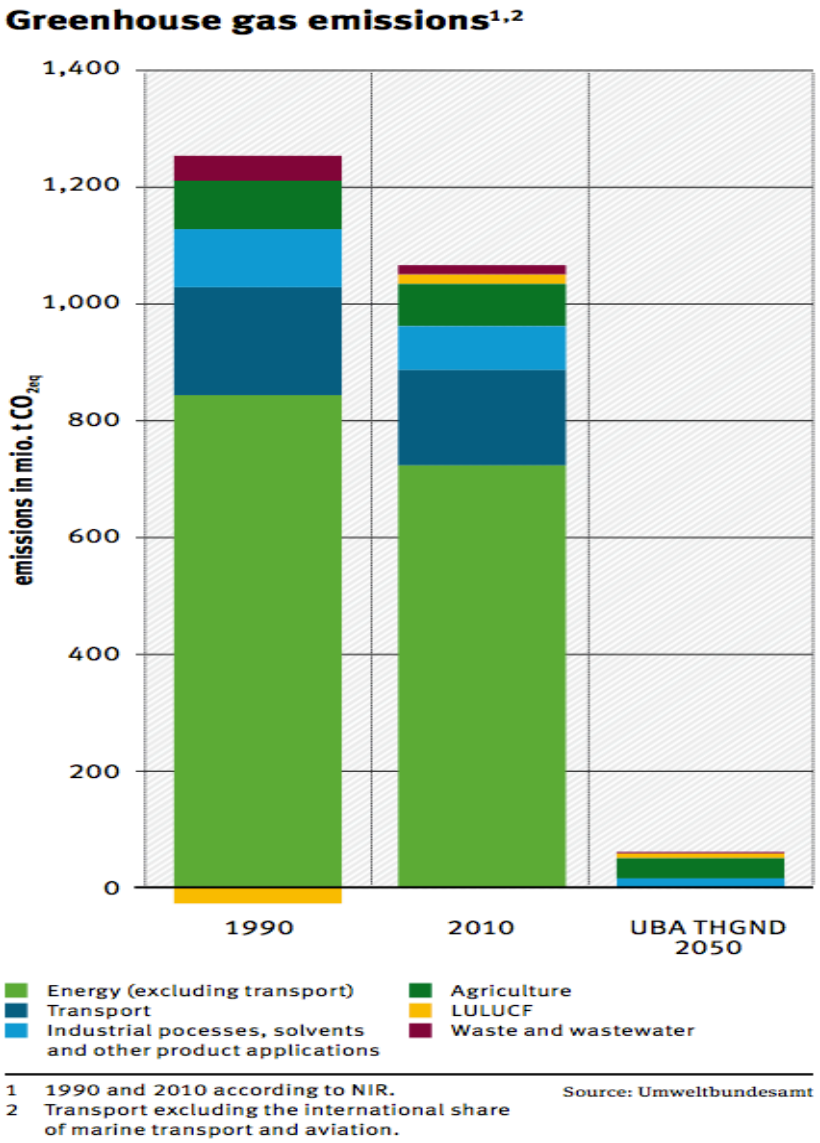
* German abbreviation for greenhouse gas-neutral Germany

Emission Source	CO_{2eq} in million tonnes
Energy[I]	0
Industrial processes, solvents and other product applications	14
Agriculture	35
LULUCF[II]	8
Waste	3
Total	**60**

I including transport, processing industries etc.
II Land use, land use change and forestry.

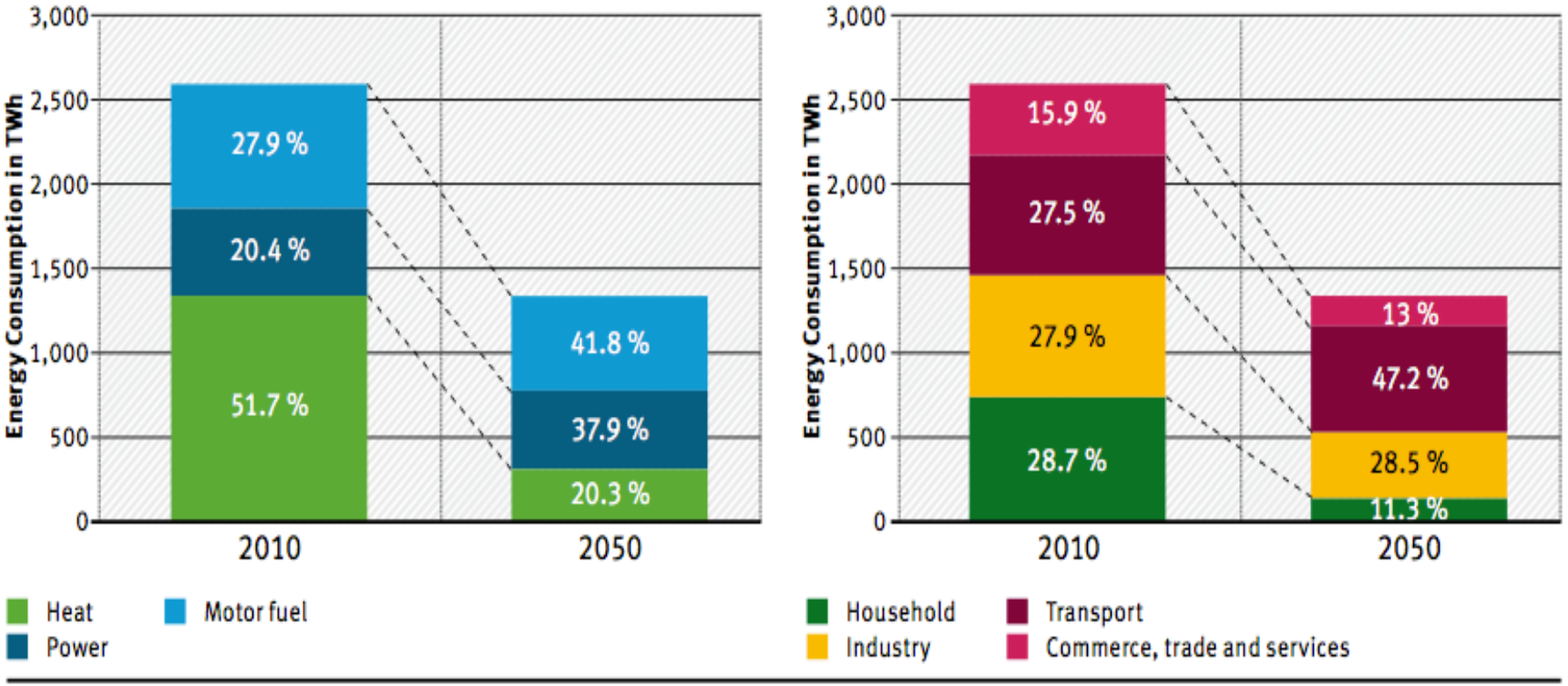
Source: Umweltbundesamt

Source: UBA 2013



First prerequisite: Reducing final energy by 50%
Forced absolute decoupling - assuming 1% p.a. economic growth

UBA THGND 2050 Scenario, comparison of final energy in 2010 and 2050 (left: sorted by purpose, right: sorted by sectors) I, II

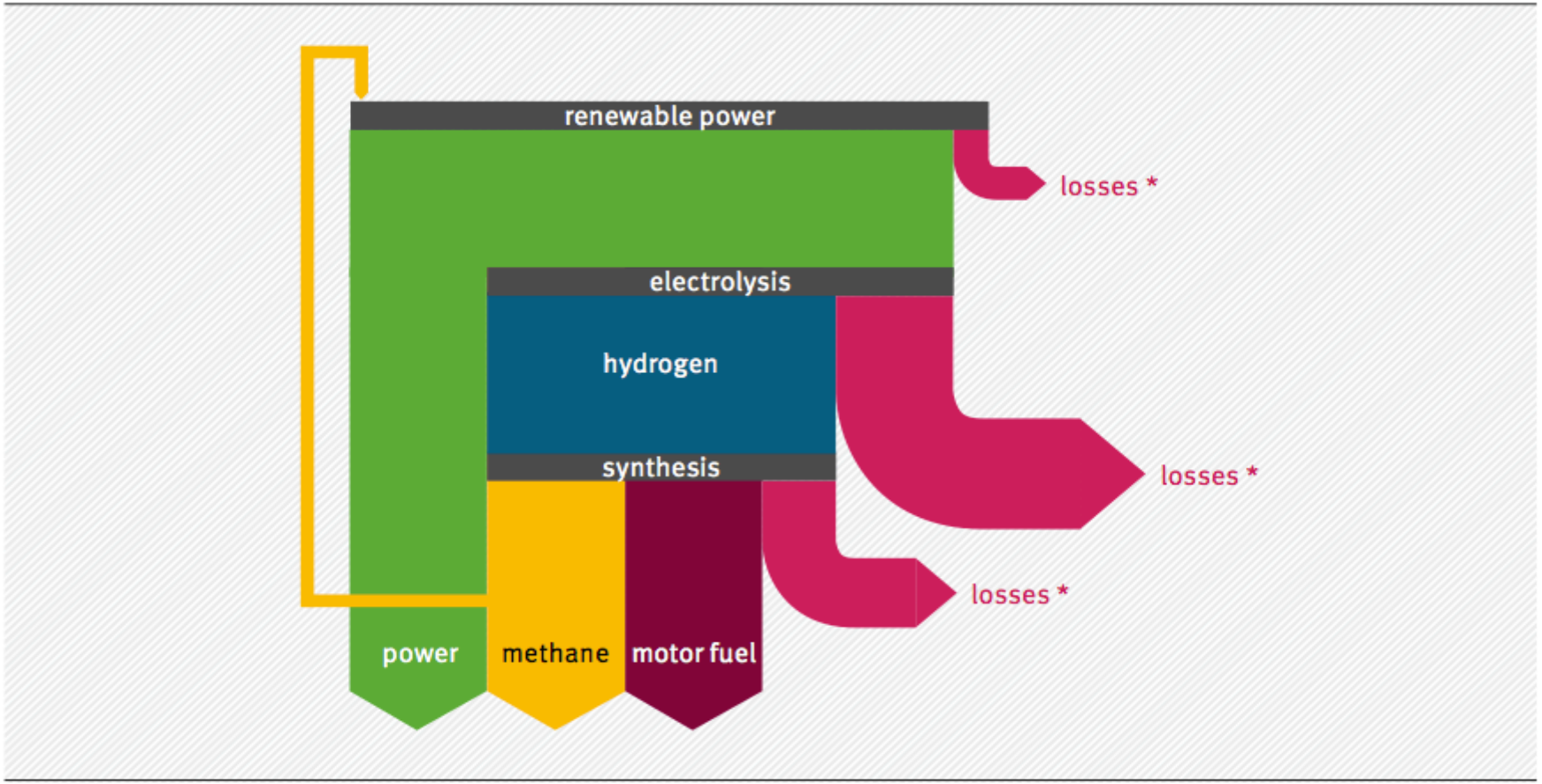


I In calculations for shipping transport, only domestic fuel stocks were included rather than the German share in international shipping. Similar rules apply to aviation calculations, which results in considerably lower figures. If the German share in international shipping and aviation is taken into account, final energy consumption will only be marginally reduced.

II Not including final energy in the shape of renewable methane as input in the chemical industry (using current calculation methods)

Second prerequisite for a $C0_2$-free Germany:
abundant and socially accepted renewable power (wind/PV)

Qualitative representation of the energy flow in the UBA THGND 2050 Scenario,[1,2] own graphics.

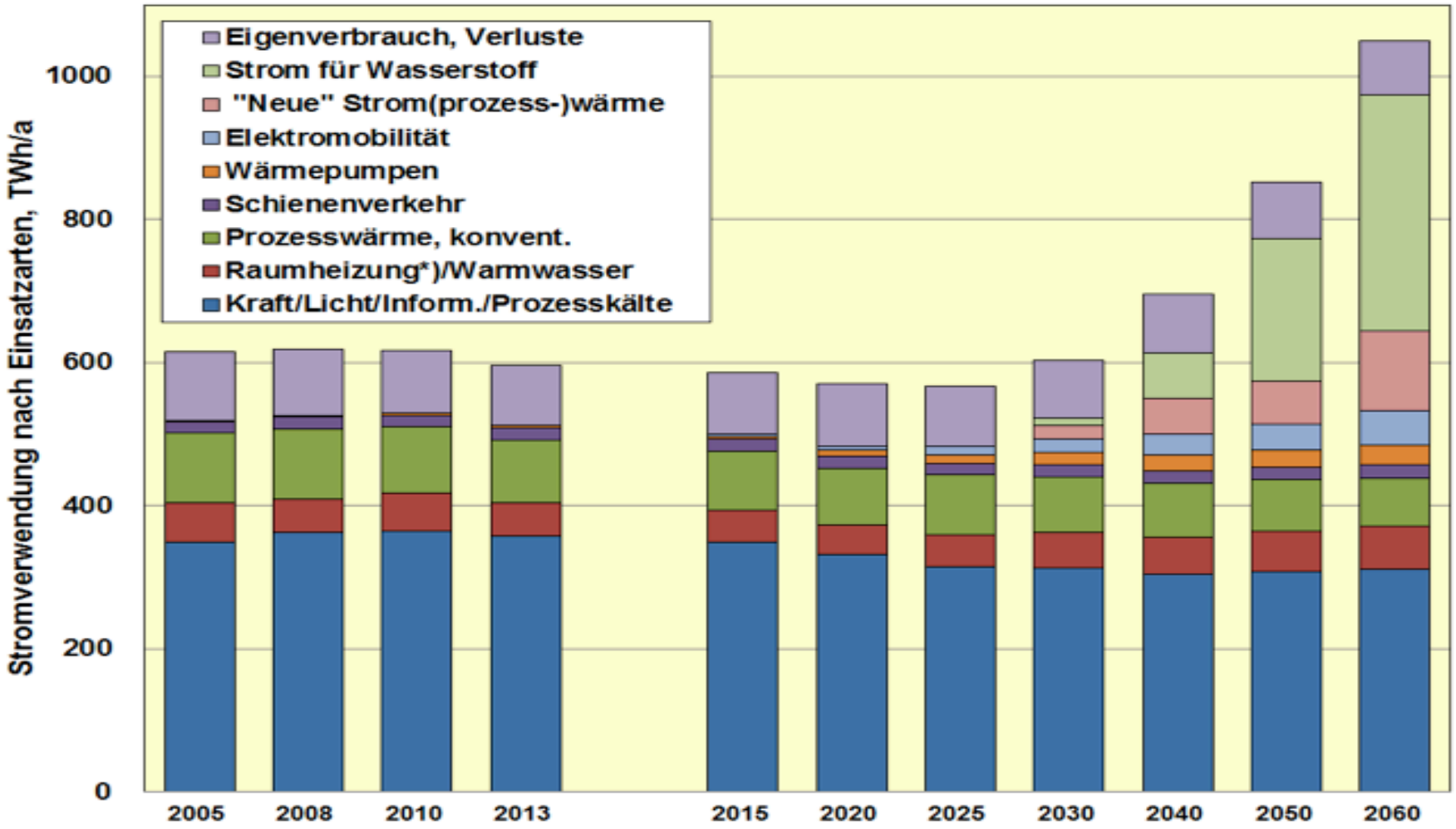


1 Including demand for renewable inputs in the chemical industry.
2 Energy flows are shown in proportion to energies required.
* Including line losses, losses from reconverting methane into power and losses from converting biomass into power

Source: Umweltbundesamt

Power production and application up to 2060 (100% REG)

Strong increase of PtG (e.g. hydrogen) and PtH (e.g. heat pumps) after 2030



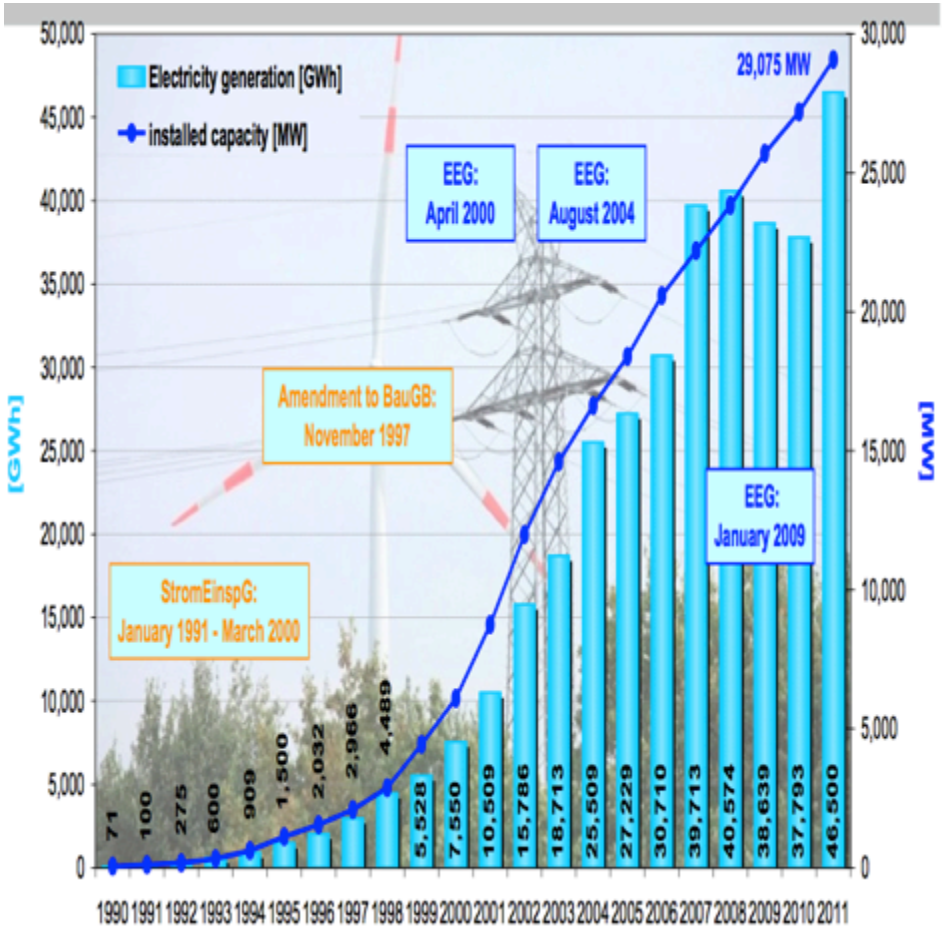
Quelle: Nitsch 2014

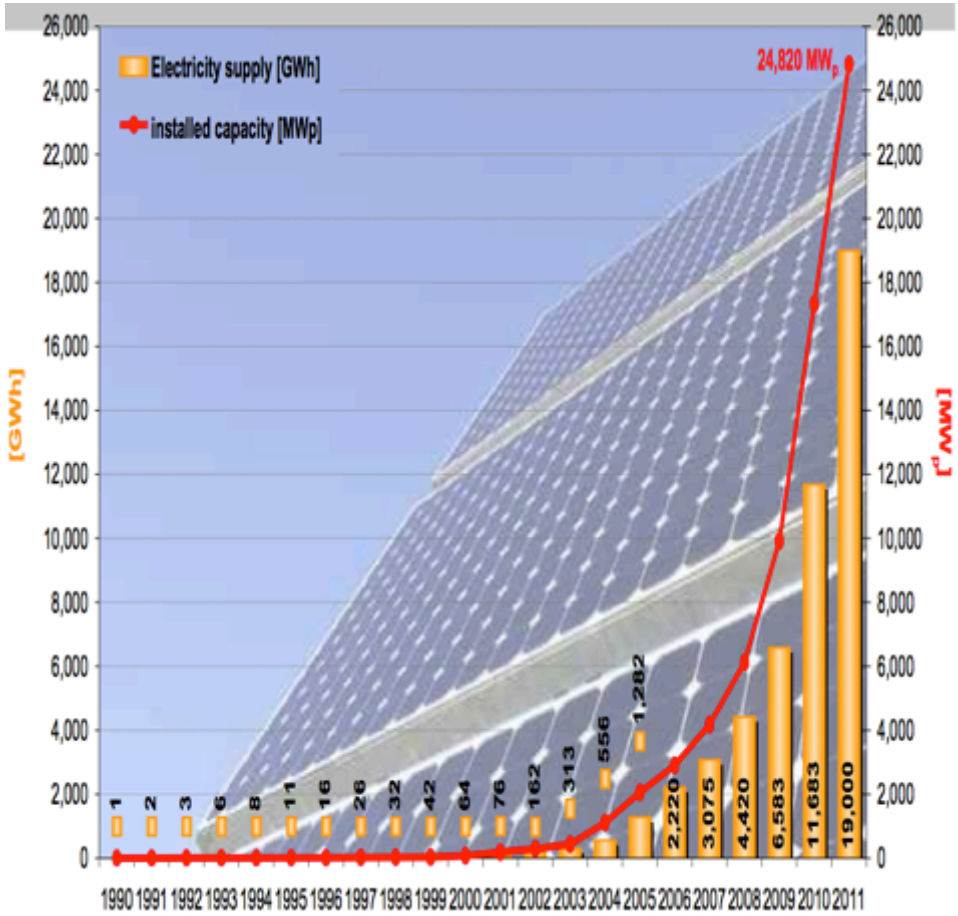
Green electricity: How much, how quick, how competitive?

Feed-in law opens the markets for green electricity

Steep learning curves and cost degression for wind and PV power in Germany

In 2014: Wind 38 GW and PV ca. 35 GW!



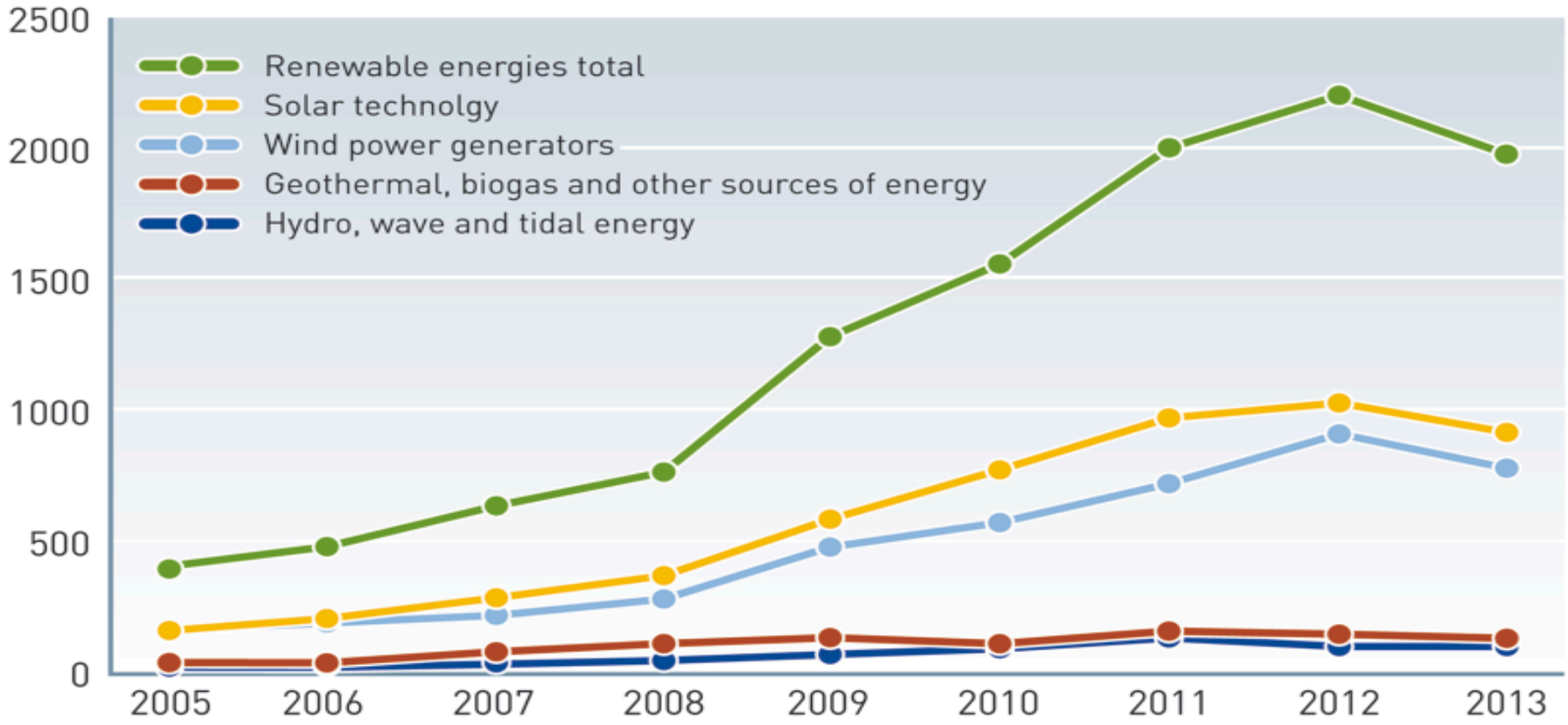


Source: BMU 2012

Nuclear phase out + Feed-in Law…

removing the barriers for technological and social innovations

Number of patent applications in the renewable energies sector in Germany, 2005-2013



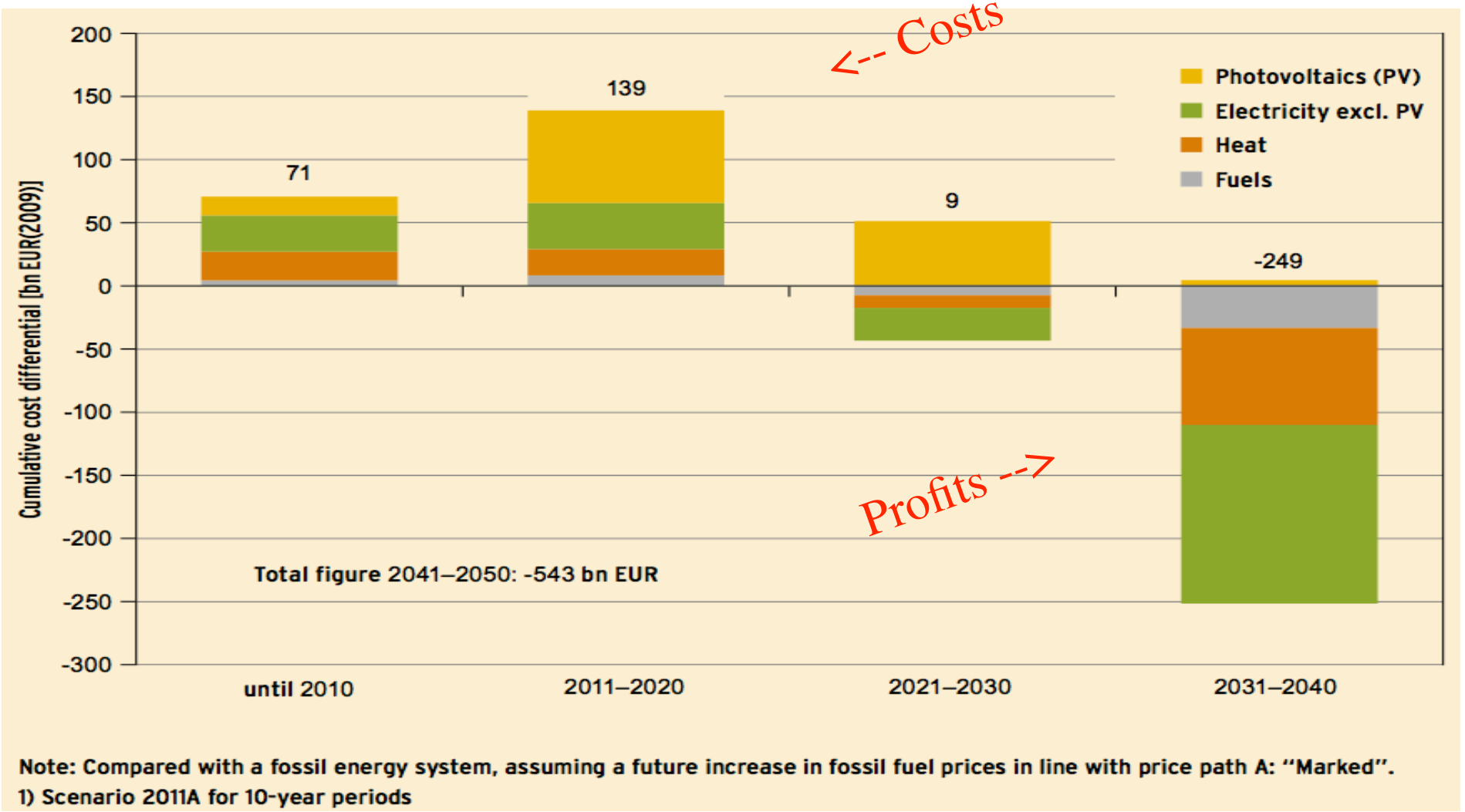
Source: DPMA; as of 06 / 2014

www.renewables-in-germany.com

Macroeconomic benefits

Projections of the differential costs of the "Energiewende"

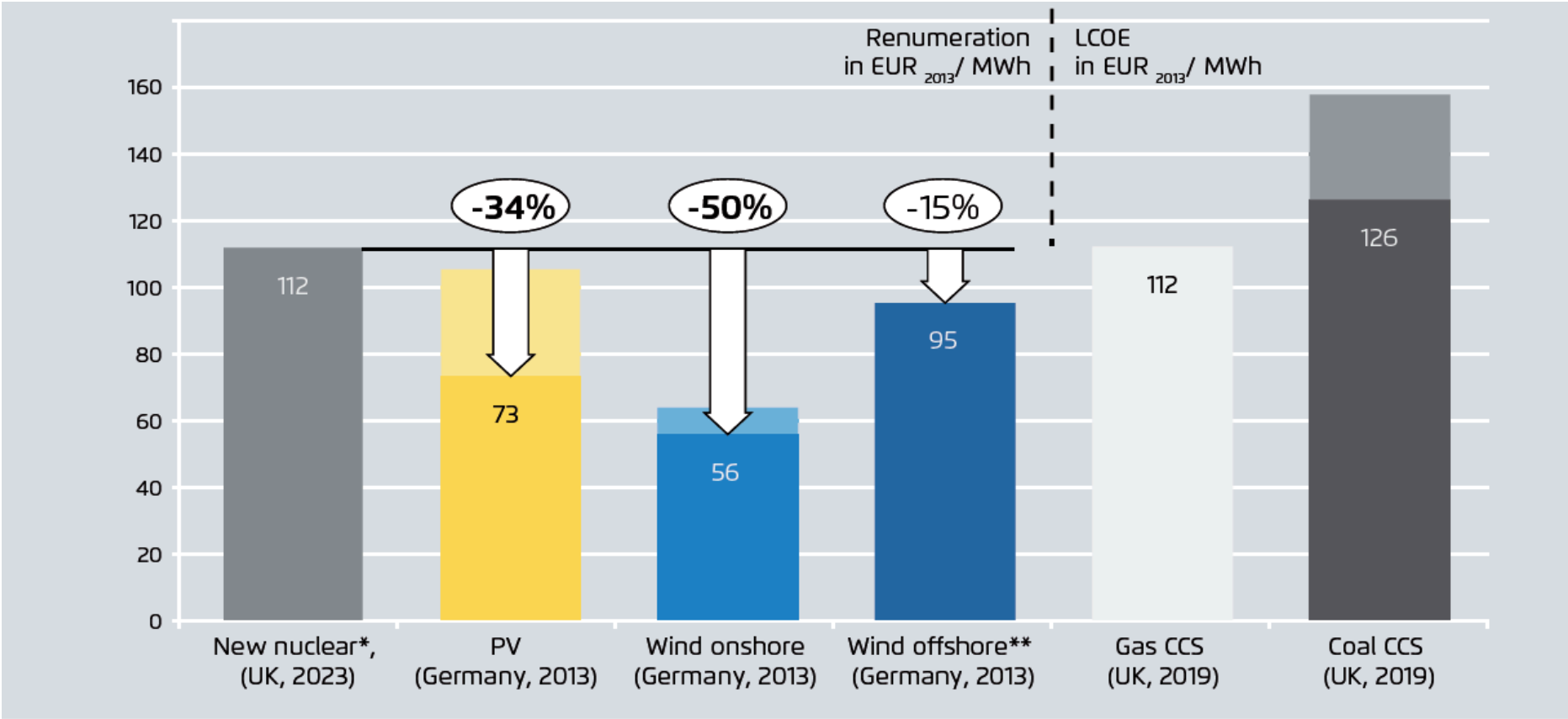
All sectors; according to German "Lead Scenario 2011"



Note: Compared with a fossil energy system, assuming a future increase in fossil fuel prices in line with price path A: "Marked".
1) Scenario 2011A for 10-year periods

Source: BMU 2012

Comparison of costs of new nuclear power plants
with PV and wind and the levelized costs of gas/coal (incl. CCS)



DECC 2013; ECB 2014a; EEG 2012; Prognos AG 2013; UK Government 2013a; calculations by Prognos AG; * Hinkley Point C agreement ** Offshore wind 2013 without grid costs; in Germany, the regulatory approach excludes grid costs from being covered by the remuneration. Offshore grid costs are estimated at between 25 and 35 euros/MWh, depending on the distance to shore.

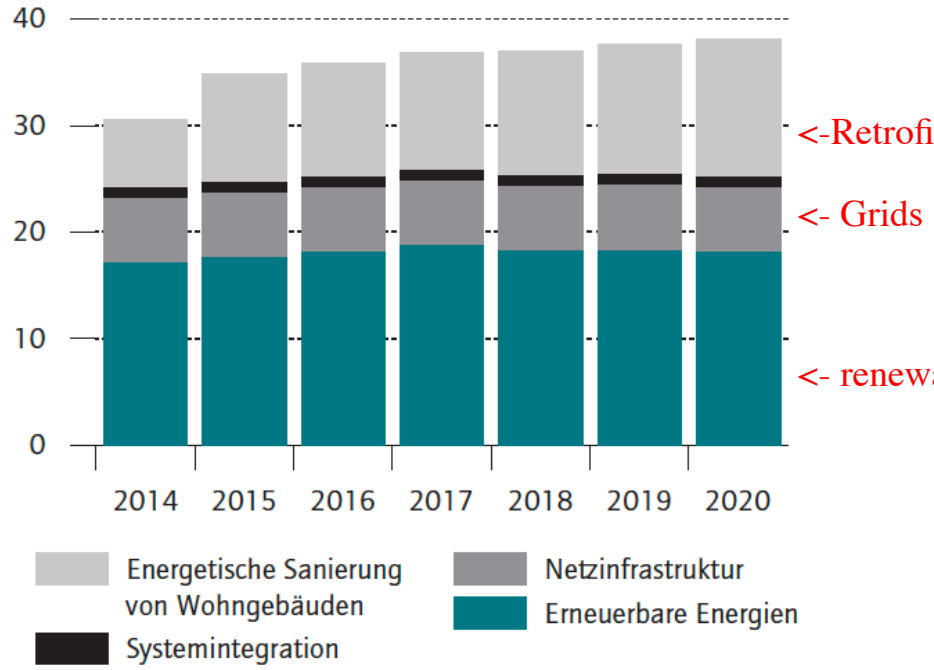
Source: Agora/ Prognos 2014

Annual investment for the Energiewende: 31-38 bn € (2014-2020)

"Macroeconomic benefits are positive" (DIW WB 26/2013, S. 25)

Investitionen zur Umsetzung der Energiewende nach Aufgabenbereichen

In Milliarden Euro

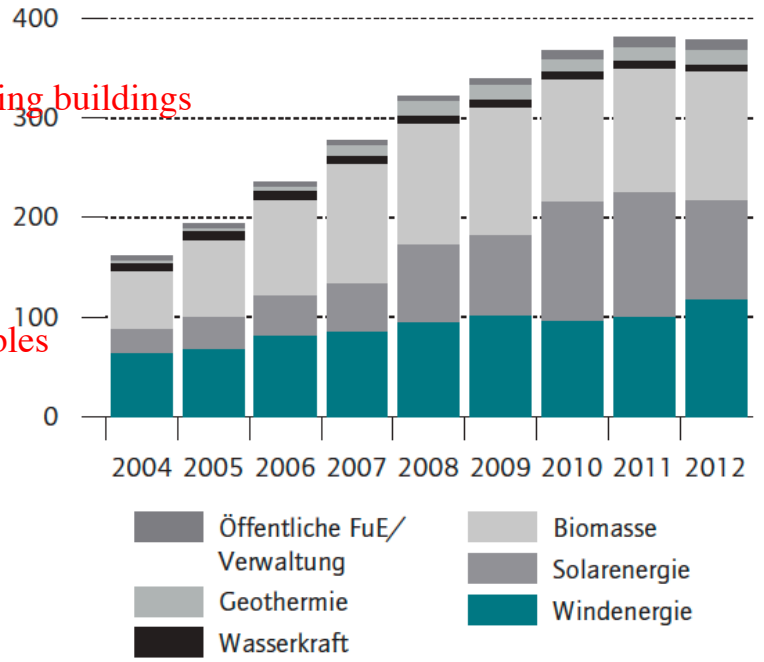


Preisbasis 2012. Zu Systemintegration gehören Energiespeicher und die Flexibilisierung von Kraftwerken.

Quelle: Berechnungen des DIW Berlin.

Bruttobeschäftigung durch erneuerbare Energien in Deutschland

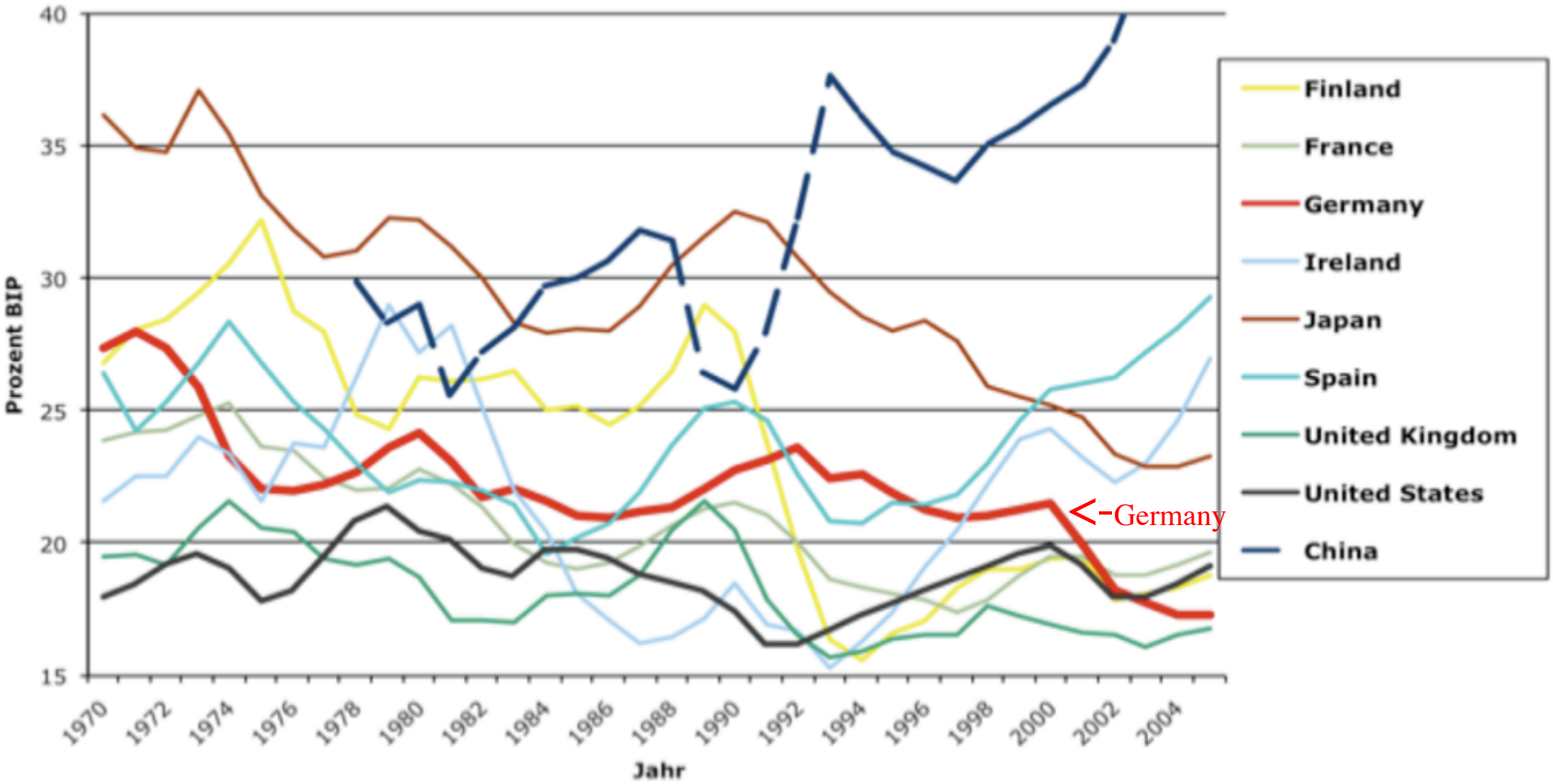
Zahl der Beschäftigten in Tausend



Quellen: DLR, GWS, ZSW, DIW Berlin.

Additional investments in climate and resource protection –
A core strategy to raise the investment and innovation rate ("Green New Deal")

International comparison of gross investment rates (1970-2006)



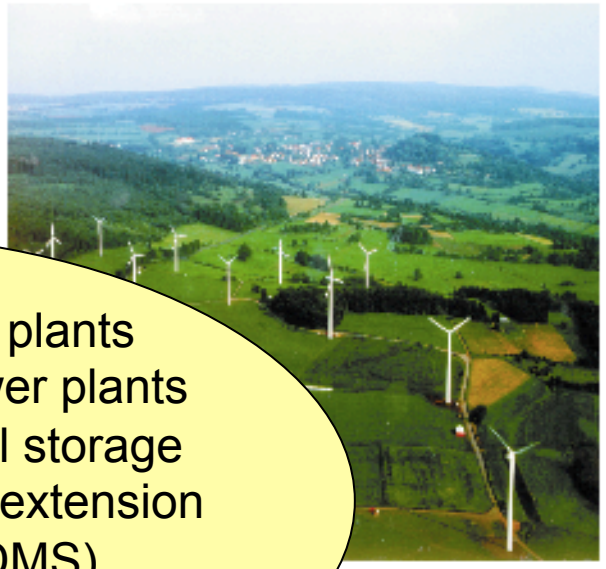
Quelle: C.Jäger, PIK, 2009

Controversial topics of the Energiewende

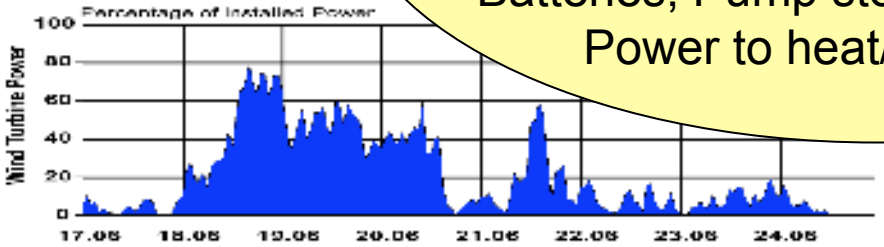
- **Political Leadership:** Management and responsibilities?
- **Costs:** How much, how long, for whom?
- Security of power supply vs. system integration of **intermittent power**?
- Focus on power: system transformation of **heat and transport** sector?
- Supply side biased; how to foster **energy (resource) efficiency**?
- **Decentralized** ("smart grids") vs. centralized power ("Desertec")?
- Citizens **participation** and democratisation?
- **Lifestyle changes** to sustainable consumption and production?

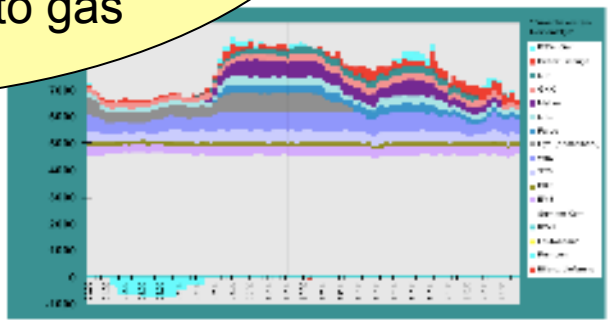
Options to raise flexibility of fluctuating power supply

Innovation (Batteries; PtG; PtH; Smart Grid…) and optimized structural options



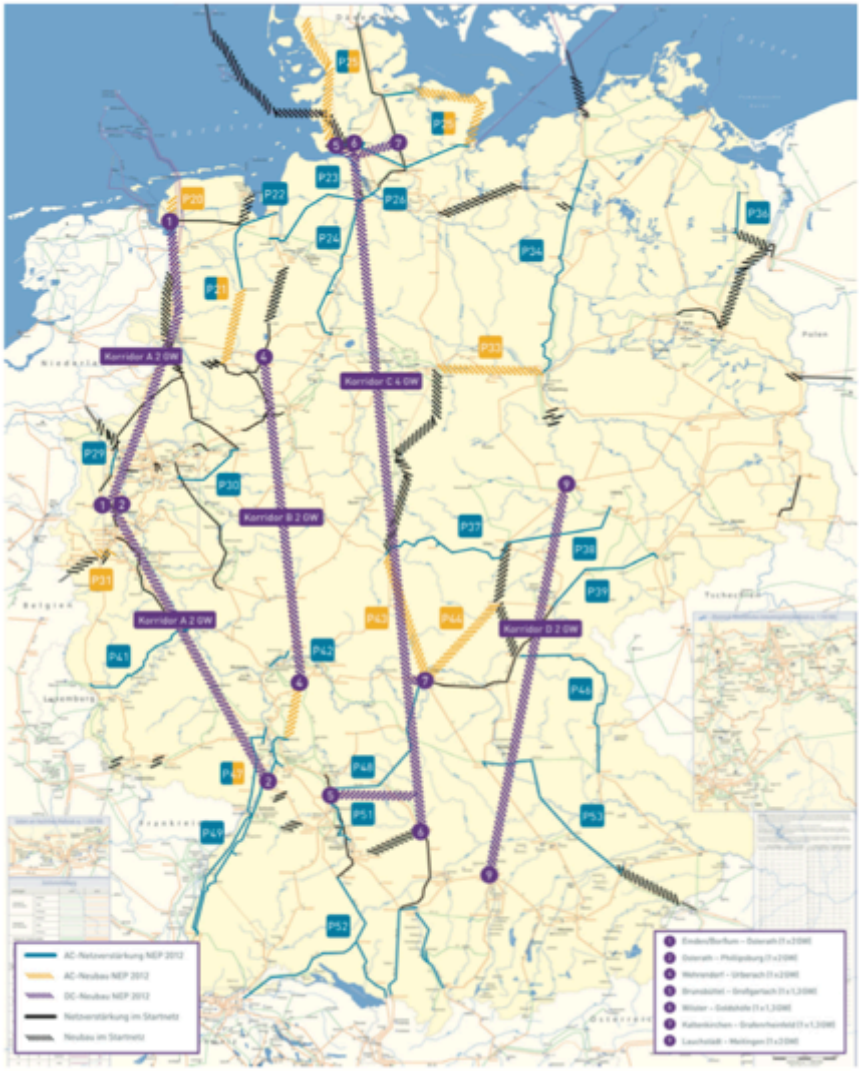
Combined heat-/power plants
Flexible conventional power plants
Power plants with thermal storage
National/international grid extension
Load management (DMS)
Batteries; Pump storage power plants
Power to heat/power to gas





How much new transmission lines?
For the “Energiewende” until 2030

- **Four new power lines in 2020 (north/south)?**
- **Affordable amount of total costs (20bn)?**
- **Decentralized options underestimated?**
- **All energy efficiency potentials used?**



Quelle: VDE Verband der Elektrotechnik Elektronik Informationstechnik e.V./Übertragungsnetzbetreiber

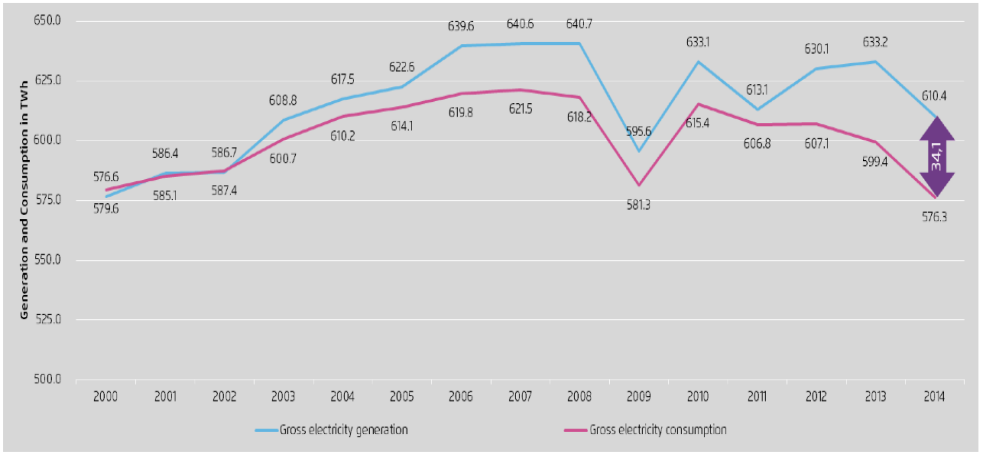
Energiewende and the "Climate Paradox":

State of the affairs and $C0_2$-turnaround

(Based on Agora 2015)

The gap between electricity generation and demand is widening since 2001: Germany is power export champion in Europe

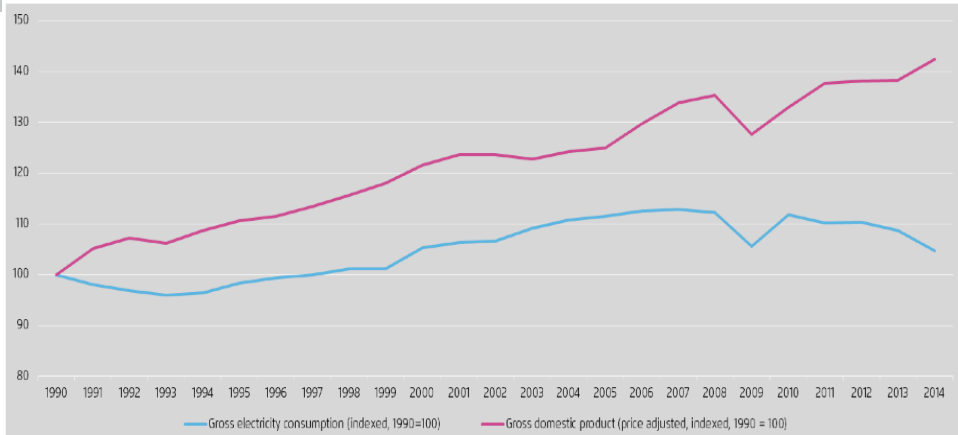
Gross electricity generation and production in TWh



AG Energiebilanzen 2014

Economic growth and electricity demand are no longer correlated: While the economy has grown more than 40% since 1990, electricity demand has been decreasing significantly since 2007

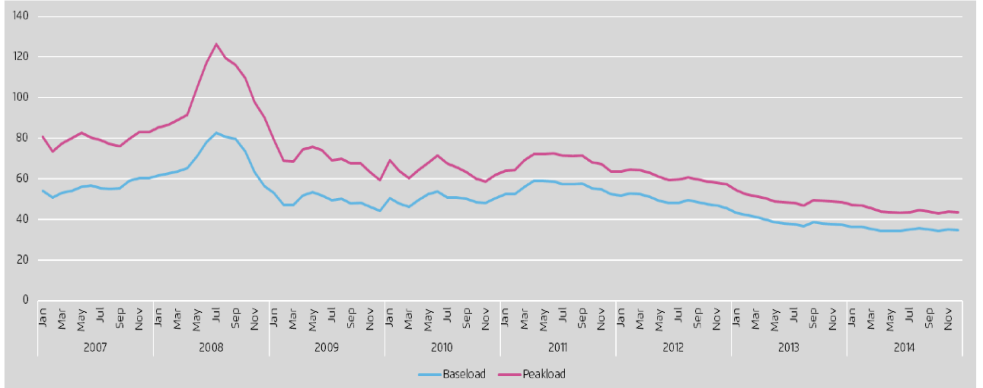
Indexed economic growth and electricity usage (1990=100)



Statistisches Bundesamt 2014

The power price at the electricity exchange has been falling almost continuously since 2008 – on average, power could be bought in 2014 for less than 40 EUR/MWh.

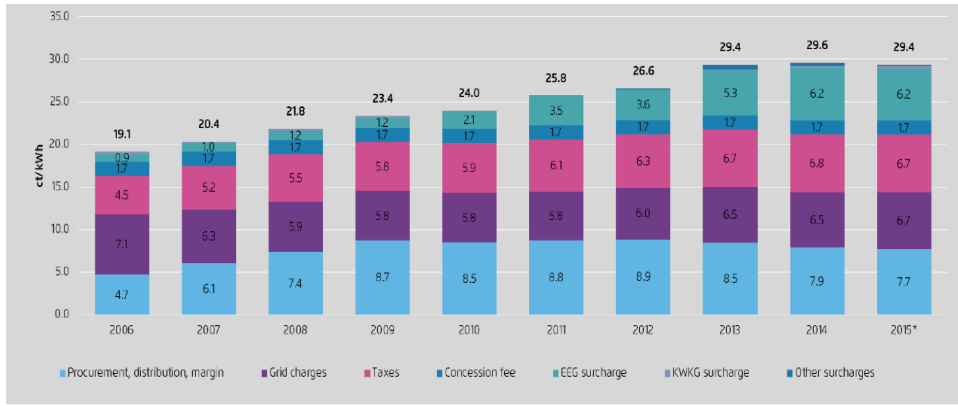
Annual Future for Power Delivery (roin Euro/MWh



EEX 2014

In 2015, the rise in household electricity prices will be suspended – on average, they should even slightly decline.

Composition of household electricity prices 2006-2015

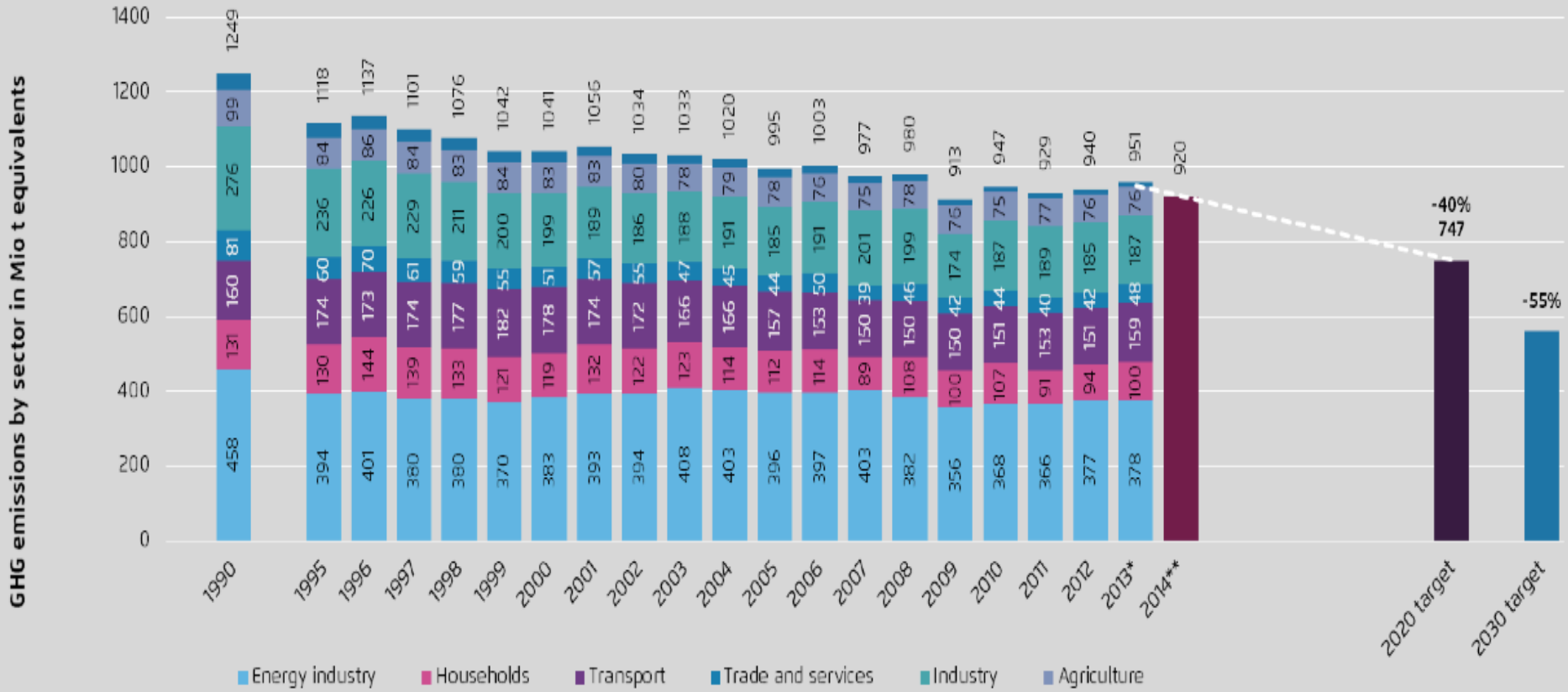


BDEW 2014, BNetzA 2014, own calculations; *Prognosis for 2015

Reduced emissions by the energy industry and the mild winter lead to a major decline in greenhouse gas emissions 2014. However, there is still a lot to do in order to reach the 2020 climate target.

Agora Energiewende

Greenhouse gas emissions by sector in mio. t CO_2-equivalents, as well as German government targets for 2020 und 2030



UBA 2014, own calculations, *preliminary, **own estimates

Road Map to 40% $C0_2$-reduction until 2020
Sector specific mitigation targets of the German Government (2014)

Overview

Key policy measures	Contribution to greenhouse gas emission reduction (million t CO_2 equivalent)
National Energy Efficiency Action Plan (NAPE) (without measures in the transport sector)	approx. 25 - 30 million t (including energy efficiency in buildings)
Strategy on **climate-friendly building and housing** (contains NAPE measures specific to buildings)	In total approx. 5.7 - 10 million t (1.5 - 4.7 million t of which in addition to NAPE)
Measures in the **transport** sector	approx. 7 - 10 million t
Reduction in non-energy-related emissions in the sectors:	
• **industry, commerce/trade/services and waste management**	3 - 7.7 million t
• **agriculture**	3.6 million t
Emissions trading reform	Dependent on decisions at EU level on structure
Further measures, especially in the electricity sector	22 million t
TOTAL:	**62 - 78 million t**

Climate mitigation gap: 5 to 8 percentage points ≙ 62.5 to 100 million tonnes CO2 equivalent

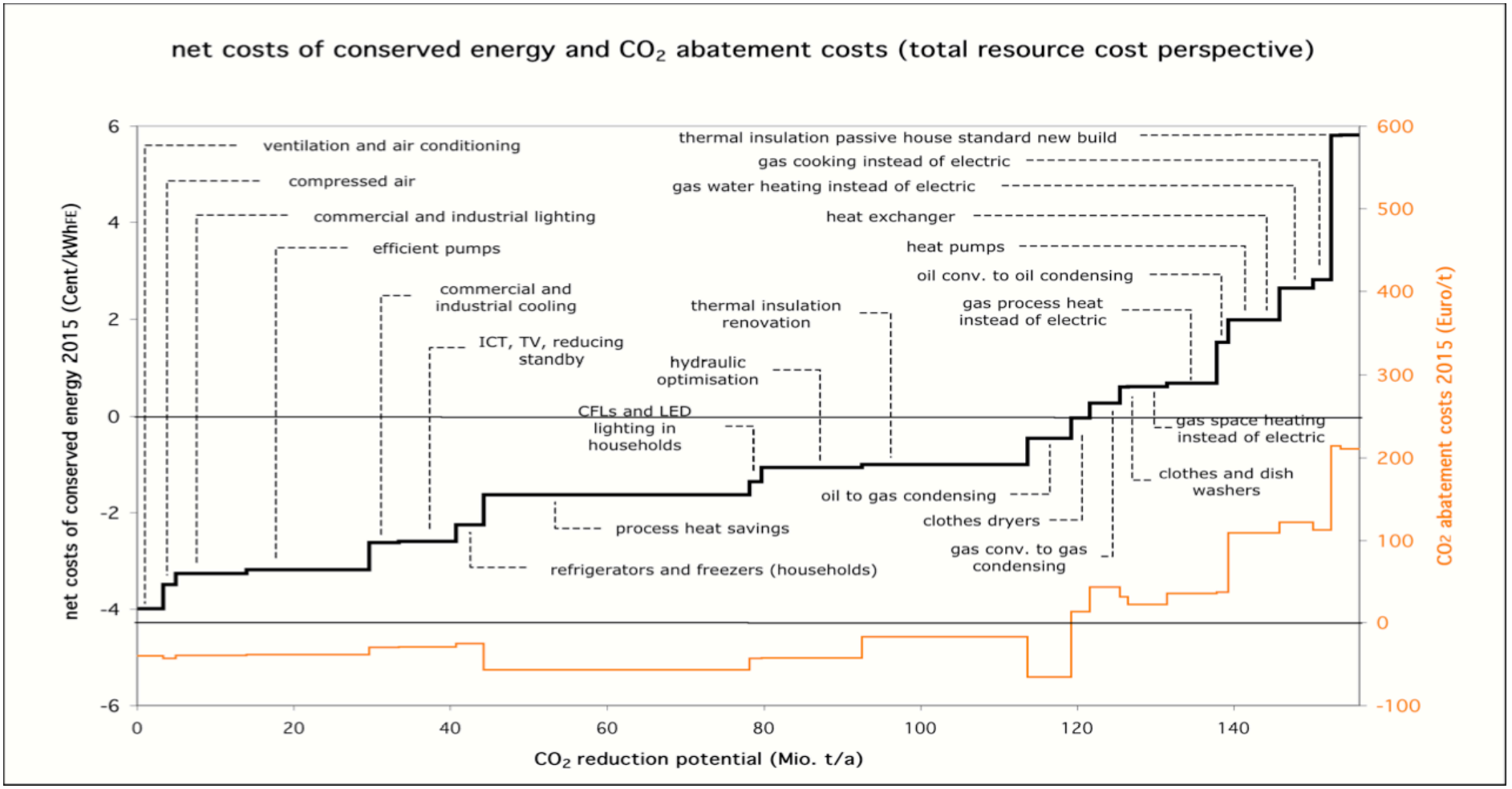
Source: BMUB 2014

Giving highest priority to energy efficiency would make the transition to sustainable energy quicker and cheaper

The economics of “Negawatts” compared to “Megawatts”

140 TWh can be saved with a profit – when barriers are removed!

Example for Germany



Source: Wuppertal Institute 2006

State of the art: Buildings used as power plants

“Plus-energy-houses” in Freiburg/Germany

Caption: Plus energy houses are designed to produce more energy than they consume in the course of the year.

Subsidies for retrofitting the building stock are necessary
- but the macroeconomic multiplier and self-financing effects are promising!

Promotional effects

	2009	2010	2011
Commitments (in millions of EUR)	8,863	8,746	6,510
housing units (in 1.000)	617	953	282
reduction of CO_2 (in 1.000 Tonnen p.a.)	1,452	1,049	567
jobs * (in 1.000)	292	342	247
investments (in millions of EUR)	18,335	21,330	18,427
federal budget (in millions of EUR)	2,033	1,337	934
leverage	9.0	16.0	19.7

* safeguarded employment for one year

Effects of promotion

- Increase of retrofitting ratio
- Sustainable reduction of CO_2-emissions
- Promotion for SMEs and creation of employment
- Substantial investments in buildings be triggered

Budget funds being recovered by additional revenues of taxes

Paradigm shift to binding targets for energy efficiency
The EU Energy Efficiency Directive (EED 12/2012)

- Within the framework of the **EU 20-20-20 targets:**
- Reduction of 20% primary energy **not on track** → main reason for EED

Key points of the Energy Efficiency Directive (EED):

- Binding national **targets** (Art.7): 1.5% proven conservation of energy per year (exemptions: can be reduced to 1.25%)

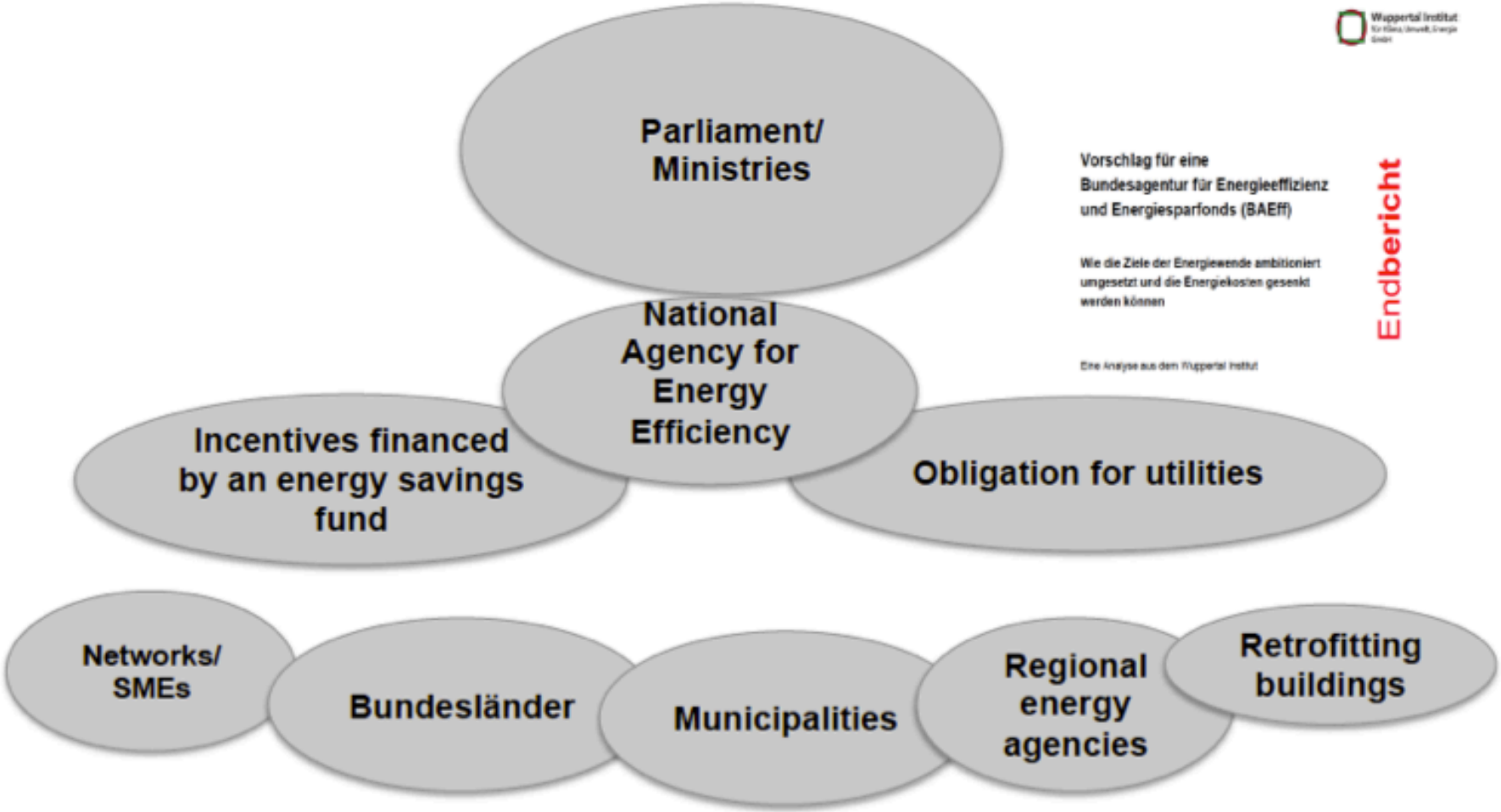
- **Energy savings fund** can be installed

    - **Energy saving obligations** of the power industry (system operator or energy provider) or
    - **Alternatives are possible**, e.g. existing and new promotion of policies & measures

- **ENVI, ITRE and EuP** demand a 40% binding reduction target for 2030 !

National Agency for Energy Efficiency + Savings Fund

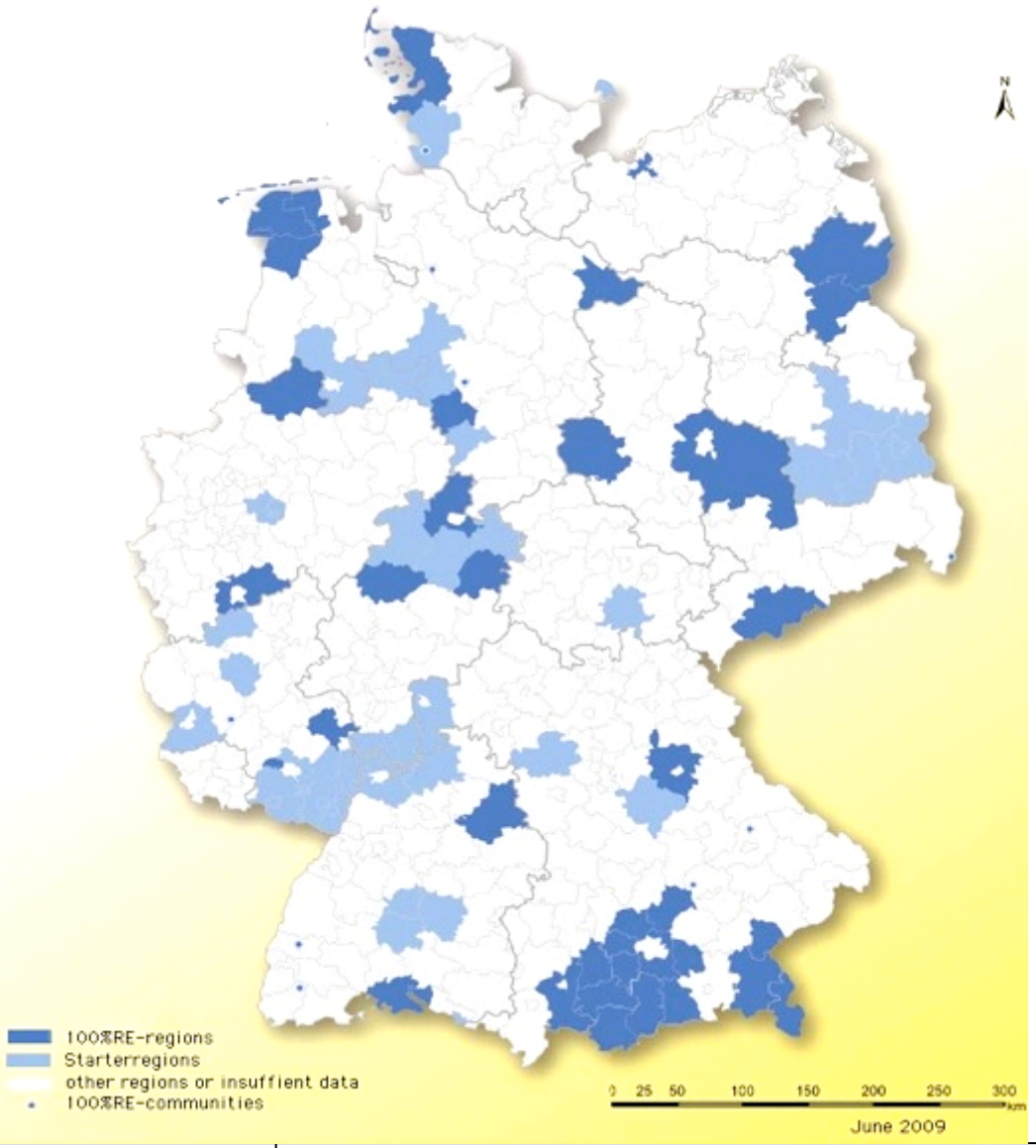
A proposal for a new "policentric governance" of energy efficiency policies

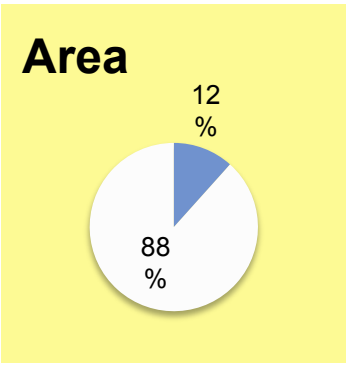


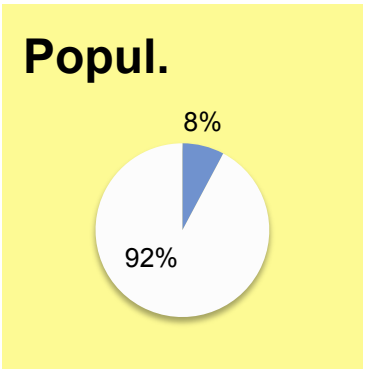
Quelle: Wuppertal Institut 2014

Decentralisation: The role of cities, municipalities, cooperatives, citizen financing…

Increasing decentralized options in rural areas
100%-Renewable-Energy-Regions in Germany



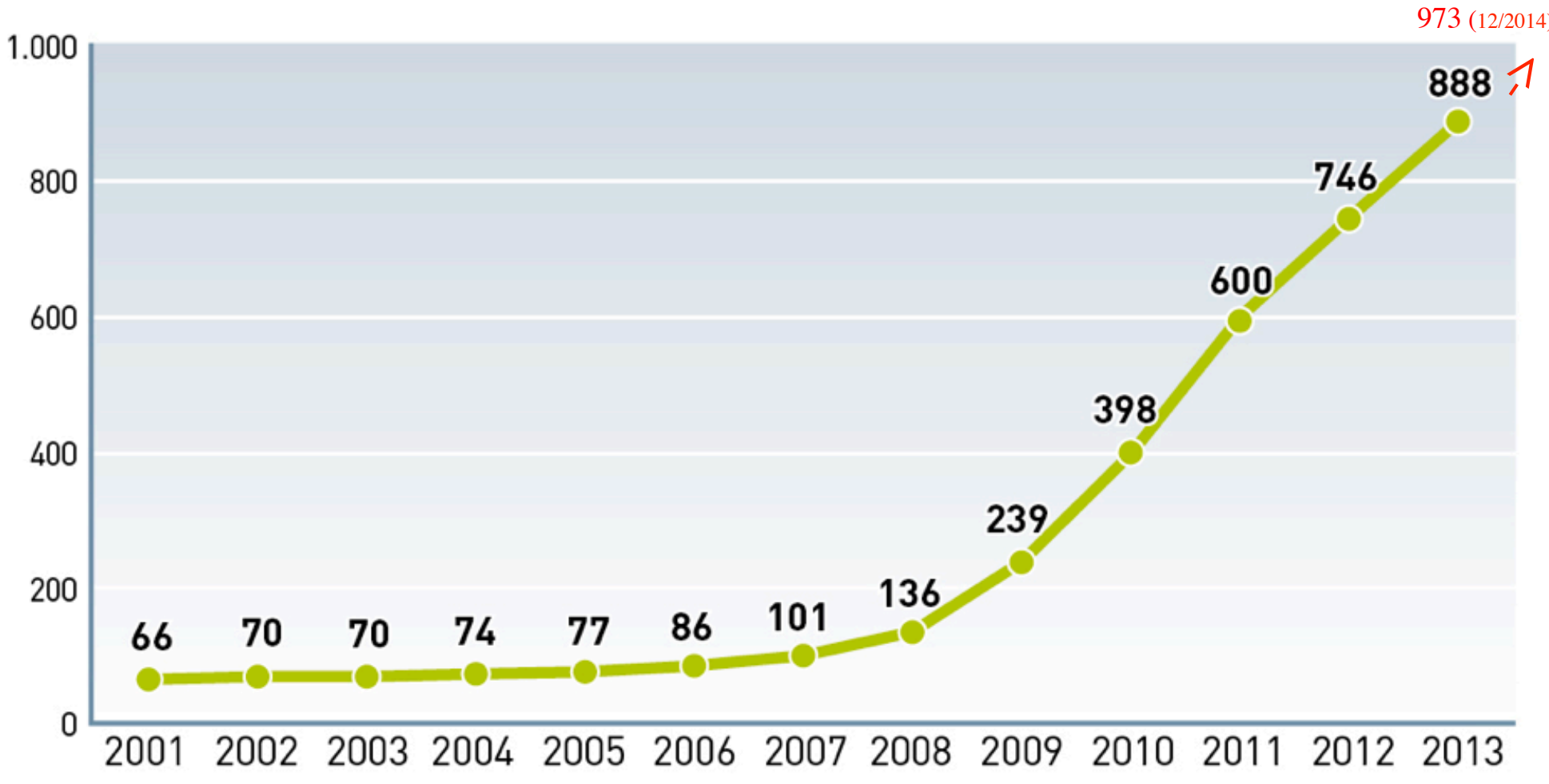




- Political decision towards 100% renewable energy in more than 100 cities or regions
- Aim: Complete change towards renewable energy as well as reducing energy use
- Using regional sustainable energy sources to create regional welfare (income effects)
- Main barriers: co-ordination, local acceptance, lack of funds
- Innovative financing (citizen companies, cooperatives, local funds)

Energy Co-operatives in Germany: A Success Story

Over the last few years the number of energy co-operatives has increased sharply.

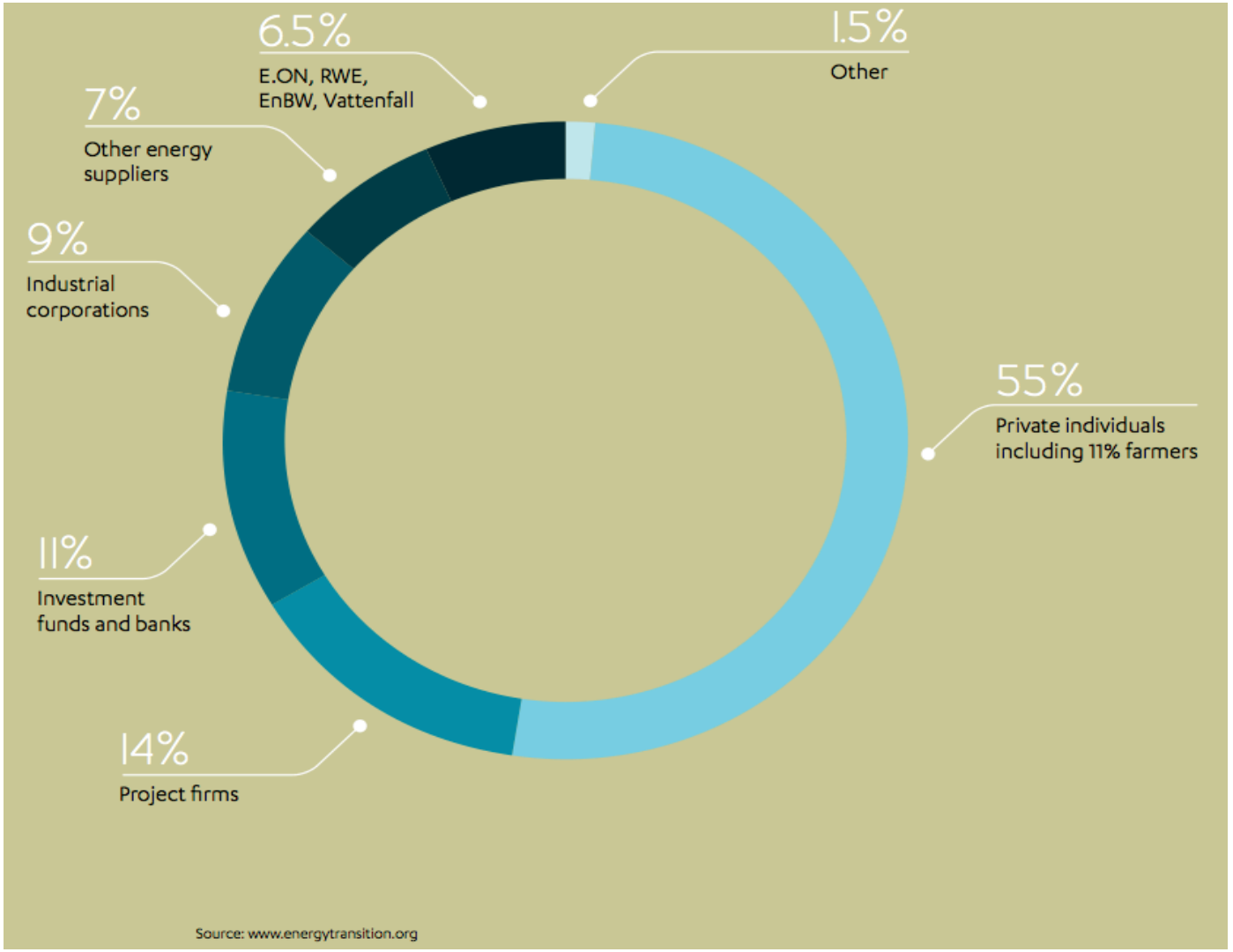


Source: Klaus Novy Institut; as of 01/2014

www.renewables-in-germany.com

Renewable Energies Agency

Ownership of installed renewable power capacities in Germany 2010

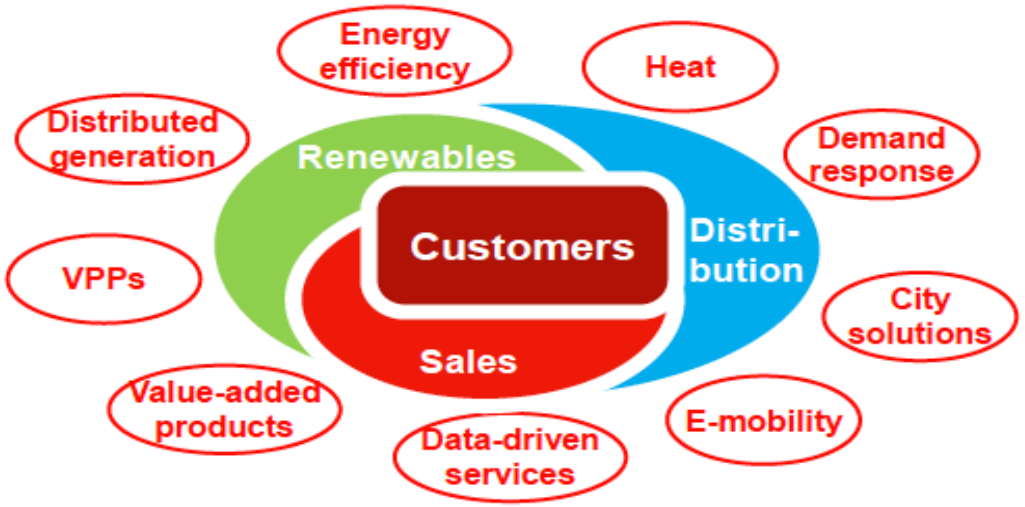


Source: Greenpeace International 2013

The split of E.ON : “A matter of survival”.

FR 12.3.2015: “Tottering giants. Billons of losses for RWE and E.ON”!

Two very different energy worlds emerging



Conventional energy world

- System-centric
- Security of supply
- Global/regional perspective
- Large scale, central
- Conventional technologies

New energy world

- Customer-centric
- Sustainability
- Local proximity
- Small scale, distributed
- Clean technologies

A city good practice example in NRW: Innovation City Bottrop

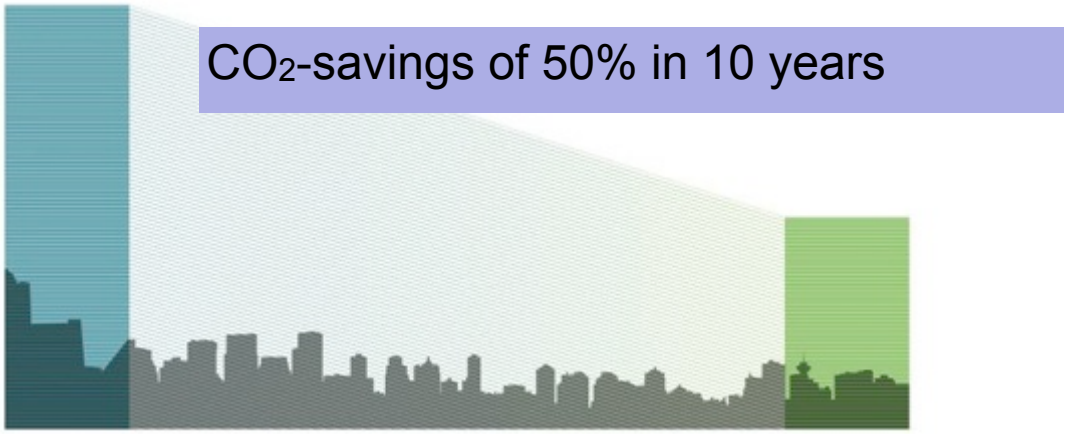
climate mitigation + improved quality of life + participation (citizens, industry)

InnovationCity Ruhr
Modellstadt Bottrop

Climate Protection

- Living
- Working
- Energy
- Mobility
- City

Quality of Life



Innovation City Bottrop started with 20.000 signatures by citizens in four weeks (ca. 1/3 of inhabitions of pilot area)

Case Bottrop: Information, motivation, citizen participation

Retrofit rate exceeds German average by a factor of 7!

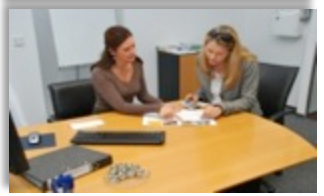
27 Theme Evenings with 2.000 Participants
(Heating, Insulation, Solar, Financing, etc.)

InnovationCity Day with 500 Participants
(Information, Motivation)

Public Workshops in 5 Quarters
(> 300 Proposals)

8.995
House-by-House-Consultations =
89% of all Property Owners

1.300 Single Consultations =
13% of all Property Pwners



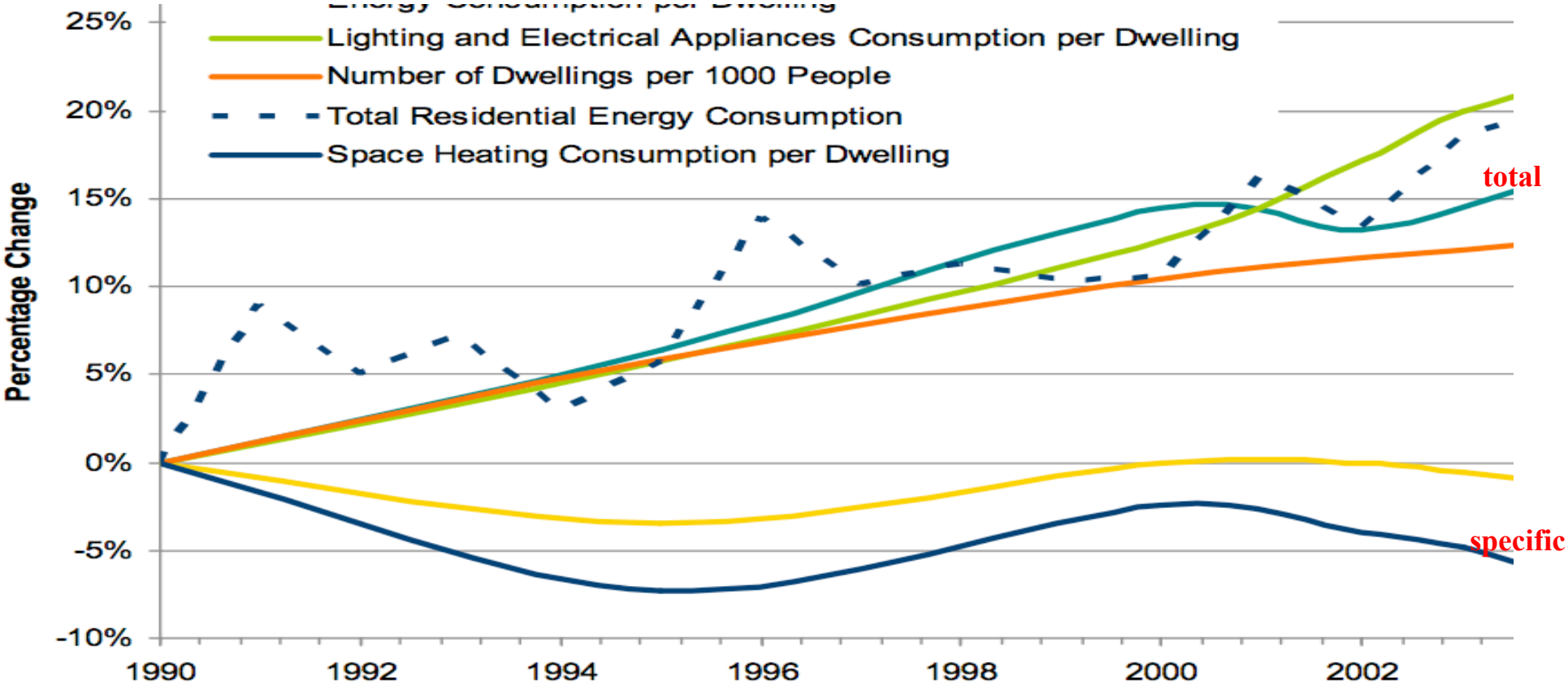
978 Buildings retrofitted =
7,82 % of all Residential Buildings

October 2011 to November 2013

Is efficient sufficient?

More dwellings, more living space, more appliances…
have overcompensated the specific efficiency gains in buildings!

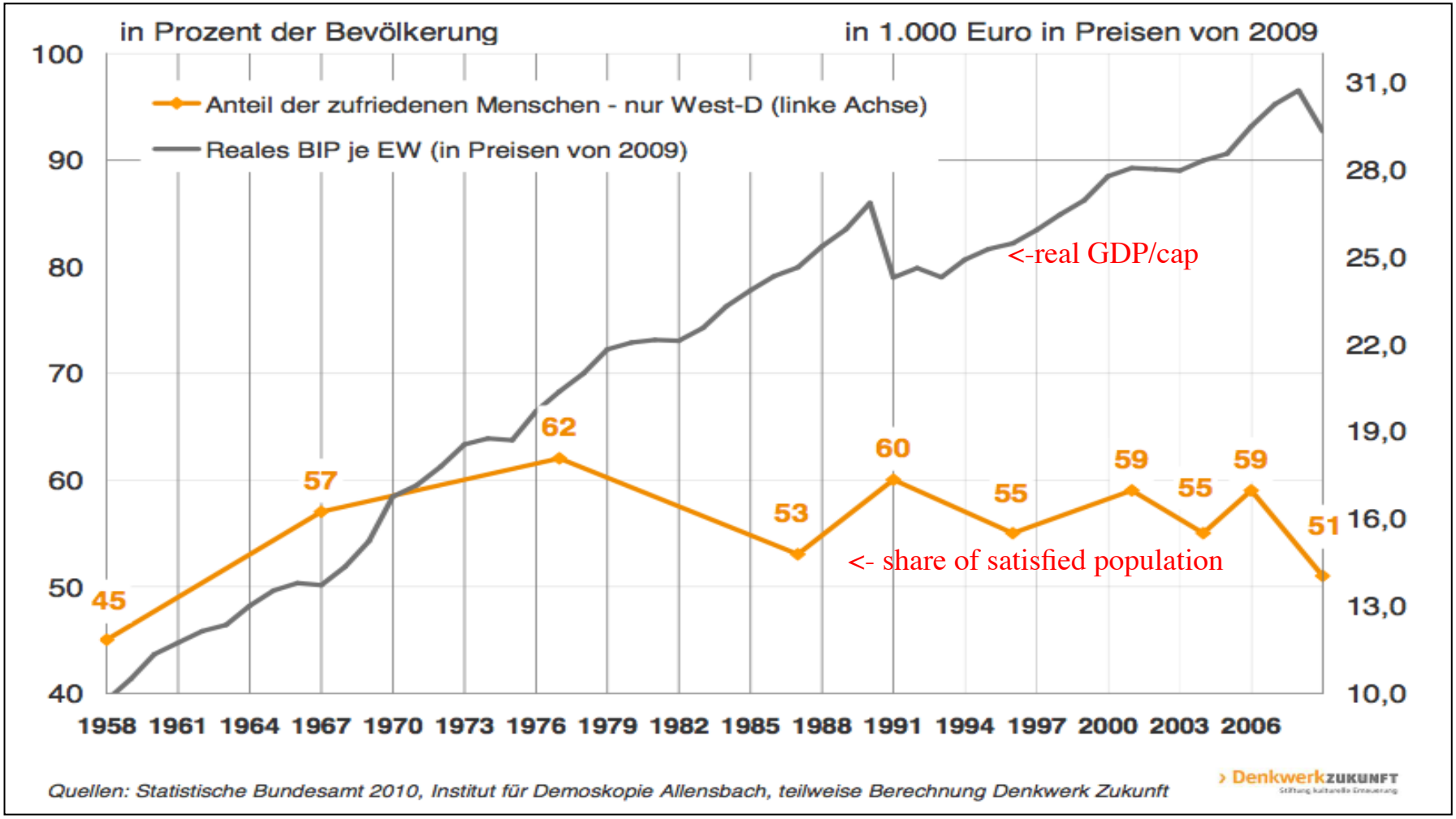
Trends in EU Housing Efficiency, 1990-2004



Source: Is efficient sufficient? ECEEE 2010

Increase in GDP has decoupled from life satisfaction

GDP/capita and life satisfation in Germany 1958 until 2009



Source: Denkwerk Zukunft (2010)

A strong plea to combine efficiency + sufficiency policies -
to reduce rebound effects and encourage life style changes!

„The older I get the more I like regulation“

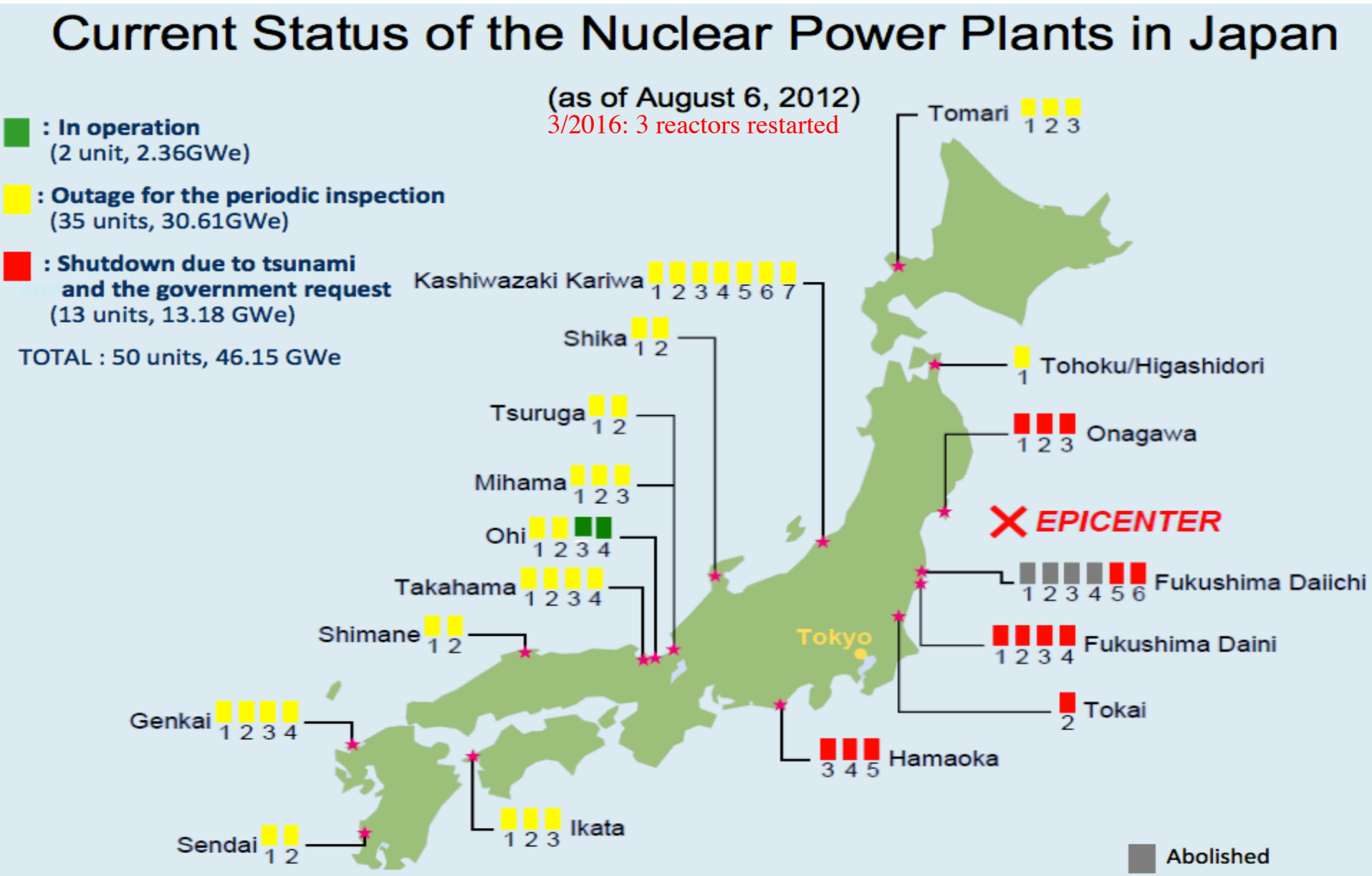
(Eoin Lees, Former Head of Energy Savings Trust/ UK)

- **System adjustments**
  - **Direct:**
    - Binding energy saving targets (EU 2011/2012)
    - Energy efficiency obligations for utilities (EU ESD 2012)
    - Reduction of subsidies and internalizing ext. cost of nuclear/fossil fuels
    - Caps, e.g. dynamic standards for fleet consumption of cars (EU)
    - Bonus/malus regulations e.g. for cars („feebates“)
    - More ambitious targets for EU ETS
    - Progressive standards (e.g. ICT)
    - Ecotax
  - **Indirect:**
    - Structural change to less resource intensive sectors (i.e. services)
    - Promotion of renewable energy in coordination with energy efficiency
    - “ProgRress” (German Program Ressource Effciency)
- **Behavioral change**
    - Sustainable consumption, promotion of common goods, education…
    - Reducing societal disparities (e.g. income, wealth, access)…

Outlook: Strengthen international cooperation on the energy transition

Phase out of all nuclear power plants in Japan –

based on efficiency campaign ("Setsuden"). Problems: costs? $C0_2$? Imports?



German-Japanese Energy Transition Council (GJETC)
on behalf of the German Federal Environmental Foundation (DBU)

Main results of feasibility study

- Stakeholder support in both countries
- Positive signals/decisions for funding
- Structure of the Council clarified
- Study and work program identified

Vorstudie zur Einrichtung eines „Deutsch-Japanischen Kooperationsrats zur Energiewende“

DBU-Az.: 32756/01-4

Prof. Dr. Peter Hennicke
Dr. Stefan Thomas
Dr. Dagmar Kiyar
Dorothea Hauptstock
Wilhelm Meemken
Johanna Schilling

Wuppertal und Osnabrück, 30.9.2015

Abschlussbericht

Conceptual ideas for the GJETC-partnership

- The Council is **a non-governmental institution** founded by research and consulting institutions. The Council is working independent of politics and business.

- The Council will **focus on strategic policy issues in both countries** (e.g. potential analysis, scenario, technical, economic and social innovation, good examples, policy recommendations).

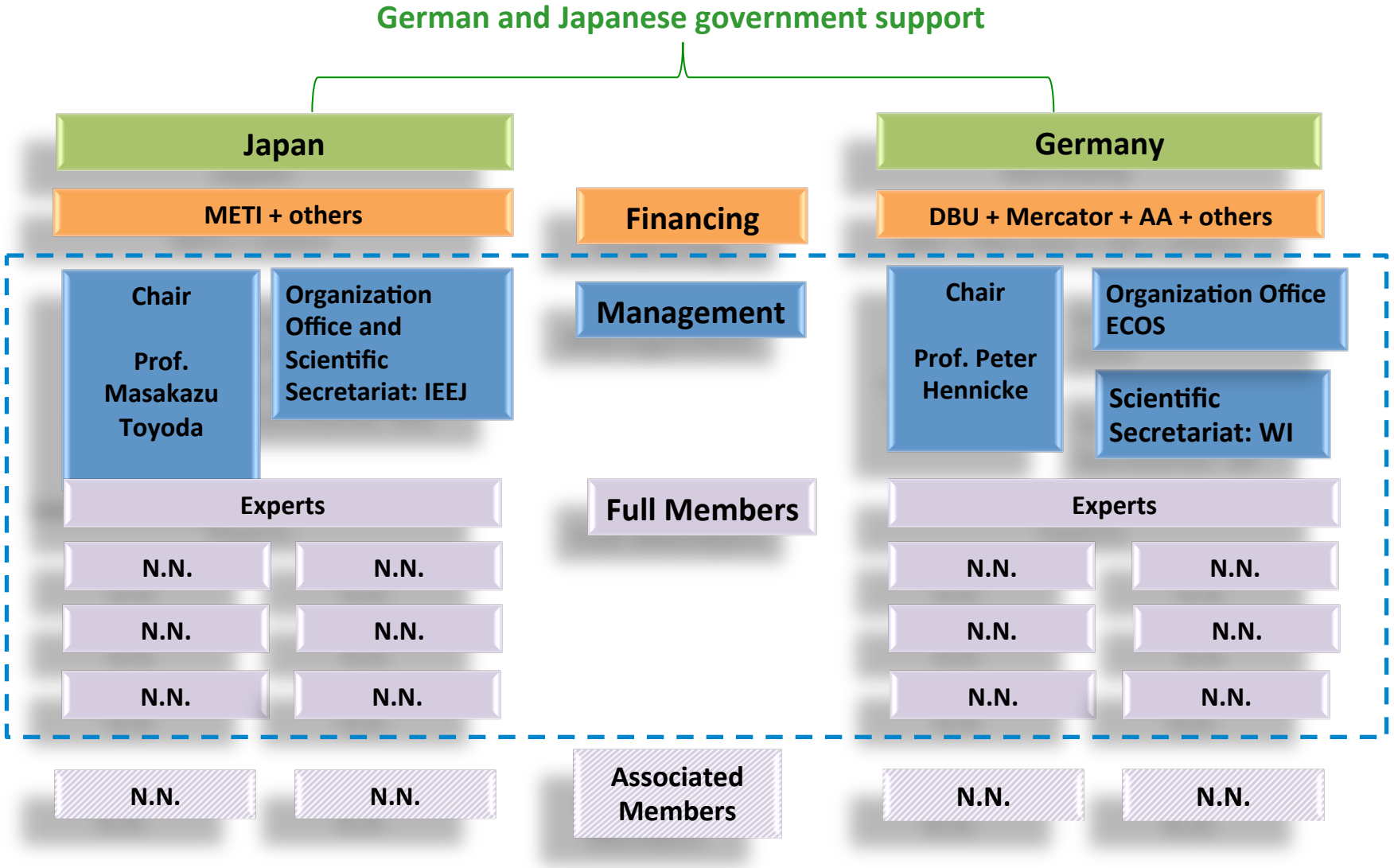
- The Council will have p**arallel organizational structure** in Japan and Germany; the Council will use its results to provide feedback and work closely with relevant German-Japanese stakeholders.

- The expected **14 members of the Council** (six energy experts and two Co-Chairs from Japan and Germany) will be appointed by the co-chairs. Members will include recognized experts in research

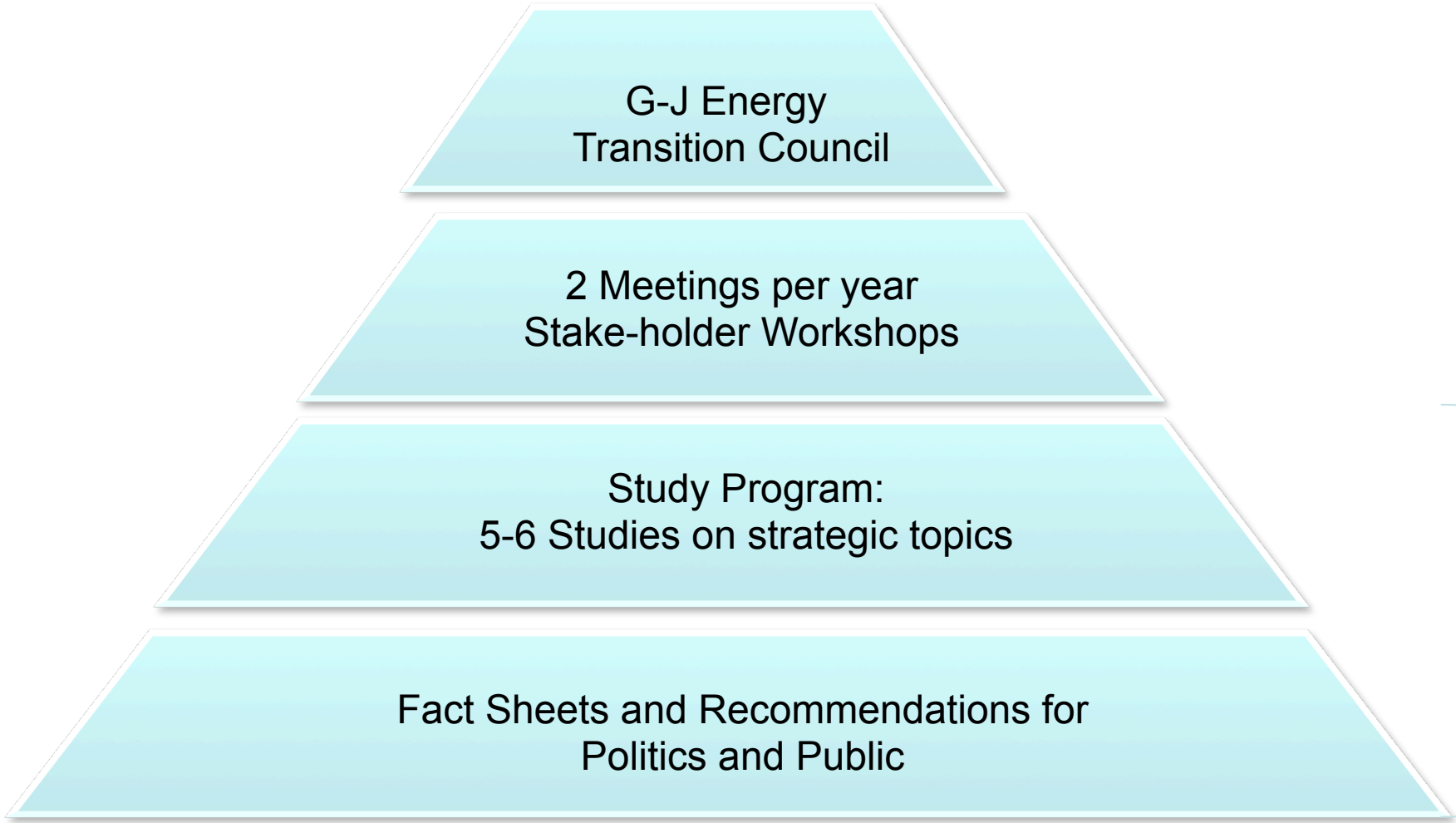
- The Council will **carry out studies** through relevant research institutes in Japan and Germany. The studies will allow competing scientific approaches, methods and models to be considered.

- The Council will **publish and communicate** its results and maintain public relations.

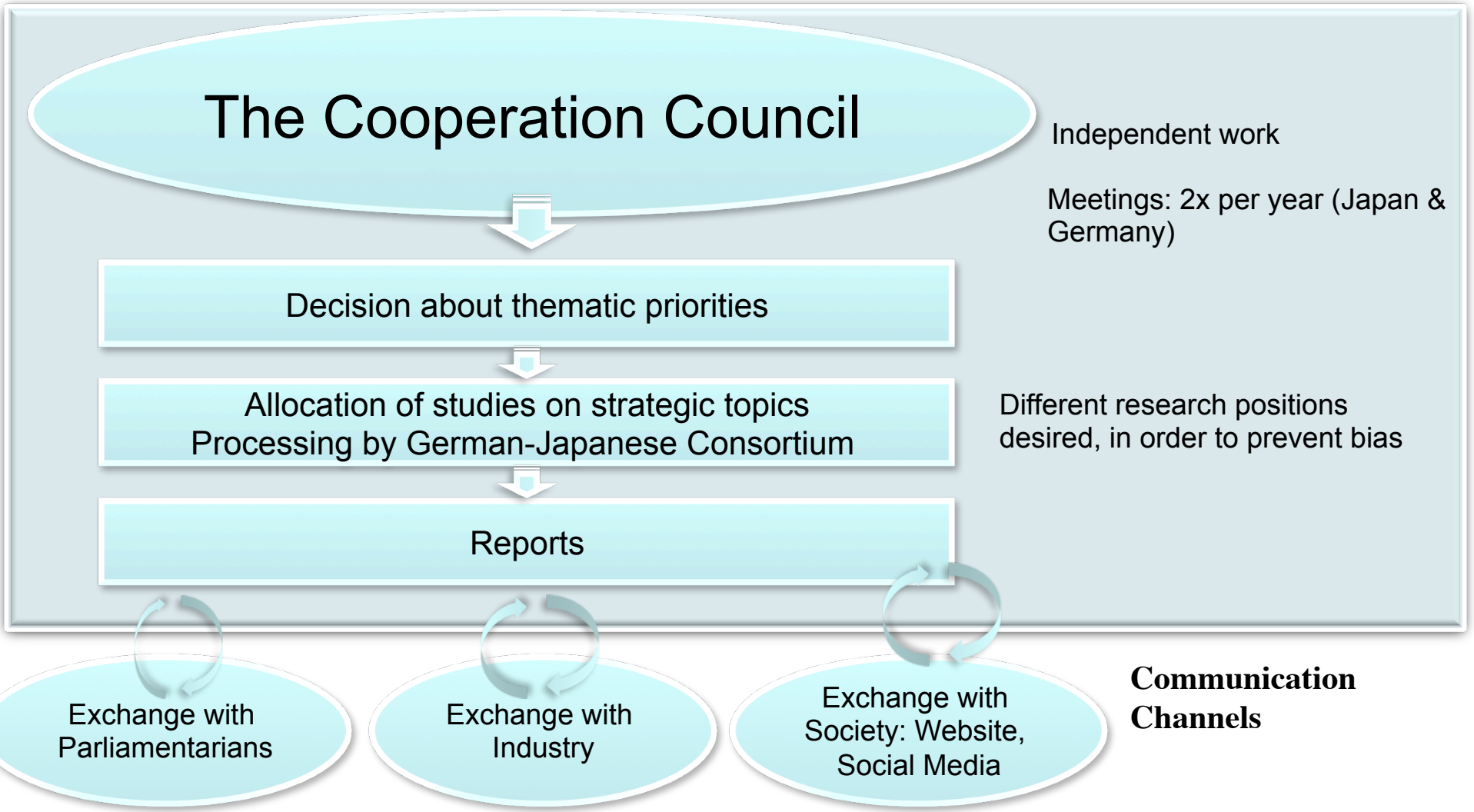
Suggested Structure for the Council



Core task: Scientifically based Output



Dialogue-oriented and Knowledge-based Operation



Wuppertal Institute
for Climate, Environment
and Energy

Thank you for your attention!

New publication:
The Energiewende
On the WI- website:
http://wupperinst.org/info/details/wi/a/s/ad/3319/