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und Reaktorsicherheit

Economic benefits of climate policy

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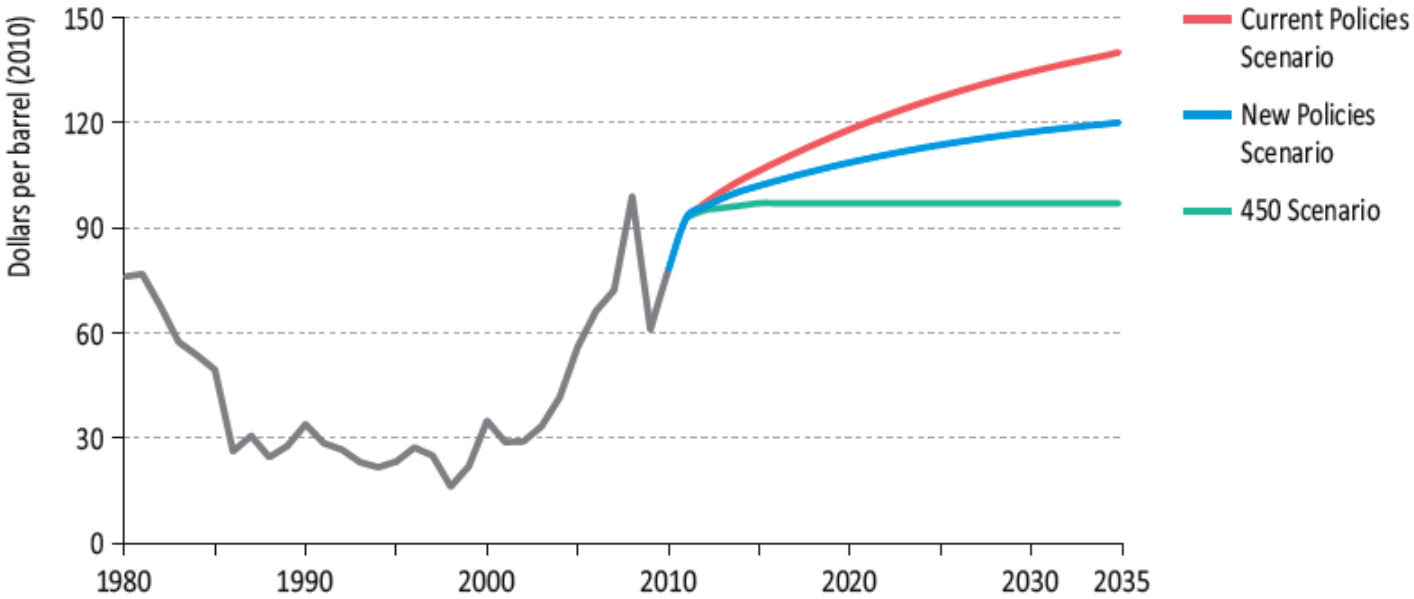
Challenge: Rising oil price

- **Energy will become more expensive!**
- Oil price very volatile → risk to a stable economy
- Climate policy counteracts price increase

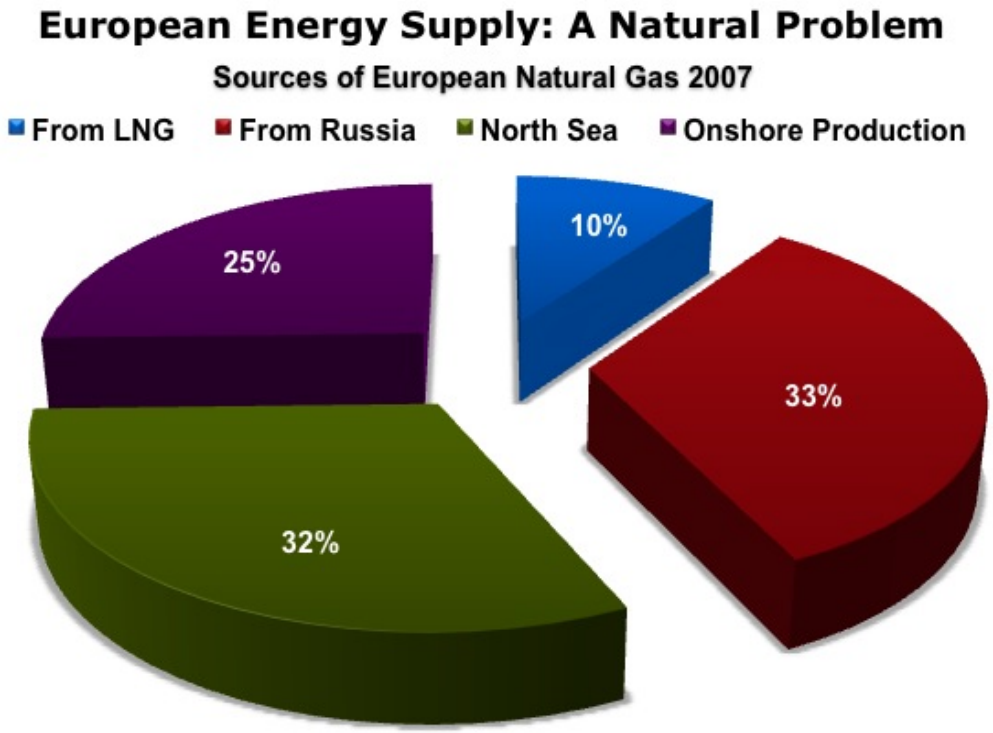
Figure 1.1 ● Average IEA crude oil import price



Source: IEA WEO 2011

Challenge: Dependence on energy imports

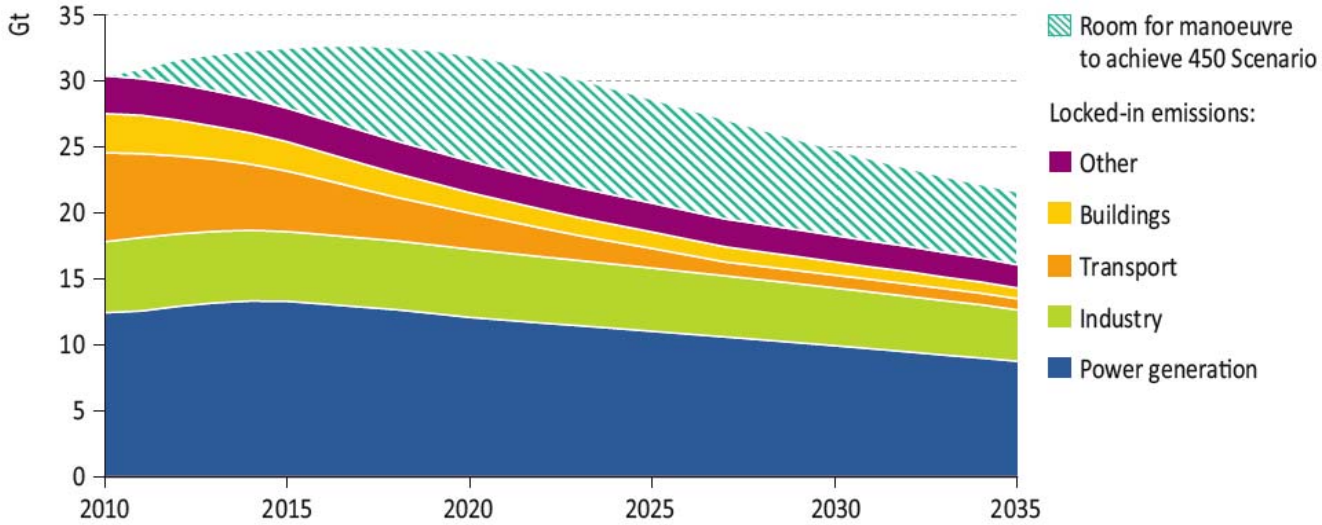
- Gas reserves in the North Sea are shrinking
- Europe increasingly dependent on gas imports mainly from Russia



Challenge: Closing window of opportunity to keep global climate change below 2 °C

- Infrastructure in place and under construction already amounts for **80%** of the total emissions from the energy sector consistent with a 2°C trajectory.

Figure 6.12 • *World energy-related CO_2 emissions from locked-in infrastructure in 2010 and room for manoeuvre to achieve the 450 Scenario*



Source: IEA WEO 2011

Costs of delayed action

- **For every $1 of avoided investment** between 2011 and 2020 an **additional $4.3** would need to be spent between 2021 and 2035 to compensate

  (Source: IEA, WEO 2011)

Source: ddpavumba / FreeDigitalPhotos.net

Multiple benefits of climate policy

- Preventing environmental and climate damages:
  - lower greenhouse gase emissions
  - reduced emissions of airborne pollutants
- Energy security:
  - decentralized, local energy production and less fossil fuel imports
- Economic effects:
  - lower fossil fuel imports
  - need for investment in new technologies such as renewables
  - driver for innovation

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The EU as a frontrunner

- The EU is a frontrunner in climate policy and comitted to reduce GHG emissions between 80-95% by 2050.
- The Low Carbon Economy Roadmap from 2011 estimates that up to **1.5 Mio new jobs** can arise from ambitious climate policy in the EU.
- Ambitious energy efficiency policies as suggested in the EE Directive can boost EU GDP by around **30 billion** Euros by 2020.
- The Energy Roadmap shows that **decarbonization** of the EU energy system is **cheaper and more secure** than business-as-usual.

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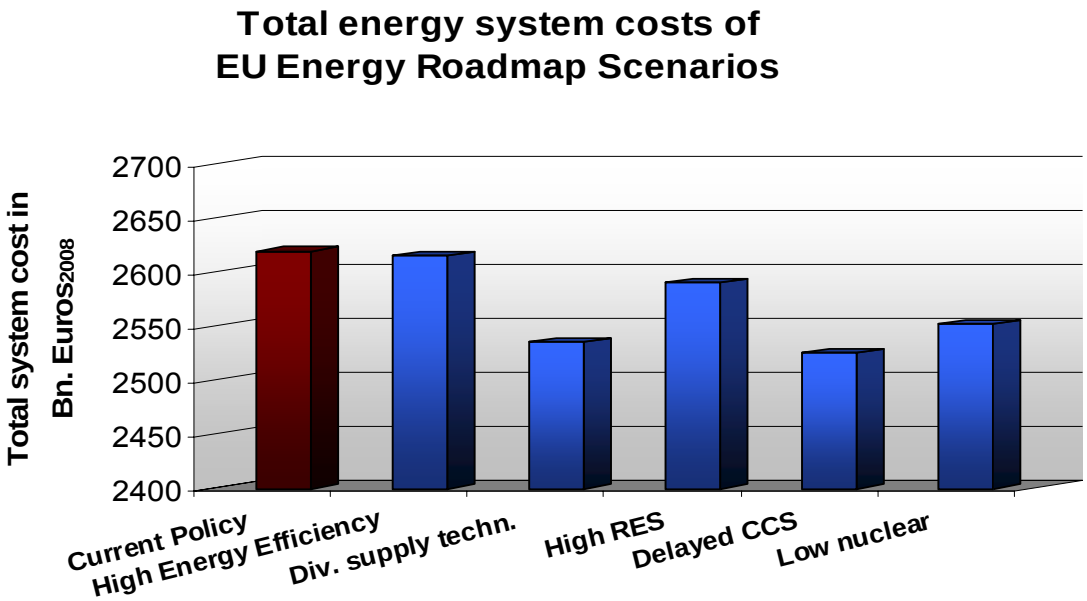
Economic impacts in the Energy Roadmap

- All **decarbonisation scenarios cost as much or less then the reference**:
  - average annual energy costs are about 2500 bn. € in decarbonisation and reference scenarios.
  - decarbonisation scenarios are remarkably similar in costs.
  - all scenarios entail a shift from fuel and variable costs to capital costs.



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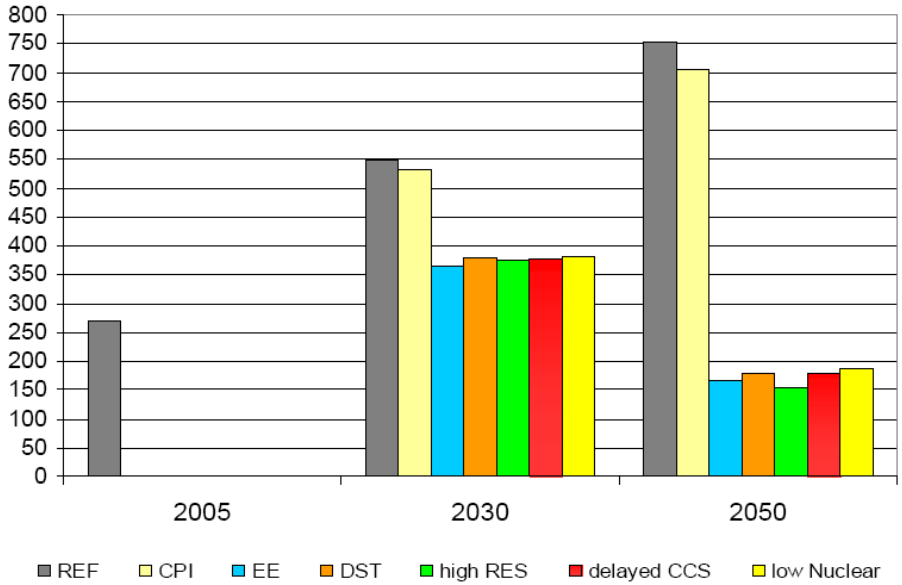
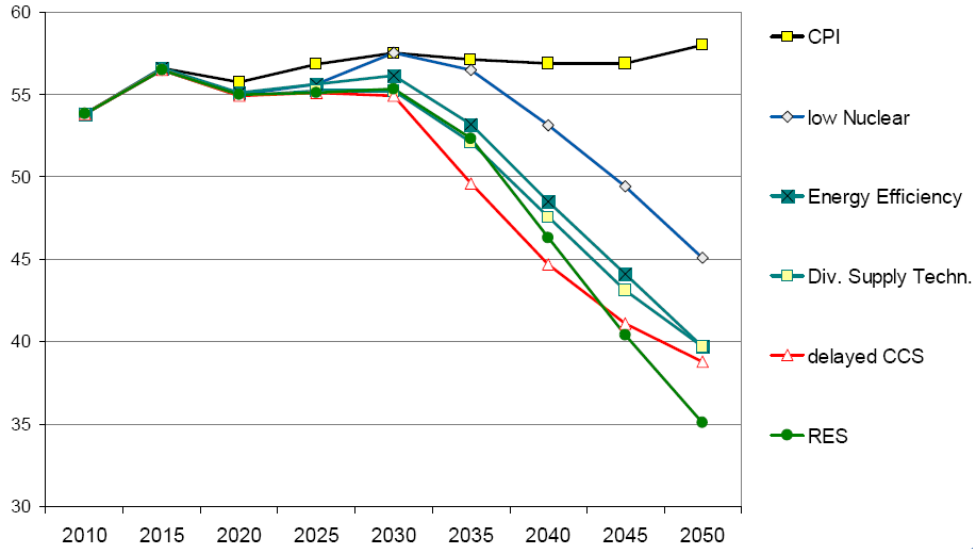
Energy security in the Energy Roadmap

- **Decarbonisation reduces fossil fuel security** risks and import dependency. External fossil fuel bill can be as low as 150 bn.€ in 2050 – compared to around 700 bn. € in business-as-usual.

EU: External Fossil Fuel Bill (in bn € of 2008)



Import dependency under current trends and decarbonisation (%)



Source: EC/ DG Energy

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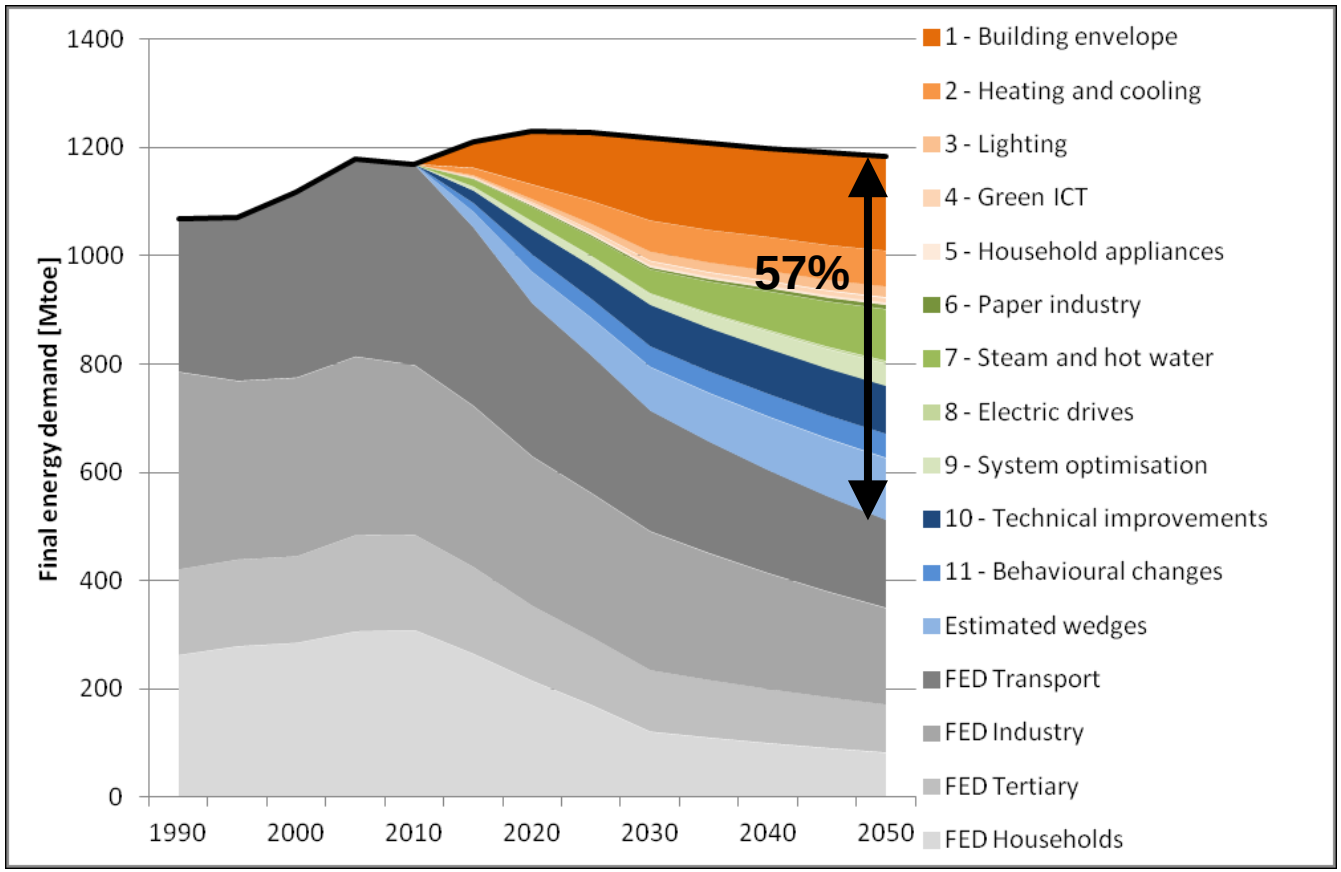
„*The cheapest energy* is the *energy we don't* use!“ Economic benefits of energy efficiency

- Overall final energy **saving potential** in the EU: **-57% by 2050**



Source: Fraunhofer ISI

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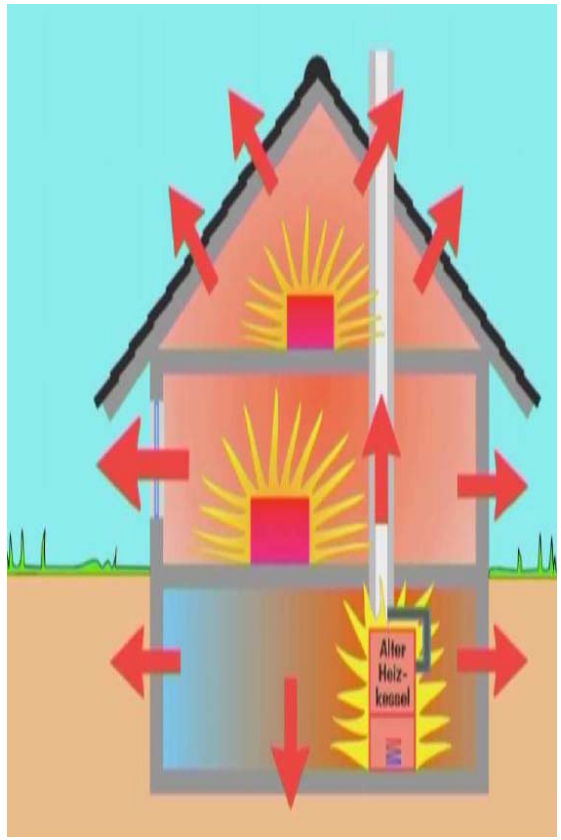
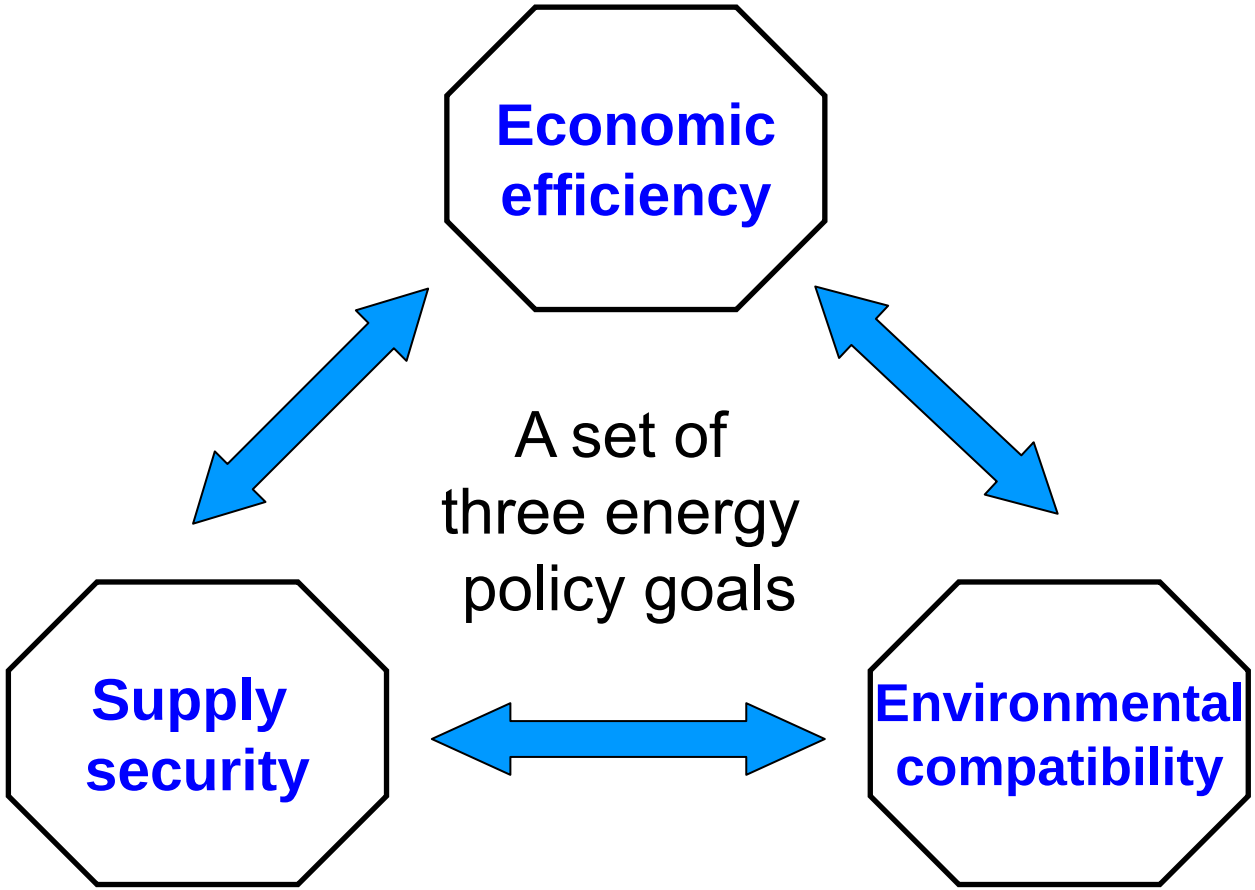
Economic benefits of ambitious energy efficiency measures

- **92%** of entire savings potential in 2050 is **cost-efficient**.
- More than **€500 billion could be saved** if all energy saving potentials would be implemented.
- 20% final energy demand reduction through building related measures



Criteria for effective energy policies
Guidelines for political action



The German Energy Concept

The Energy Concept:

Long-term, comprehensive and specific

1. Long-term: Timeline 2050
2. Comprehensive: All relevant sectors
3. Specific:
   - Goals
   - Measures: Over 100 specific measures
   - Funding

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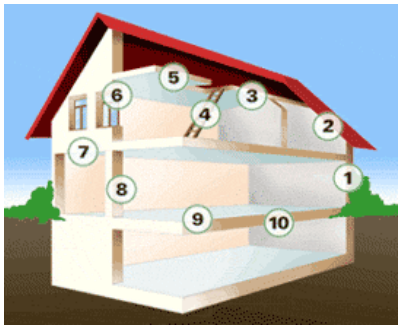
Energy Concept: A three-pronged approach

1. Renewable energy sources:
- Rapid, continuous expansion
- Cost-efficient and environmentally friendly

2. Future grids:
- Flexible and powerful
- Integration of electricity from
- renewable sources

3. Efficiency:
- Reduce energy consumption
- Ensure efficiency



Source: BMU

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Aims of the energy concept

	Climate	Renewable energies		Efficiency		
	Greenhouse gases (vs. 1990)	Share of elec.	Overall share (Gross final energy cons.)	Primary energy cons.	Energy produc-tivity	Building moderni-sation
2020	- 40%	35%	18%	- 20%	Increase to 2.1% p.a.	Double the rate 1% → 2%
2030	- 55%	50%	30%	↓		
2040	- 70%	65%	45%			
2050	- 80-95%	80%	60%	- 50%		

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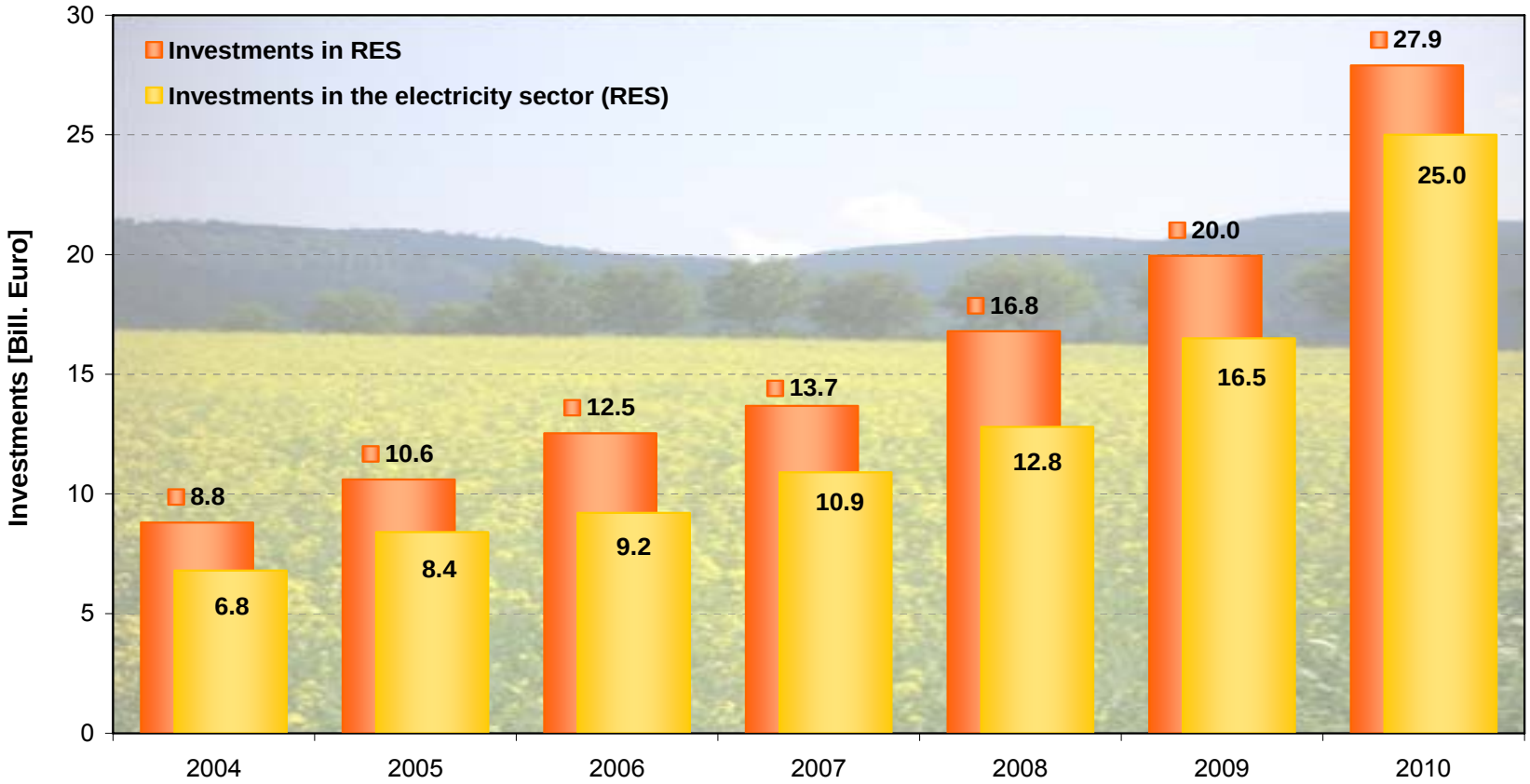
Benefits of transforming the German energy system

Investments

Investments in new renewable energy facilities in Germany 2004 - 2010



Source: BMU-KI III 1 according to the Centre for Solar Energy and Hydrogen Research Baden-Wuerttemberg (ZSW); Years 2004 and 2005 estimated;
image: BMU / Dieter Böhme; as at: December 2011; all figures provisional

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Benefits of transforming the German energy system
Green Jobs

New jobs:

- The **number of jobs** in the renewable energy sector more than **doubled** by 2010 to 367,400 since 2004 (year of first study).

More qualified jobs:

- **82%** of people employed in the renewables sector have completed **vocational training** (Ø in all industrial sectors 70%), nearly **40%** of these have a **university degree** (Ø 10%).

Source: BMU

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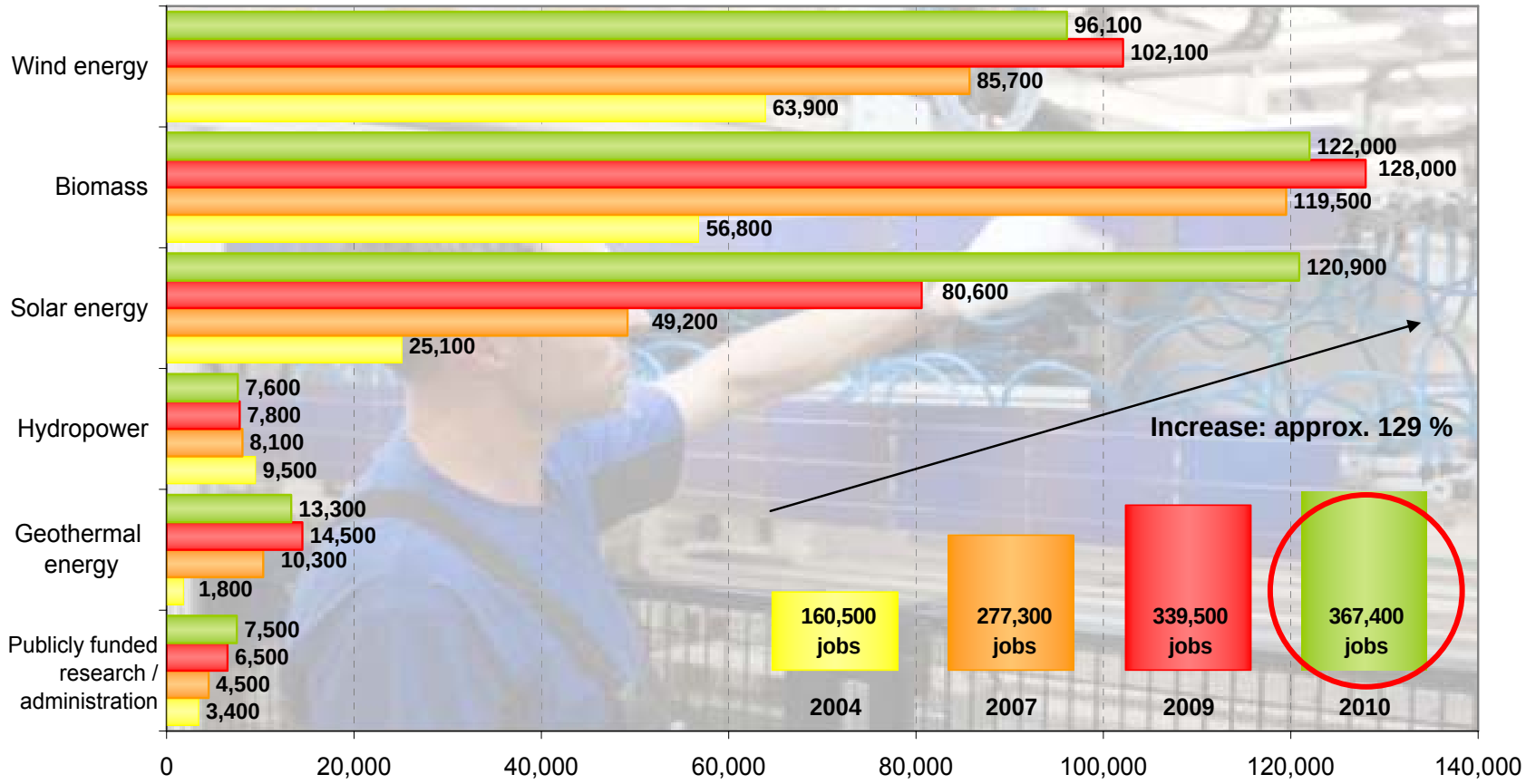
Benefits of transforming the German energy system

Green Jobs

Jobs in the renewable energy sources sector in Germany



Figures for 2009 and 2010 are provisional estimate; deviations in totals are due to rounding;
Source: O'Sullivan/Edler/van Mark/Nieder/Lehr: "Bruttobeschäftigung durch erneuerbare Energien im Jahr 20010 – eine erste Abschätzung", as at: March 2011; interim report of research project „Kurz- und langfristige Auswirkungen des Ausbaus erneuerbarer Energien auf den deutschen Arbeitsmarkt"; image: BMU / Christoph Busse / transit

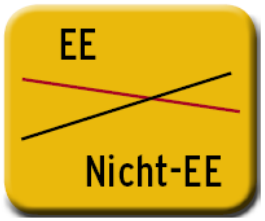
Positive net employment effects
Green Jobs

Under moderate export assumptions the net increase in employment by 2030 is 180,000 to 250,000 people in Germany

The expansion of renewable energy triggers many demand, substitution and budget effects. The net result of these effects can only be determined using integrated models.

RE expansion

Demand arising from investments and operation of facilities + +



Price ratios

"Substitution effect" –
"Budget effect" – +

Foreign trade

Exports/imports – +

Gross effect (positive effects)
– negative effects
Net effects

Source: BMU „Renewably Employed" (2011)

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Thank you for your attention.

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Economic benefits of ambitios energy efficiency targets on the EU level

Figures and facts taken from the impact assessment of the currently discussed EU Energy Efficiency Directive

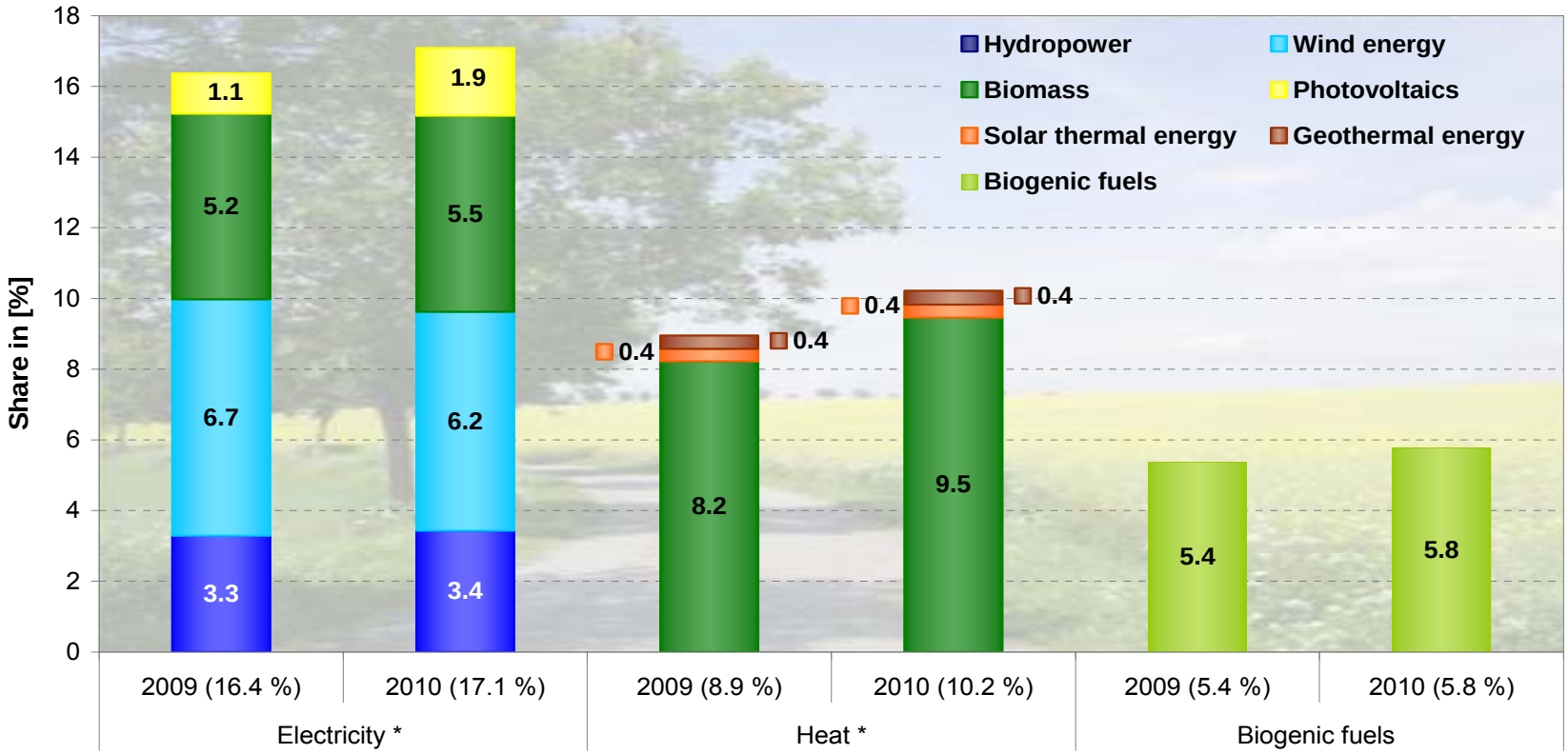
Impact in 2020* / Option	Primary energy (Mtoe)	GDP (bn € 2000)	Employ-ment	Investment (bn € 2000)	Real HH incomes (bn € 2000)	GHG emissions (Mt carbon)
B3: An energy saving obligations for all MS with full flexibility	-50 to -56	35 to 45	235,000 to 430,000	5.6 to 5.9	13 to 19	-43 to -47
B4: As B3 but with harmonisation of key design features	-108 to -118	69 to 77	438,000 to 754,000	15.3 to 15.4	17 to 29	-86 to -90

Source(s): E3ME, Cambridge Econometric

Compared to PRIMES 2009 EE scenario

State of the art in Germany

Share of renewable energy sources in total final energy consumption in Germany 2010 / 2009



* Solid and liquid biomass, biogas, sewage and landfill gas, biogenic share of waste; electricity from geothermal energy not presented due to negligible quantities produced; deviations in the totals are due to rounding; Source: BMU-KI III 1 according to Working Group on Renewable Energy-Statistics (AGEE-Stat); image: BMU / Dieter Böhme; as at: December 2011; all figures provisional

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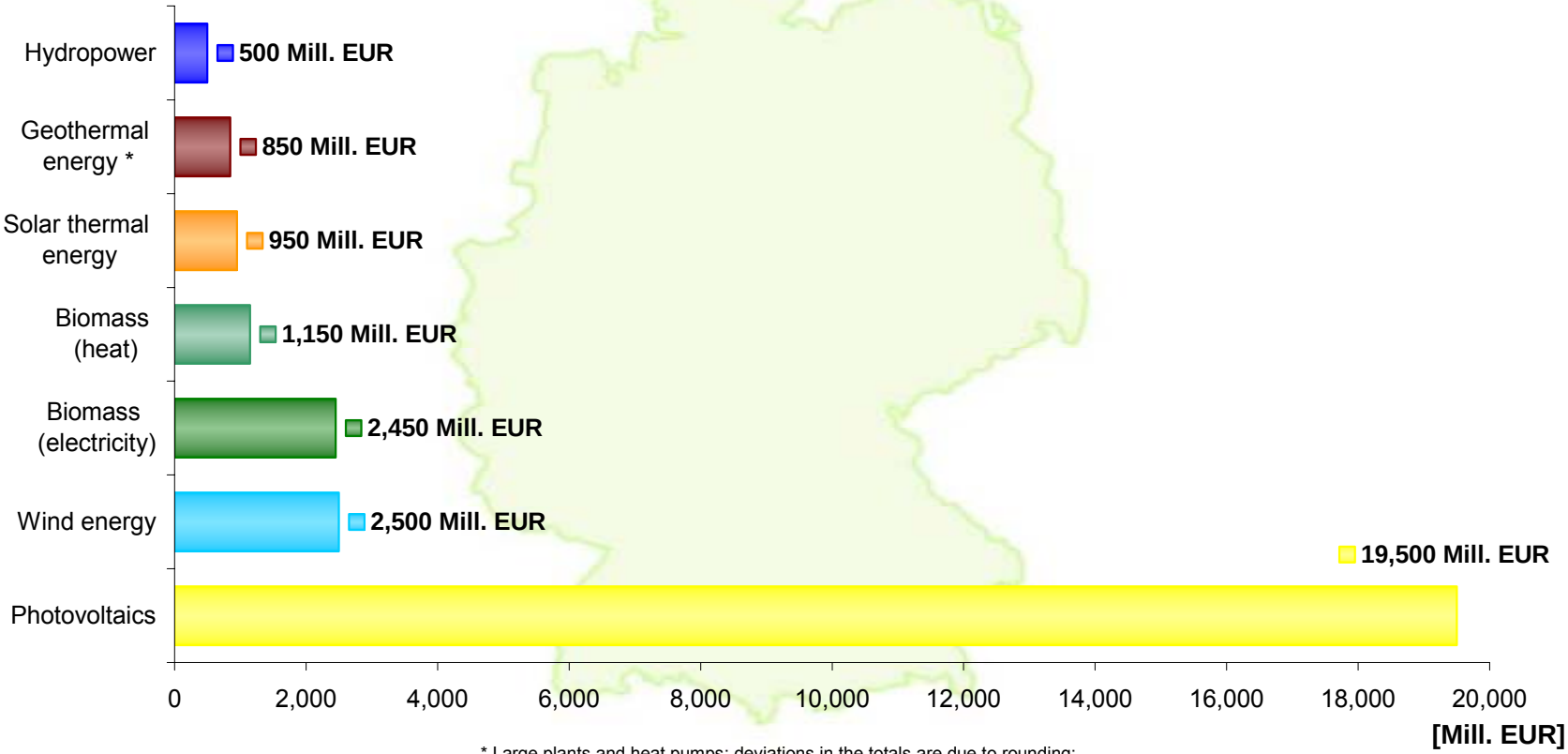
Benefits of transforming the German energy system

Investments

Investments in the construction of renewable energy installations in Germany 2010

Total: approx. 27.9 Bill. EUR



* Large plants and heat pumps; deviations in the totals are due to rounding;
Source: BMU-KI III 1 according to the Centre for Solar Energy and Hydrogen Research Baden-Wuerttemberg (ZSW); as at: December 2011; all figures provisional

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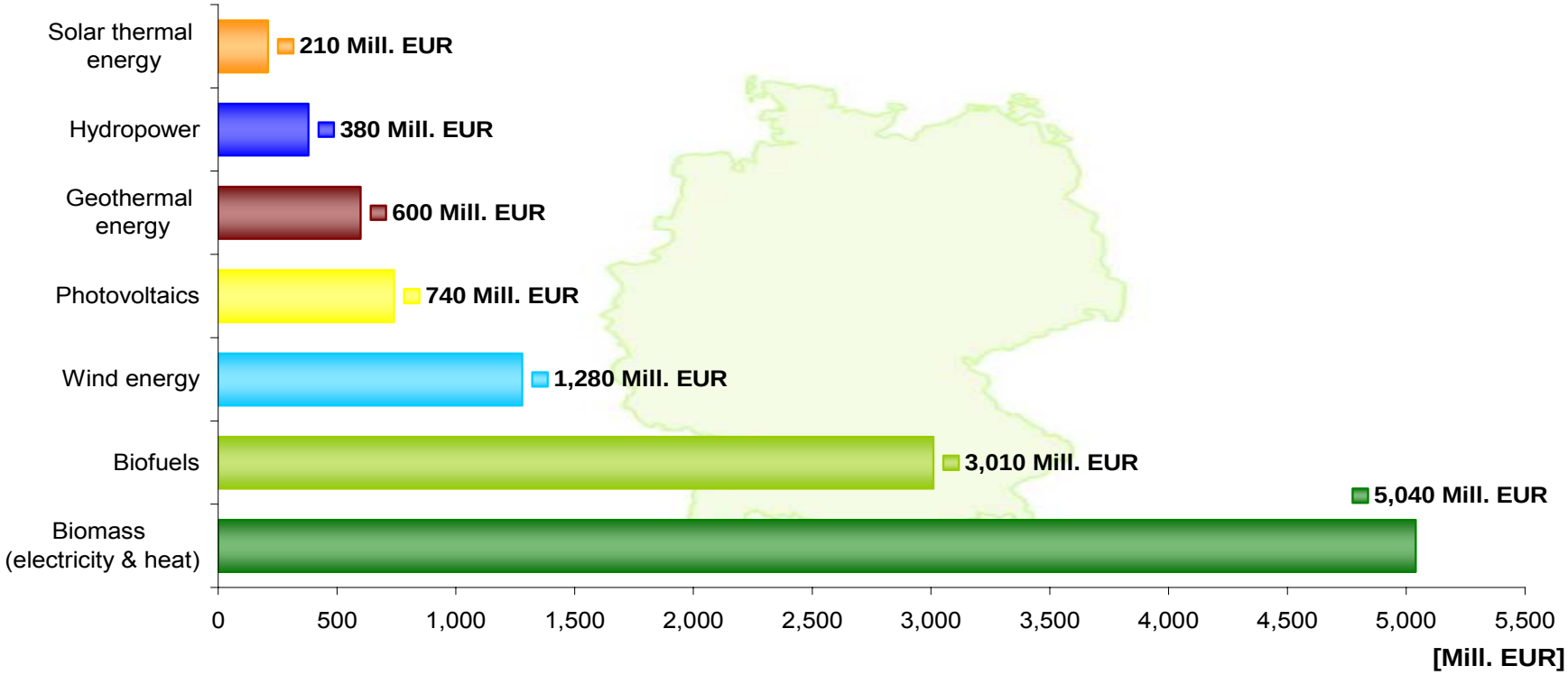
Benefits of transforming the German energy system

Economic Growth

Economic boost from the construction of renewable energy installations in Germany 2010

Total: approx. 11.3 Bill. EUR



deviations in the totals are due to rounding;
Source: BMU-KI III 1 according to the Centre for Solar Energy and Hydrogen Research Baden-Wuerttemberg (ZSW); as at: December 2011; all figures provisional

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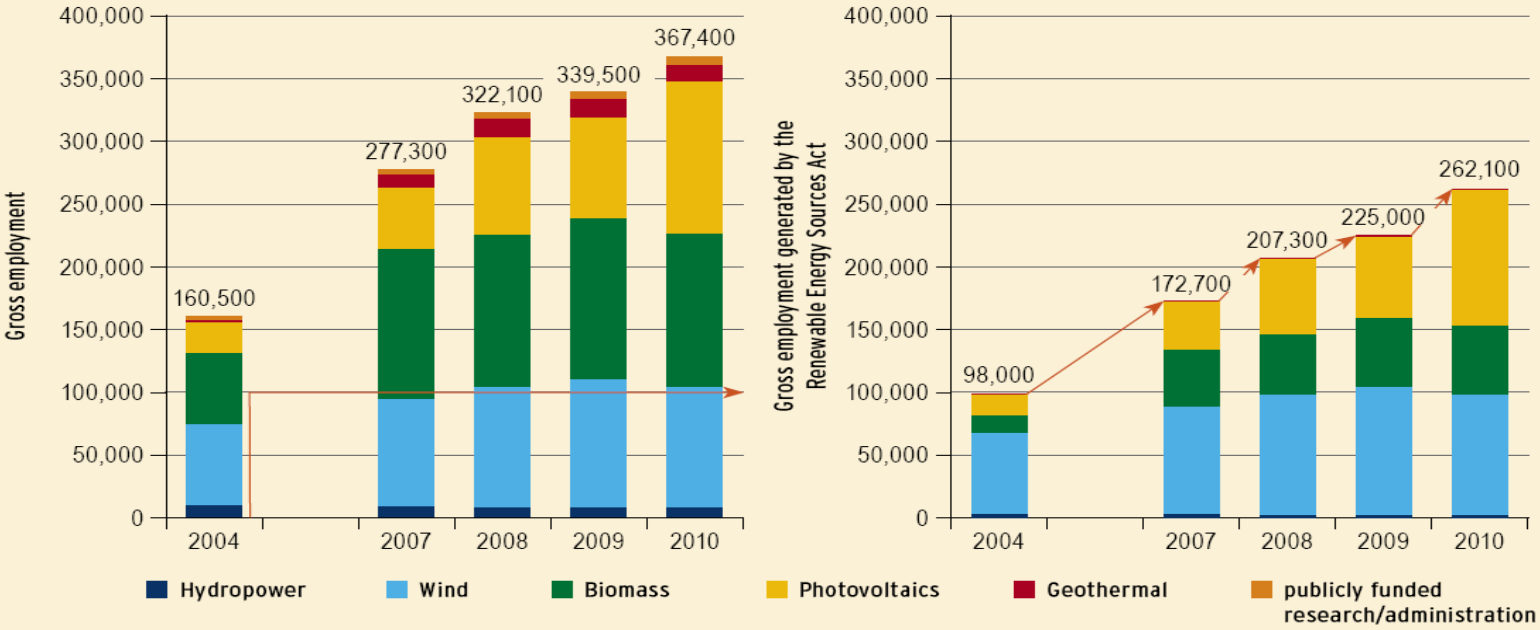
Benefits of transforming the German energy system

Green Jobs

262,100 jobs in the renewable sector induced by the Renewable Energy Sources Act in 2010

Figure 5: Employment trends in the renewable energy industry and employment induced by the Renewable Energy Sources Act between 2004 and 2010



262.100 jobs can be ascribed to the impact of the Renewable Energy Sources Act in 2010. This means that the Act's relevance for trends in levels of gross employment rose from about 61 % in 2004 to 71 % in 2010.

Source: BMU „Renewably Employed" (2011)

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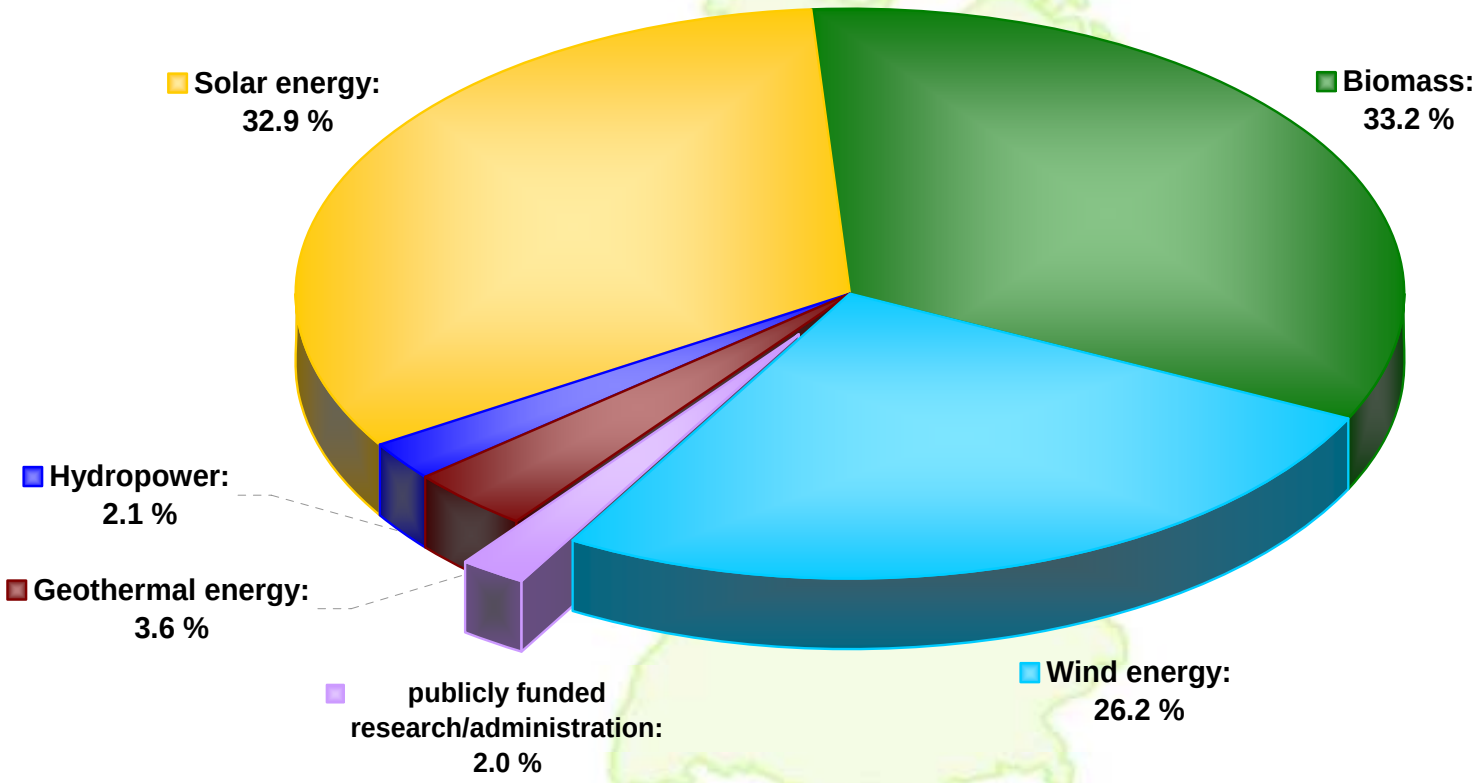
Benefits of transforming the German energy system

Green Jobs

Spread of the approx. 367,400 jobs in the renewable energy sources sector in Germany 2010



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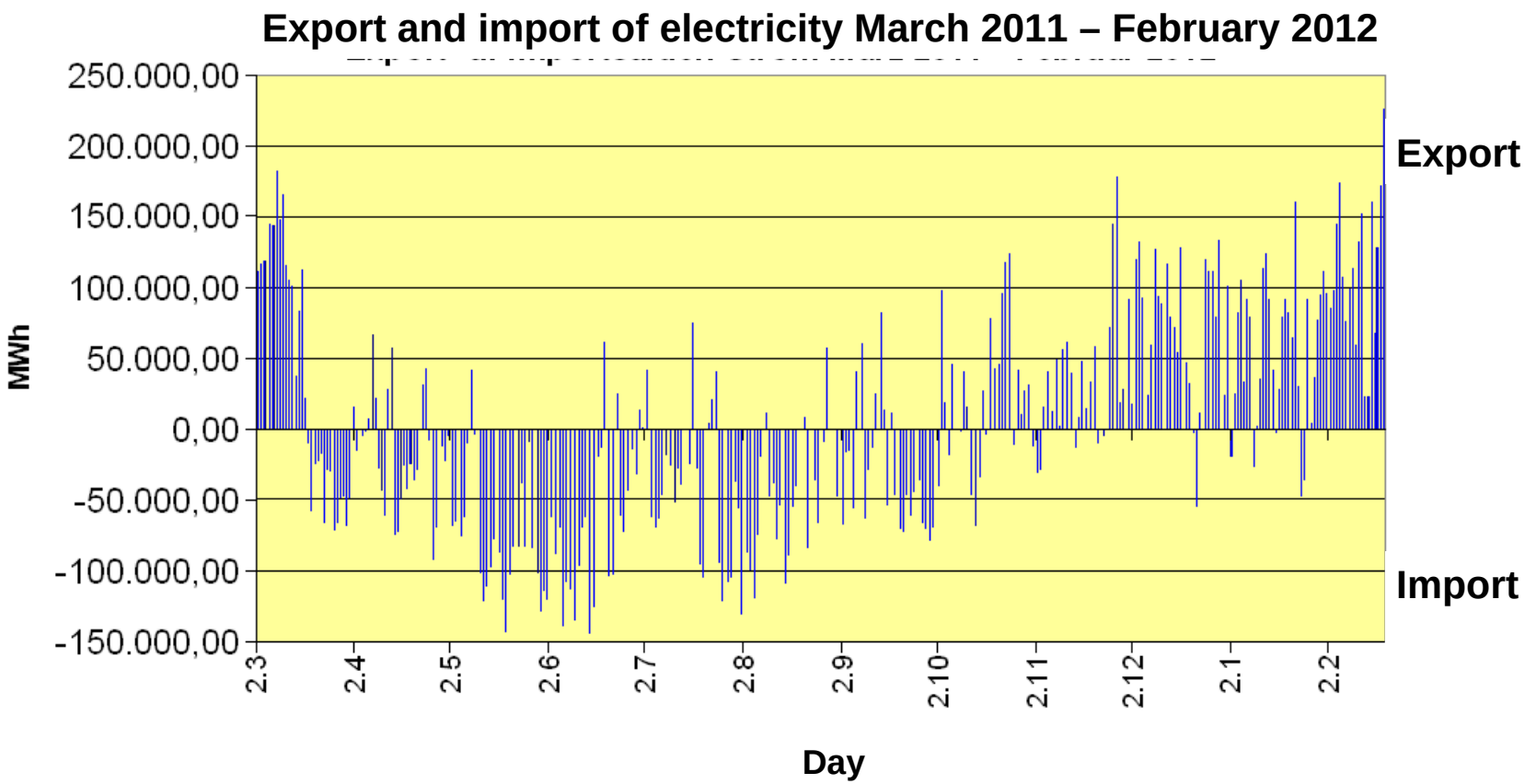
Source: O'Sullivan/Edler/van Mark/Nieder/Lehr: "Bruttobeschäftigung durch erneuerbare Energien im Jahr 20010 – eine erste Abschätzung", as at: March 2011; interim report of research project „Kurz- und langfristige Auswirkungen des Ausbaus erneuerbarer Energien auf den deutschen Arbeitsmarkt"

Import/ Export of electricity in balance



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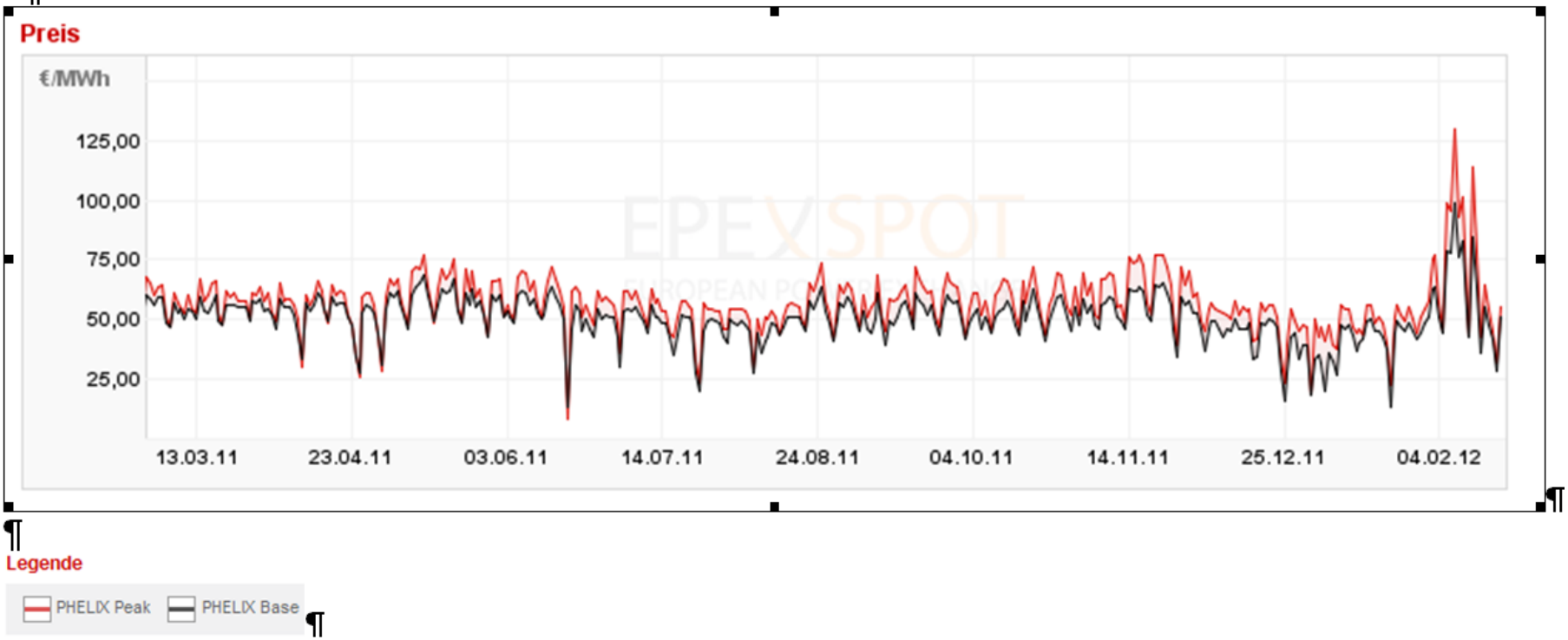
No rising prices at the electricty spot market in 2011

- Average price before the moratorium: ca. 55 €/MWh (Base) and ca. 57 €/MWh (Peak)
- Price today: ca. 51 €/MWh (Base) and ca. 55 €/MWh (Peak).



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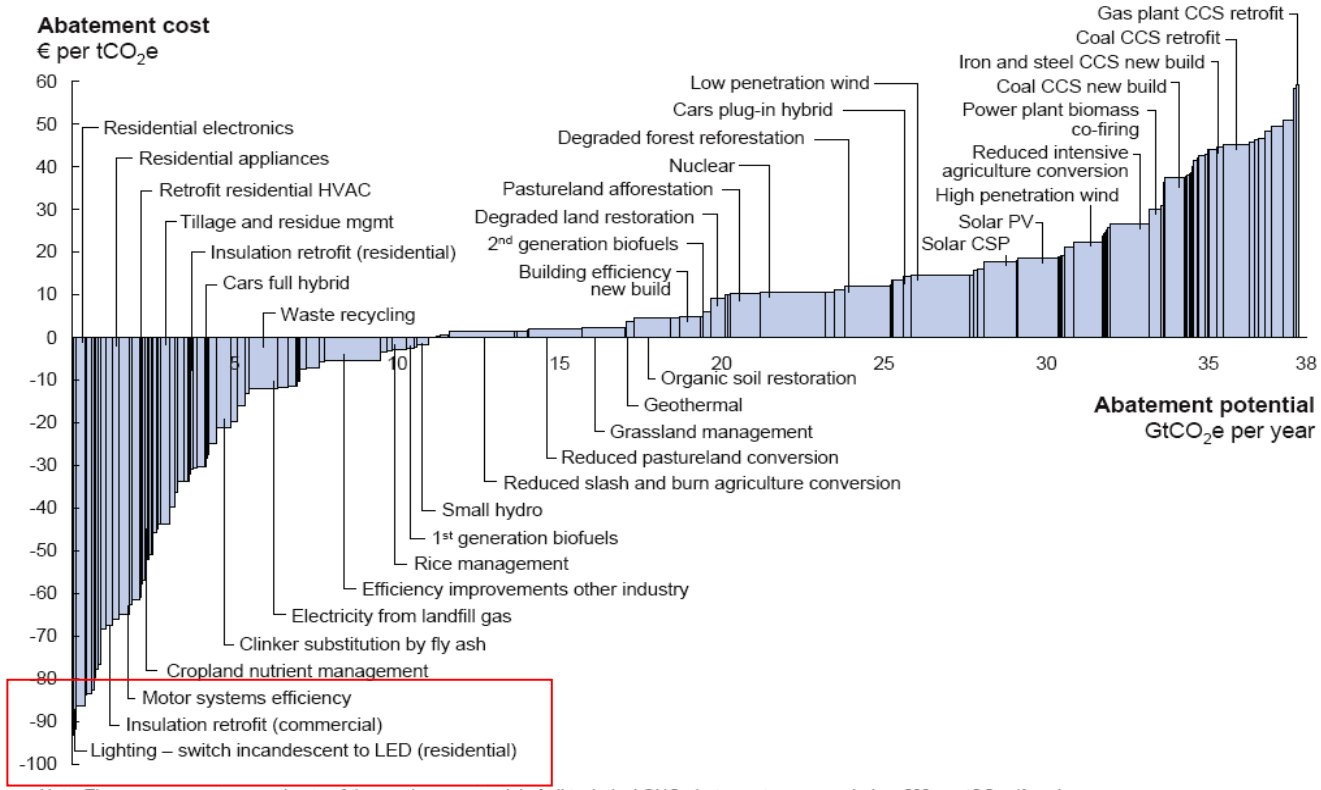
Energy Efficiency pays off!

Exhibit 1

Global GHG abatement cost curve beyond business-as-usual – 2030



Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €60 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.
Source: Global GHG Abatement Cost Curve v2.0