Dr Michael Paul, Member of the Bundestag

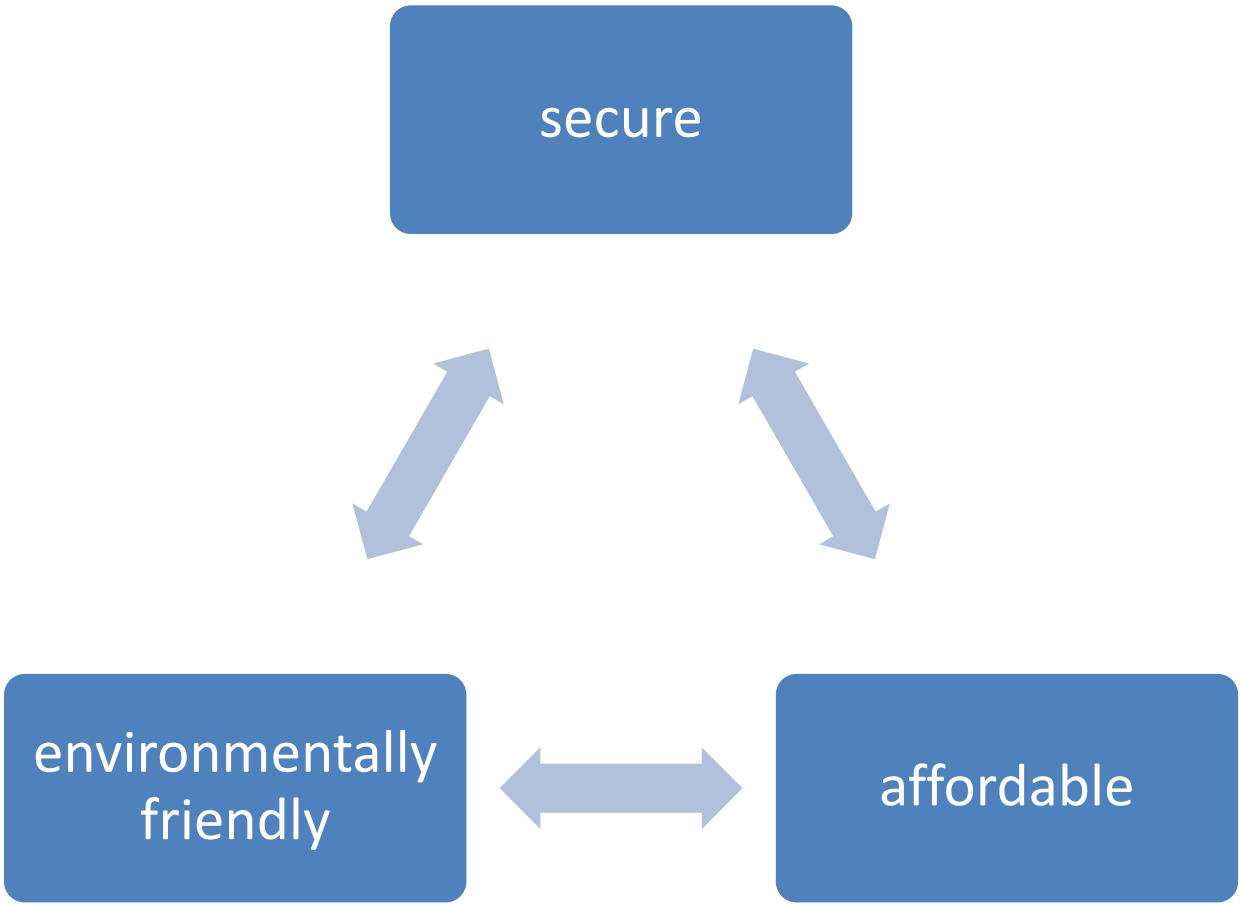
Water, Energy, and Food Security Nexus - The Bonn Perspective:

Transformation of the energy system – what is the outlook for future energy supply in Germany and Europe?

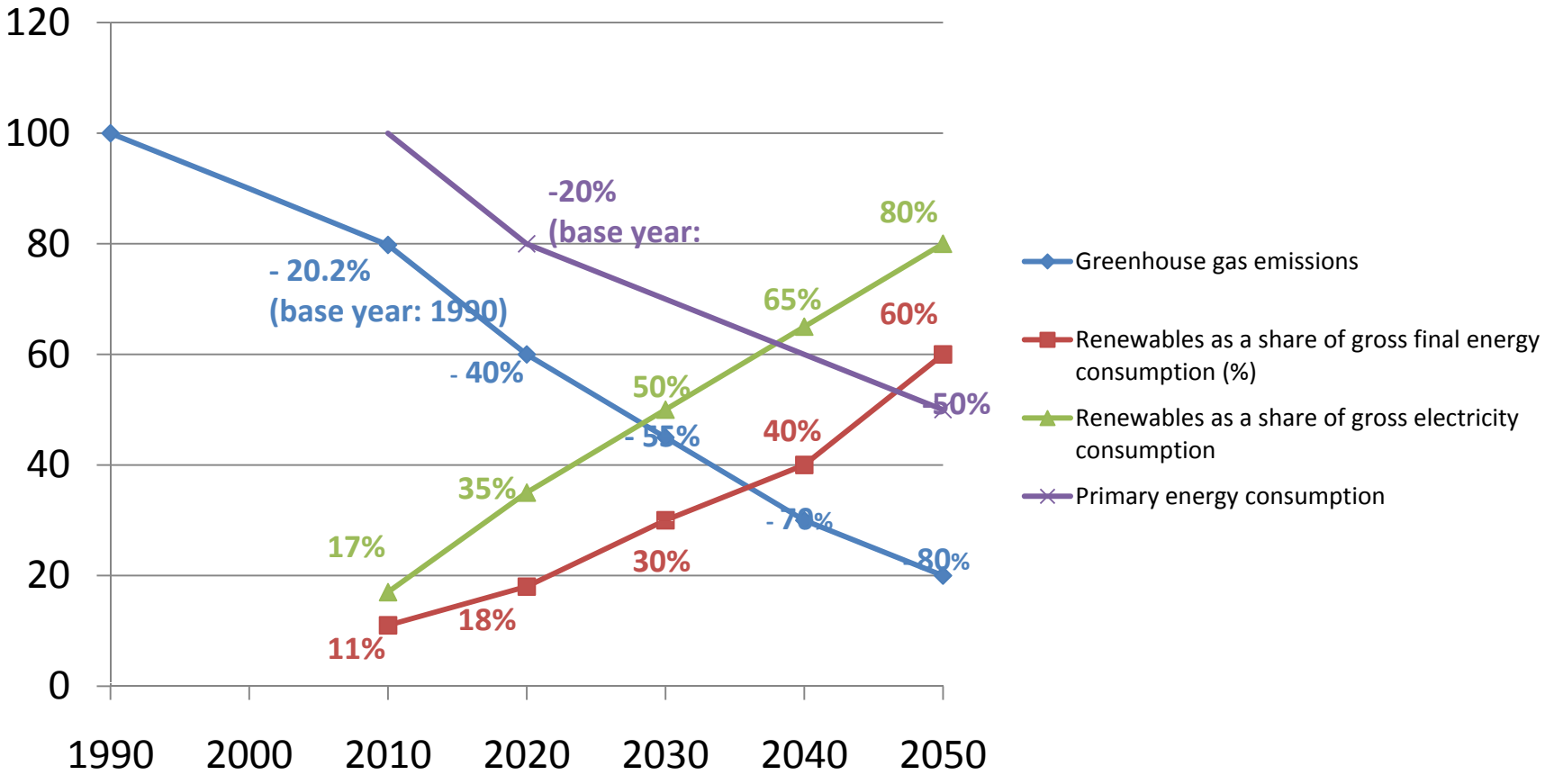
International Conference on Regional Energy Governance and the Nexus Perspective:
Challenges in the Asia Pacific Region

Kuala Lumpur, 6th of December 2012

Trio of objectives in energy policy



Ambitious targets for greenhouse gas reductions (German government's Energy Concept in 2010)



Source: The German government's Energy Concept, 2010

The new German government´s Energy Concept in 2011 „Post-Fukushima”

- Unchanged:
  - Security of energy supply
  - Affordability of energy supply
  - Further Retention of ambitious targets for energy savings and greenhouse gas reductions

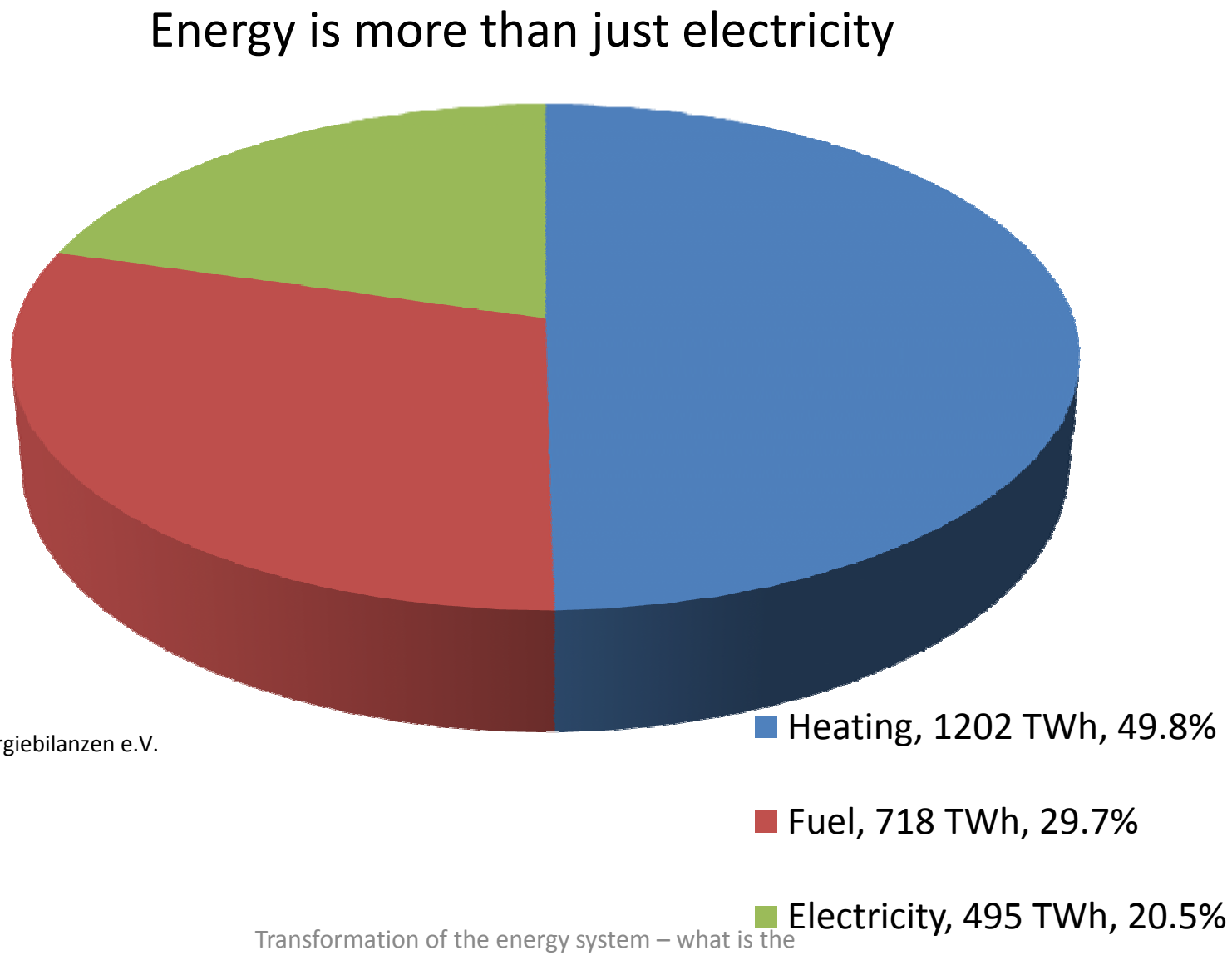
- But:
  - Phase-out of nuclear energy by 2022

    Amount of Nuclear Power in the net electricity generation in Germany:

    2010: 22,4 %

    2022: 0,0 %

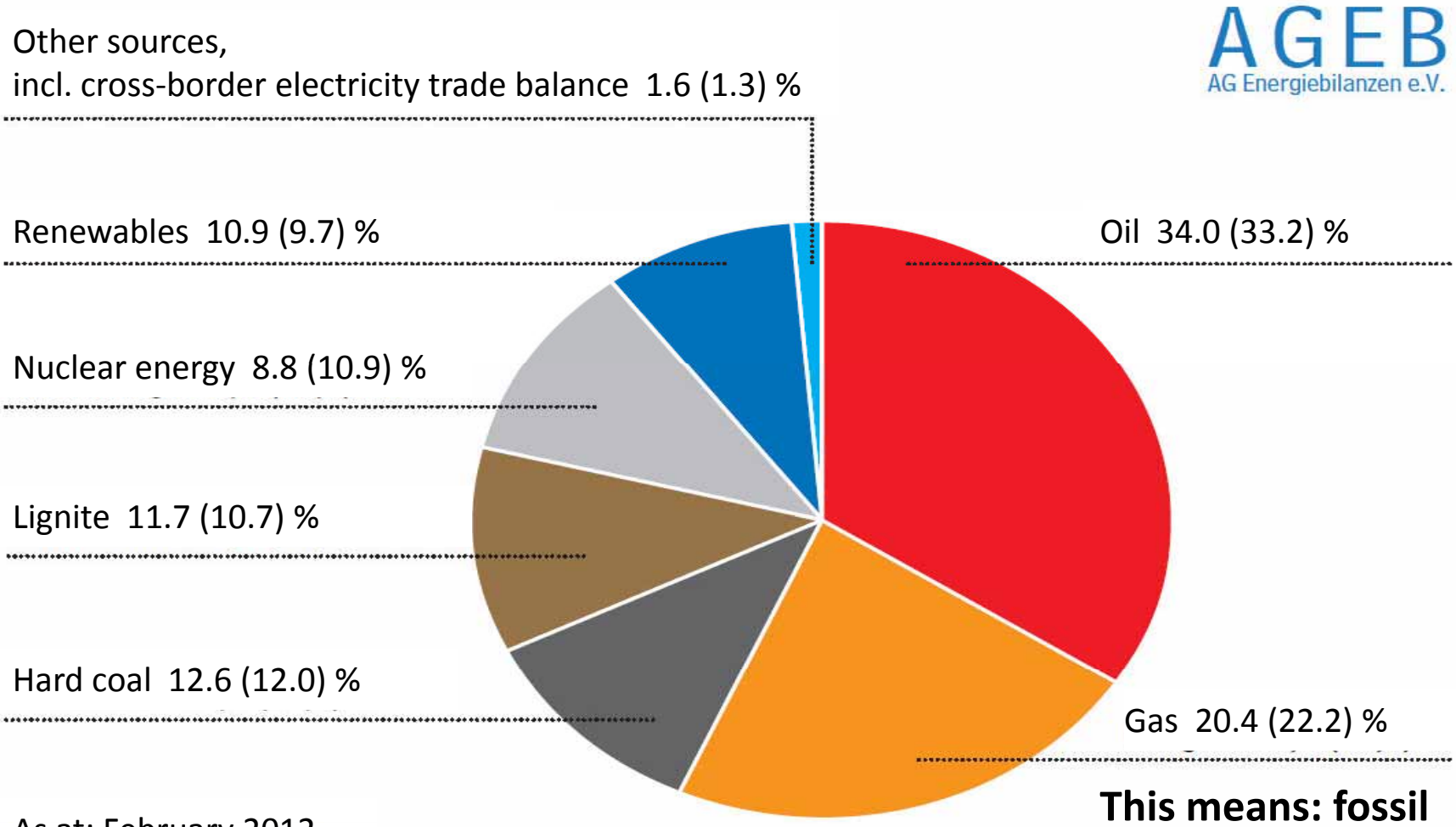
Environmental friendliness of energy supplies



Source: AG Energiebilanzen e.V.

Environmental friendliness of energy supplies

Energy mix (primary energy) in Germany, 2011
Values for 2010 in brackets



AGEB
AG Energiebilanzen e.V.

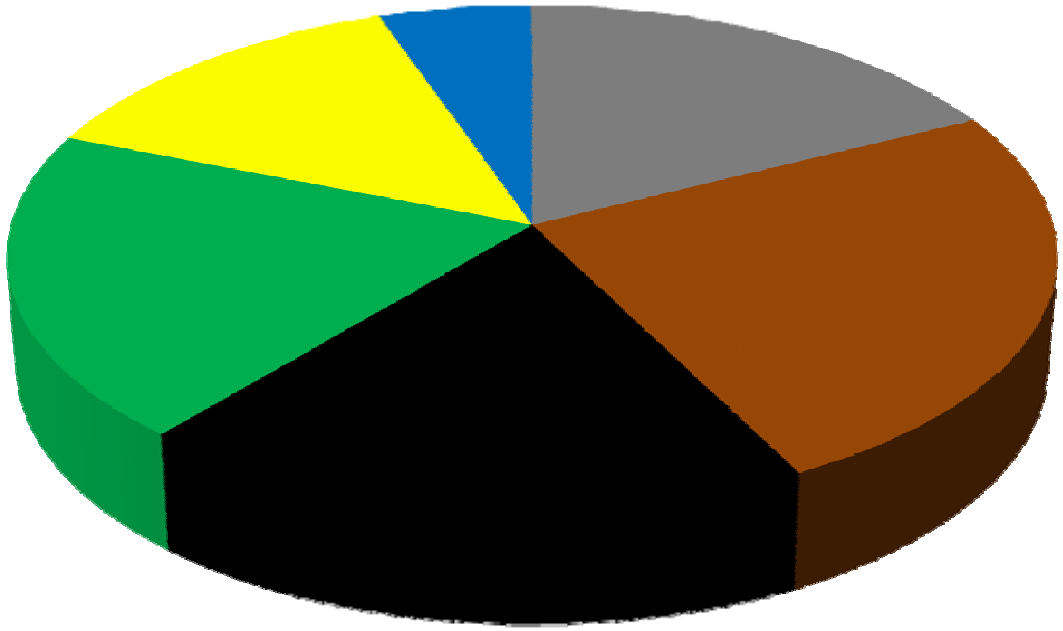
As at: February 2012

Source: Arbeitsgemeinschaft Energiebilanzen e. V.

This means: fossil fuels make up almost 80%

Environmental friendliness of energy supplies

Energy sources as a percentage of net electricity generation in Germany in 2011 (2010 figures in brackets)

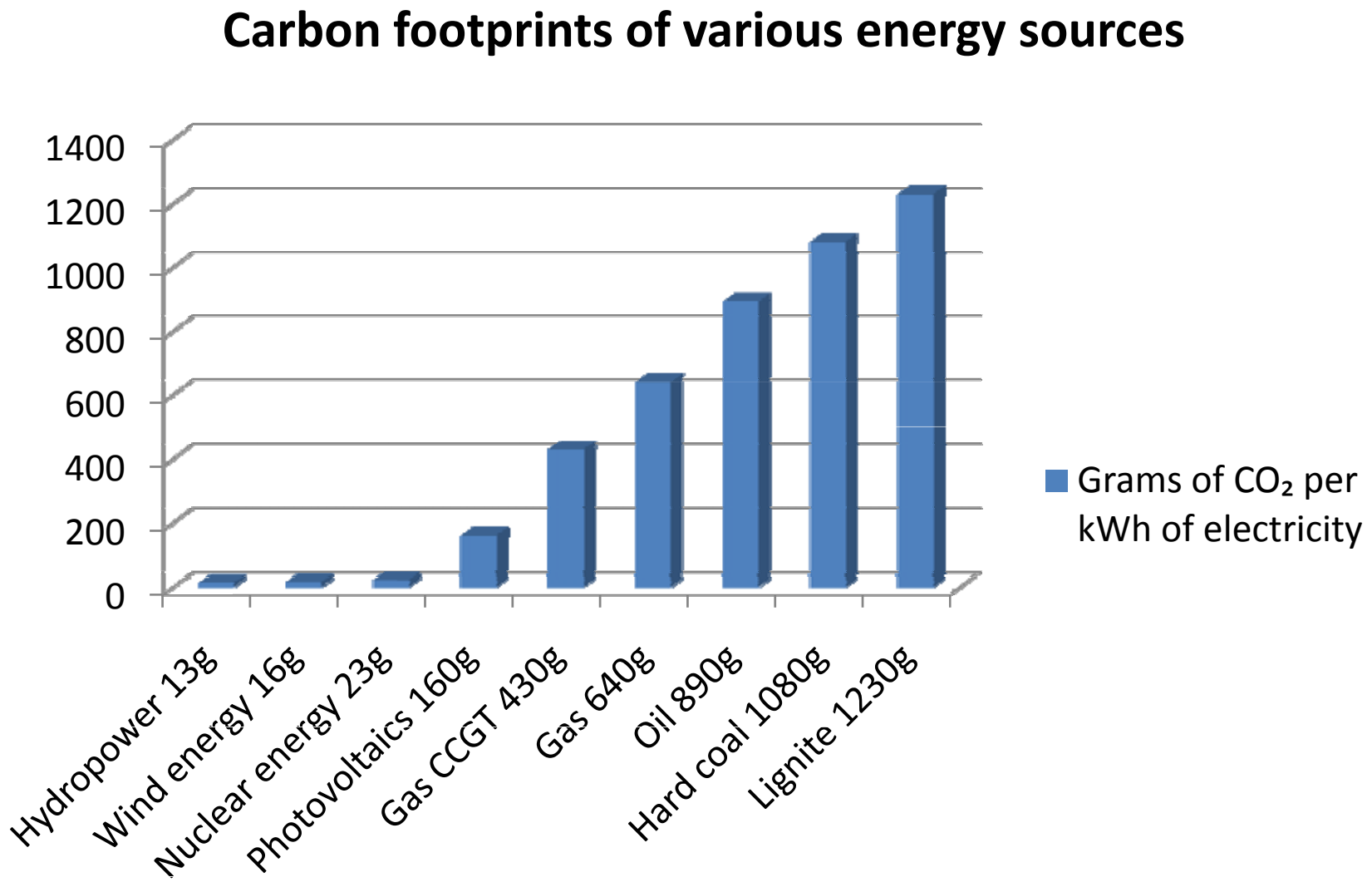


- Nuclear energy 17.6 (22.4)
- Lignite 24.9 (23.2)
- Hard coal 18.6 (18.6)
- Renewables 19.9 (16.4)
- Gas 13.7 (13.8)
- Other sources 5.3 (5.6)

This means: fossil fuels make up almost 60%

Source: AG Energiebilanzen
As at: 2012

Environmental friendliness of energy supplies

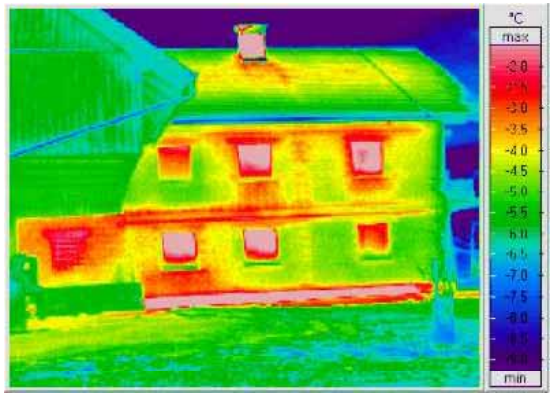


Source: Research Services of the German Bundestag

Approaches to implementing the trio of objectives in energy policy

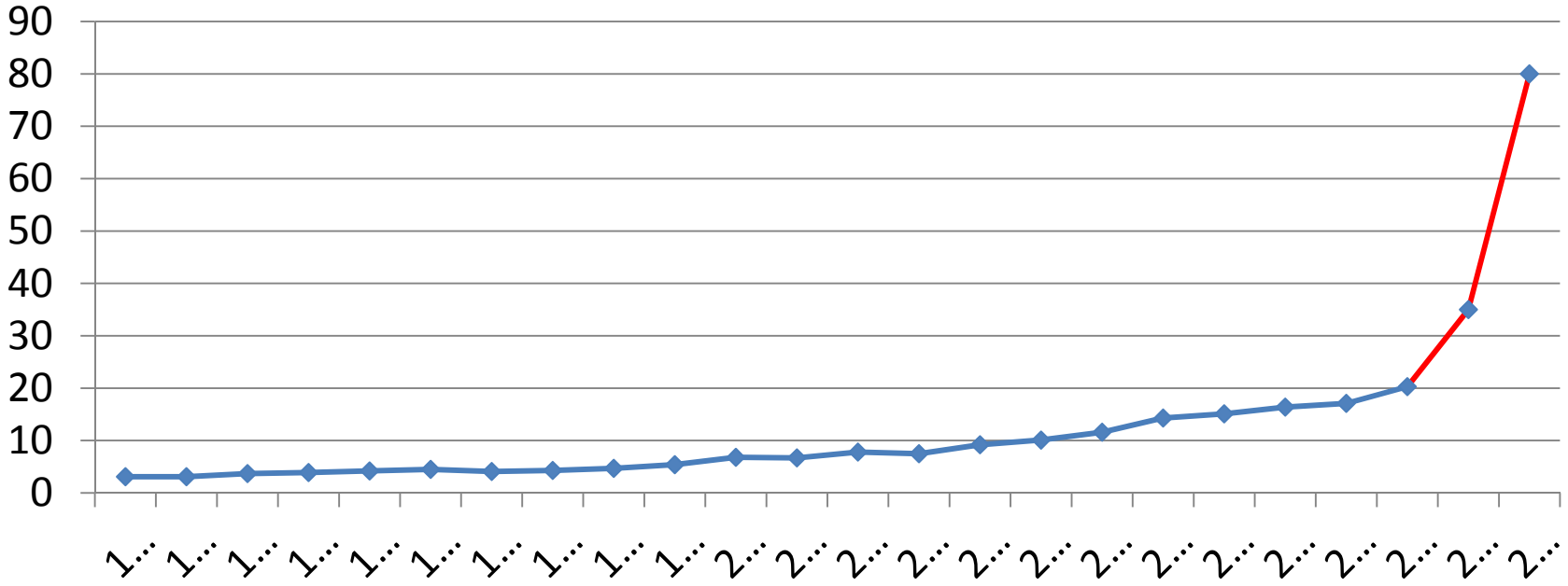
- Reductions in primary energy consumption
- Increase in energy efficiency
- Increase in the proportion made up by renewables

Reductions in primary energy consumption / Increase in energy efficiency

Combined heat and power	Building refurbishing	Road traffic / fuel
	 Unrefurbished building  Low Energy building	- Reduction of the average fuel consumption of cars: -1,7 Litres per 100km since 1990 - Reduction of low weight vehicles CO_2-emissions: - 120 g per km until 2015 - 95 g per km until 2020 Source: Federal Environment Agency  Picture: Auto Bild, Daimler AG

Increase in the proportion made up by renewables

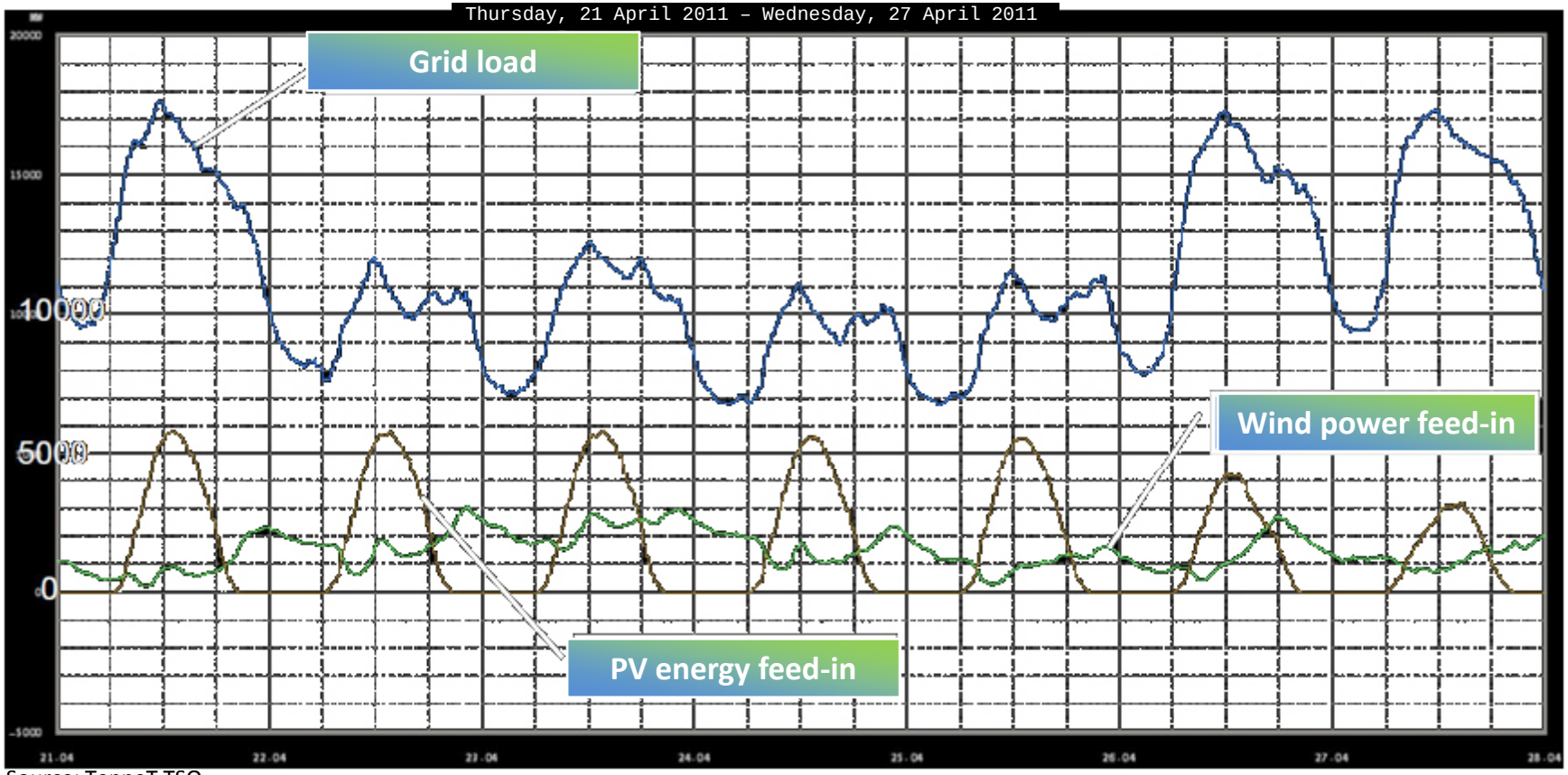
Amount of renewable energy generation since 1990



1. **Legal Act on granting priority to renewable energy sources (1991)**
2. **Renewable Energy Sources Act (2008)**

Security of supply

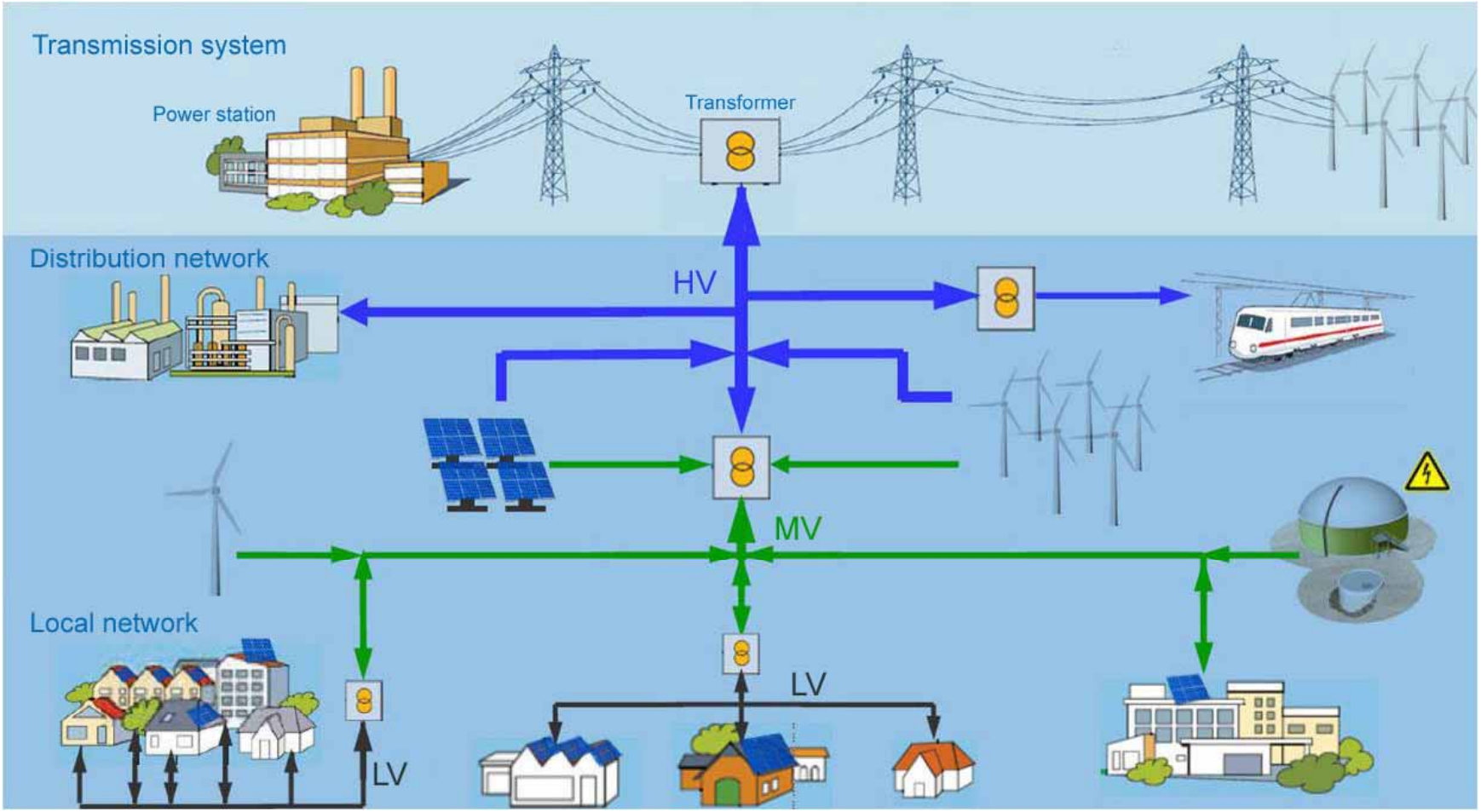
Volatility of electricity from renewable sources



Source: TenneT TSO

Security of supply

Restructuring the energy supply system

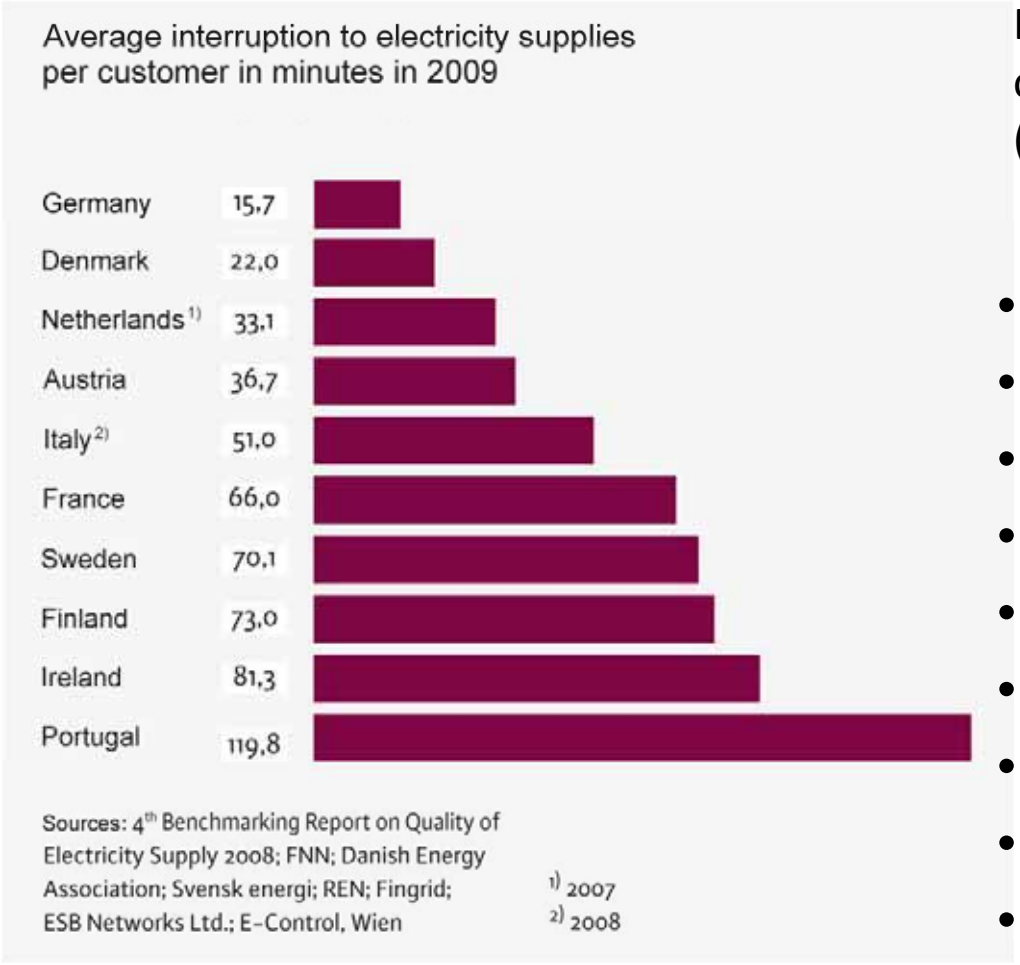


Restructuring: from “generation is driven by consumption” to “transmission and consumption are driven by generation”

Graphic: TenneT TSO

Security of supply

Network stability



Intraday interventions by the network operator to ensure network stability (TenneT grid)

Year	Days	Interventions
2003	**2**	**2**
2004	**14**	**15**
2005	**51**	**51**
2006	**105**	**172**
2007	**185**	**387**
2008	**144**	**228**
2009	**156**	**312**
2010	**161**	**290**
2011	**300**	**1024**

Source: TenneT TSO GmbH

Security of supply

Network stability

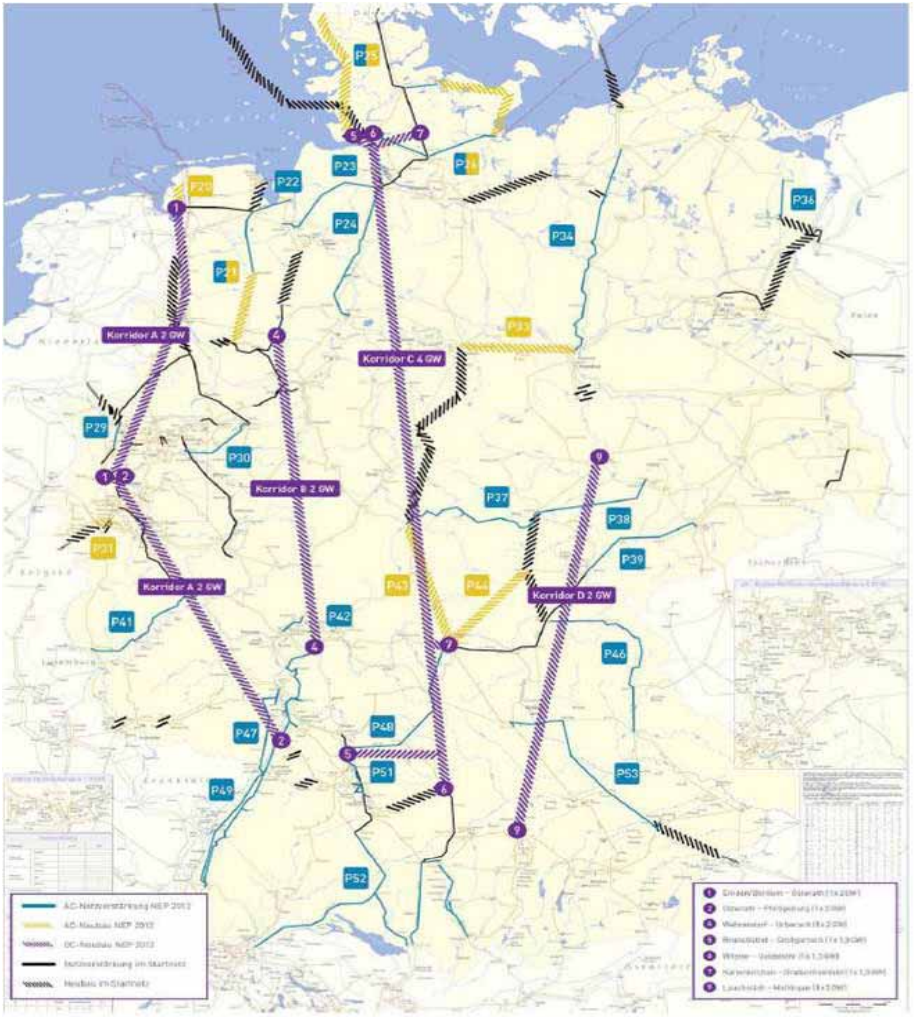
- 25 gigawatts of wind power generated in Germany's windy north
- Consumption is highest in the west and the south

This means:

- We need to expand our grid by 4450km by 2020 (DENA grid studies I and II). Achieved so far: 80km
- We need to expand/optimise the distribution networks (low-voltage level)
- We need to develop storage technologies

Security of supply

Network stability



(LEAD) SCENARIO B 2022

Optimisation of existing routes

- New AC lines on existing routes: 2800 km
- AC reinforcements and AC circuit upgrades on existing routes: 1300 km
- DC circuit upgrade: 300 km

Expansion of the grid with new routes

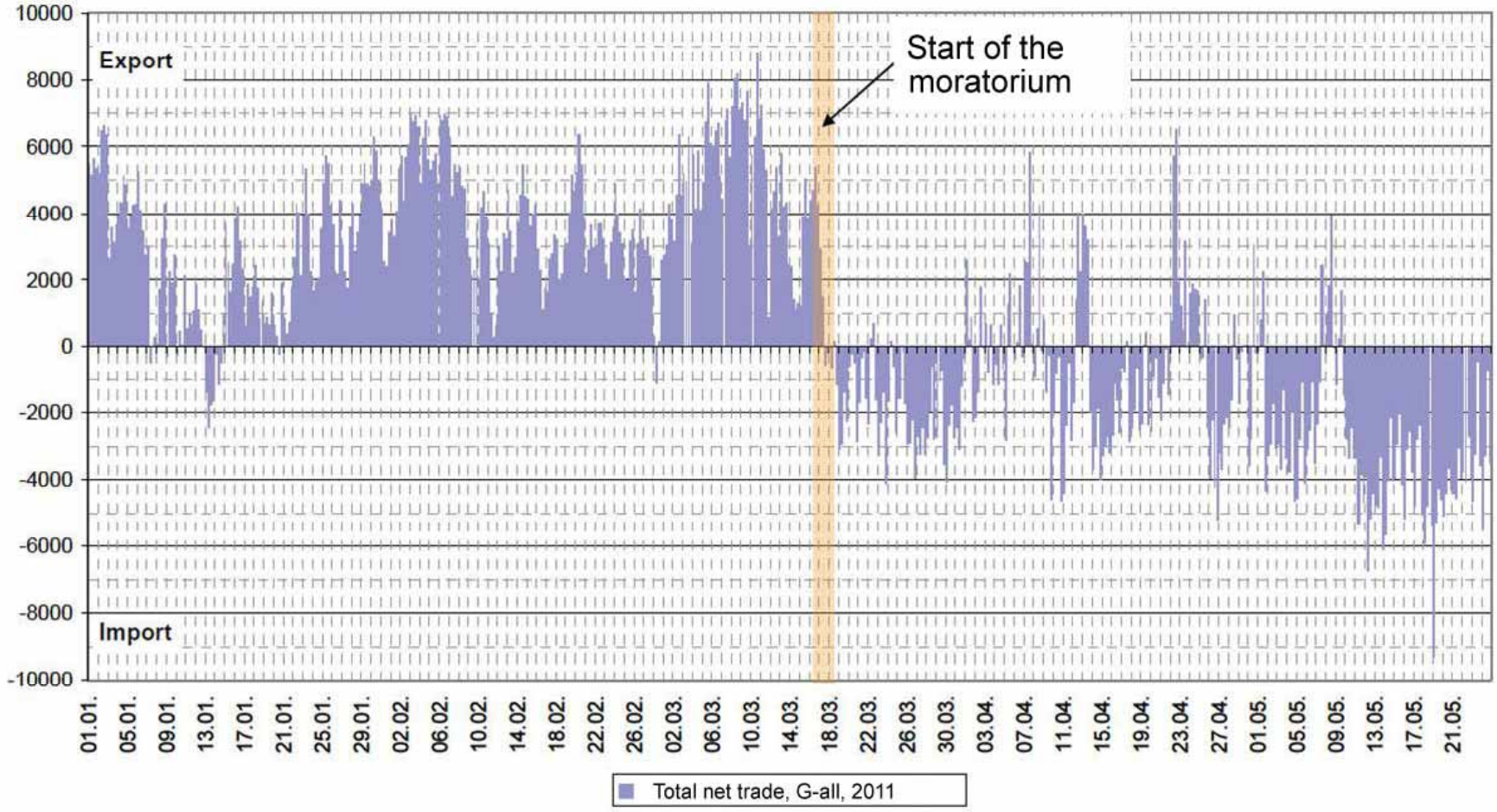
- New AC routes: 1700 km
- 4 DC corridors:
  Transmission capacity: 10 GW
  New DC routes: 2100 km
- **Estimated investment: 20 bn**

Source: Electricity Grid Development Plan working group set up by the HV transmission system operators Amprion GmbH, 50 Hertz Transmission GmbH, TenneT TSO GmbH, Transnet BW GmbH; www.netzentwicklungsplan.de

As at: 29.05.2012

Security of supply

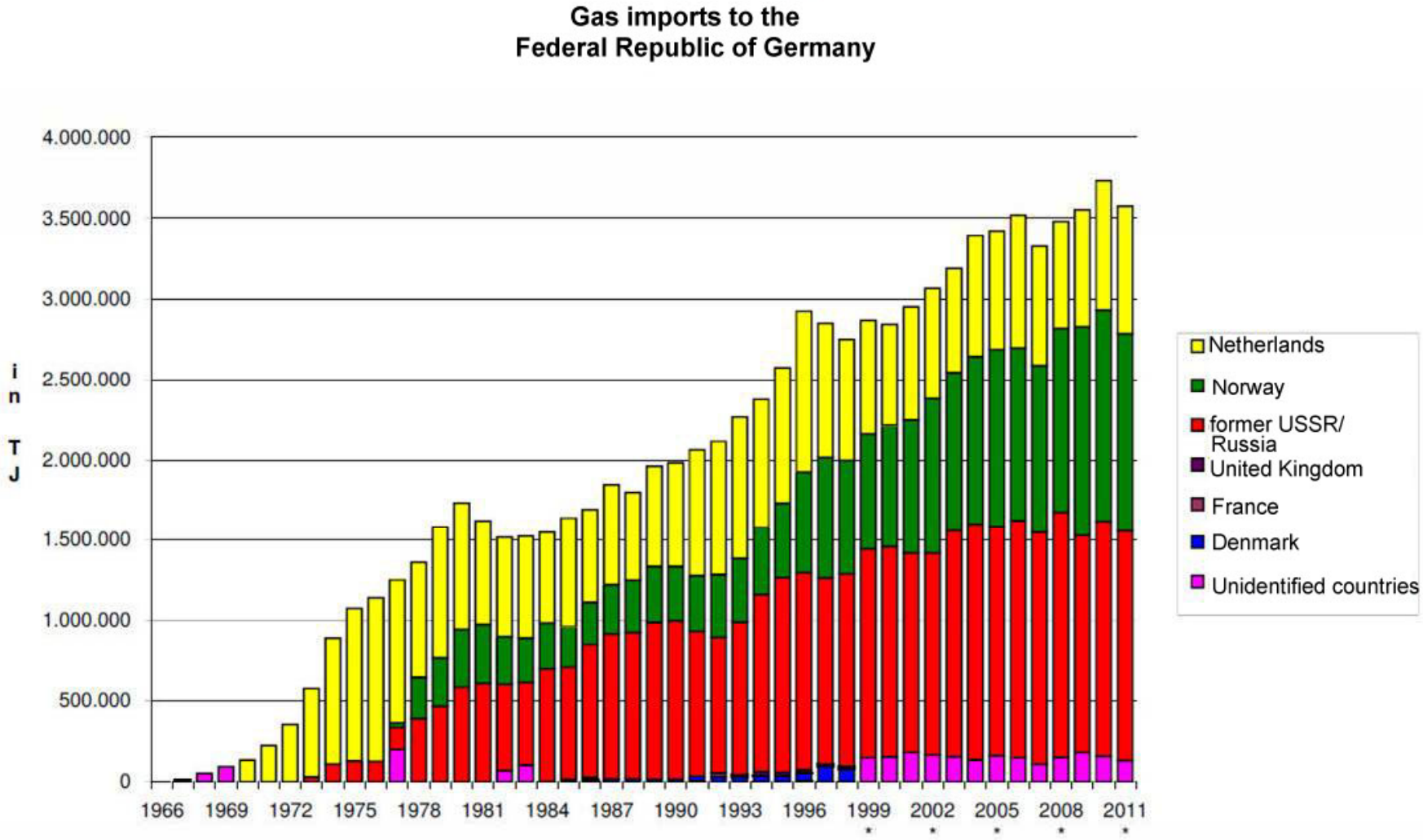
Import dependence



Data: ENTSO-E,
Graph: Federal Network Agency

Security of supply

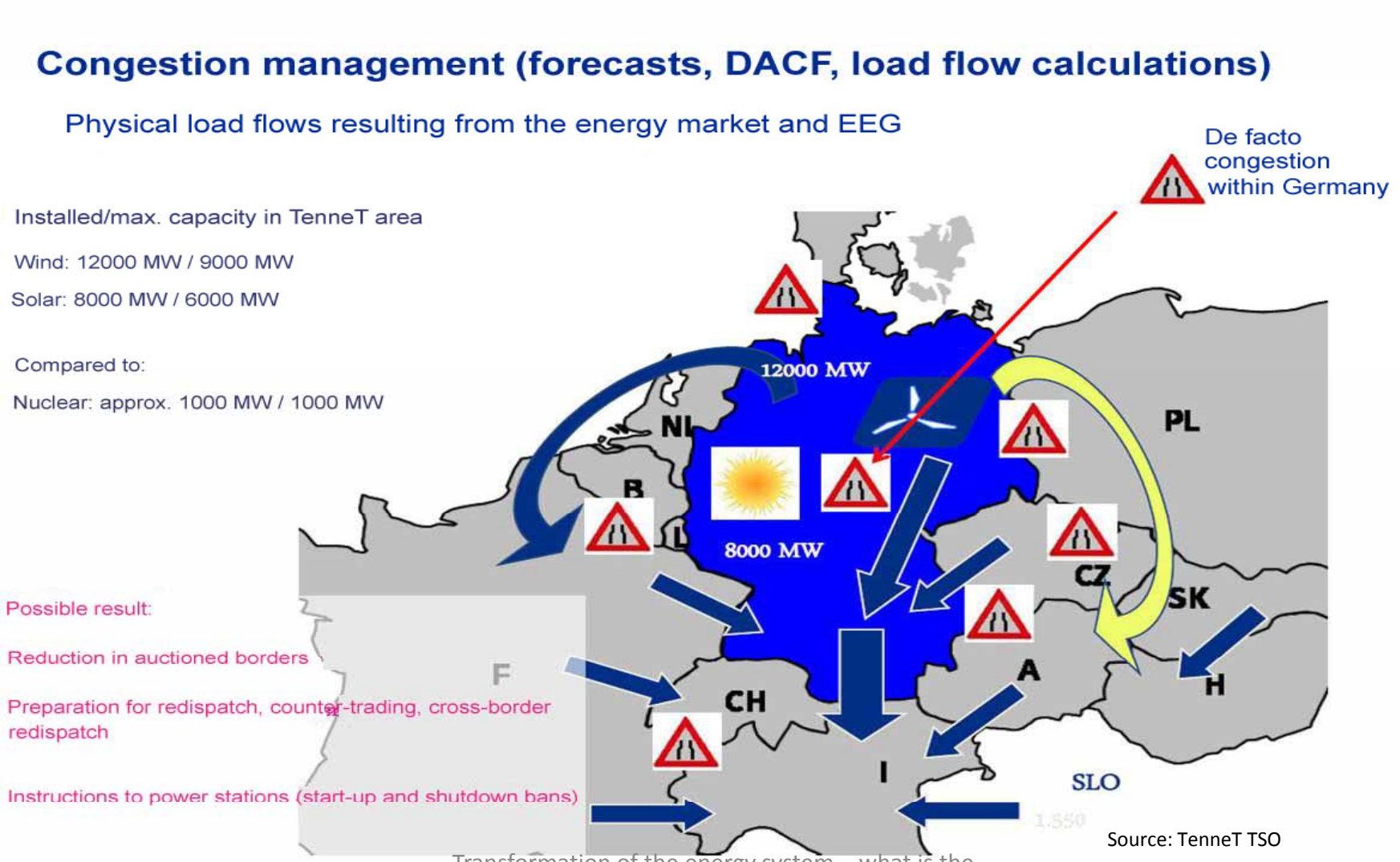
Import dependence



Source: Federal Office of Economics and Export Control

Security of supply

The impact of German energy policy on the European electricity grid



Source: TenneT TSO

Affordability of energy supply

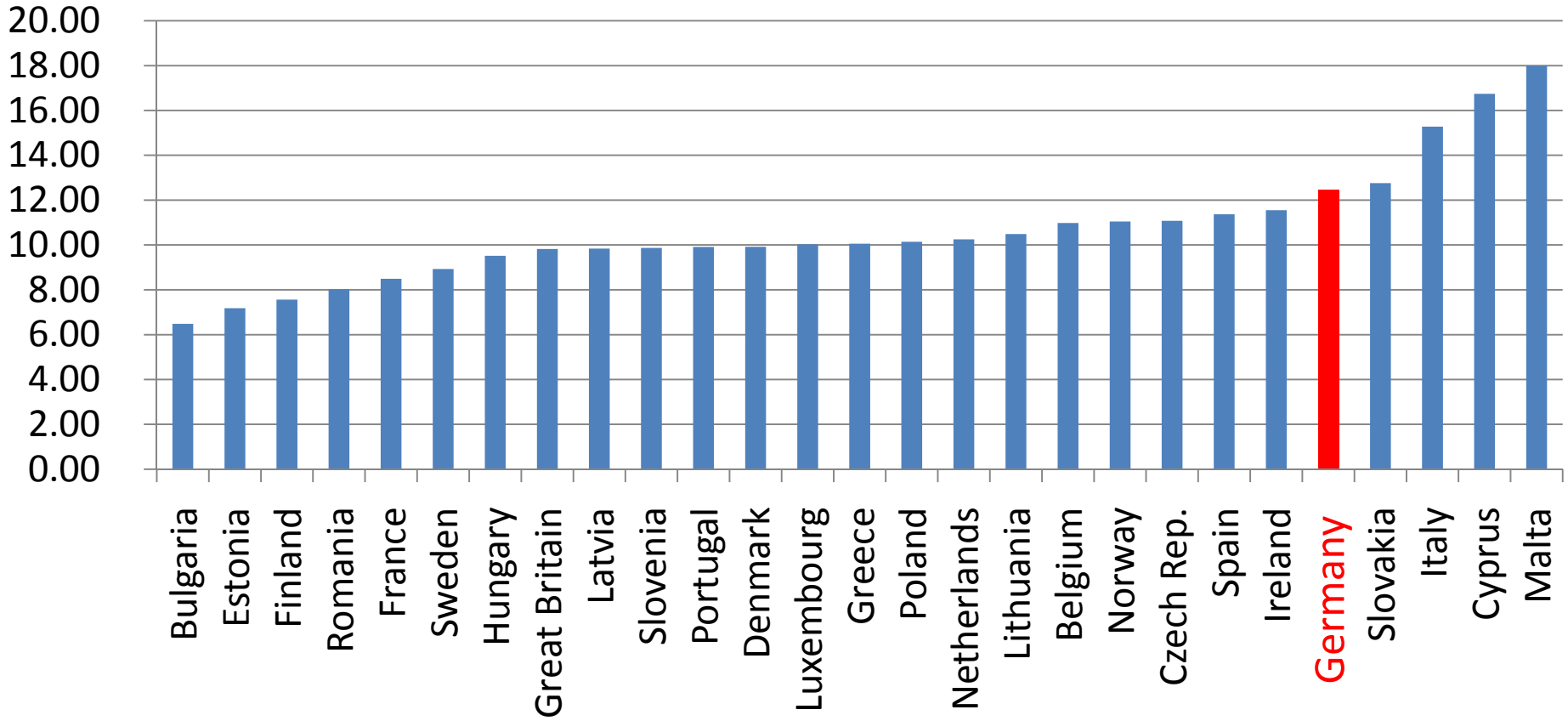
Renewable Energy Sources Act (EEG) costs per kWh

Year	Costs per kWh in Cent
2000	0,2
2002	0,3
2004	0,4
2005	0,6
2006	0,8
2007	1,0
2008	1,1
2009	1,2
2010	2,047
2011	3,53
2012	3,592
2013	5,277 (Forecast for 2013): 3,66 – 4,74)
2014	?

Source: Federal Ministry for the Environment – Renewable Energy Sources in Figures – March 2011 / Information platform of the German transmission system operators (www.eeg-kwk.net)

Affordability of energy supply

Industrial electricity prices in € / MWh in 2011



Source: Federal Ministry of Economics and Technology, as at: 2012

Challenges and responses

Challenge	Response
Carbon footprint	Greater efforts with regard to energy efficiency: - Energy savings with regard to buildings and road transport - Combined Heat and Power Act
Feed-in volatility	- Grid expansion and upgrades - Storage
Import dependence	- Eliminate domestic capacity congestion
Security of supply / network stability	- Grid Expansion Acceleration Act - Cold reserve (for a transitional period) - Construction of new power stations
Affordability of energy supply	- Easing of the burden on energy-intensive businesses - EEG surcharge should not rise above 3.5 cents / kWh - New instrument to replace the EEG

Thank you