

# Implications of a Fast Nuclear Phase-out: The German Example

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# Major Goals of the German „Energiewende“

- Phase out of nuclear energy (2022)
- GHG emissions:  
(compared to the level of 1990) -40% by 2020  
-55% by 2035  
-80% by 2050
- Total primary energy supply (TPES): -50% by 2050
- Share of renewables (RES) in TPES: ≥30% by 2030
- Electricity demand: -10% by 2020
- Share of RES in electricity generation: 50% by 2030  
80% by 2050
- Heat demand of building stock: -20% by 2020
- Share of RES in final energy demand  
of the transport sector: 10% by 2020

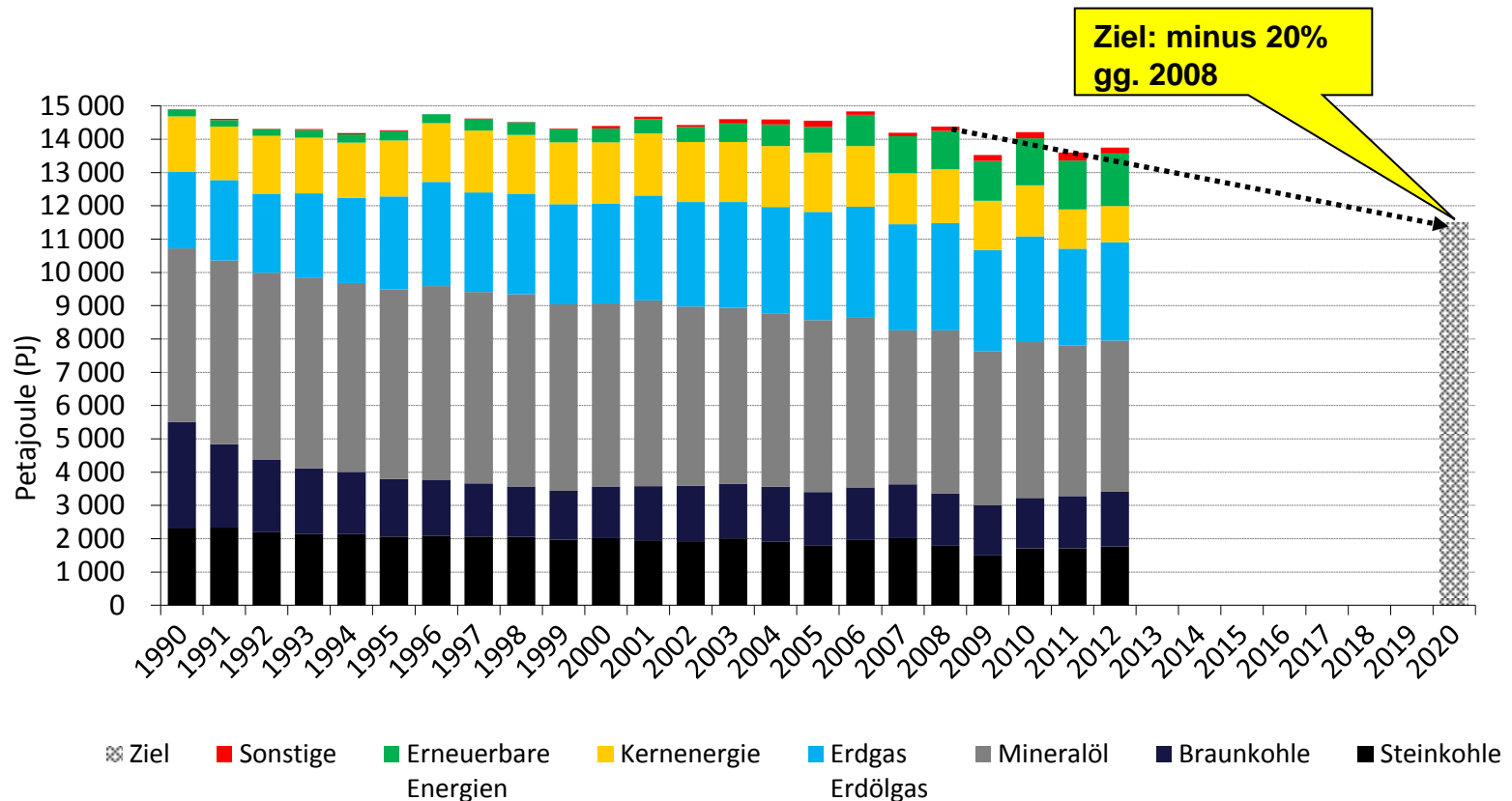
# Energiewende - Milestones/Meilensteine

1979-1985	Deutscher Bundestag - Enquête-Kommission „Zukünftige Kernenergie-Politik“
1980	Krause/Bossel/Müller-Reißmann: Energie-Wende. Wachstum und Wohlstand ohne Erdöl und Uran
1987-1990	Deutscher Bundestag - Enquête-Kommission „Vorsorge zum Schutz der Erdatmosphäre“
1994	Alt: Die Sonne schickt uns keine Rechnung. Die Energiewende ist möglich
2000	Vereinbarung zwischen Bundesregierung und Energieversorgungsunternehmen
2000-2002	Deutscher Bundestag - Enquête-Kommission „Nachhaltige Energieversorgung unter den Bedingungen der Globalisierung und der Liberalisierung“
2003	WBGU: Welt im Wandel – Energiewende zur Nachhaltigkeit
2011	Ethik-Kommission: Deutschlands Energiewende – Ein Gemeinschaftswerk für die Zukunft

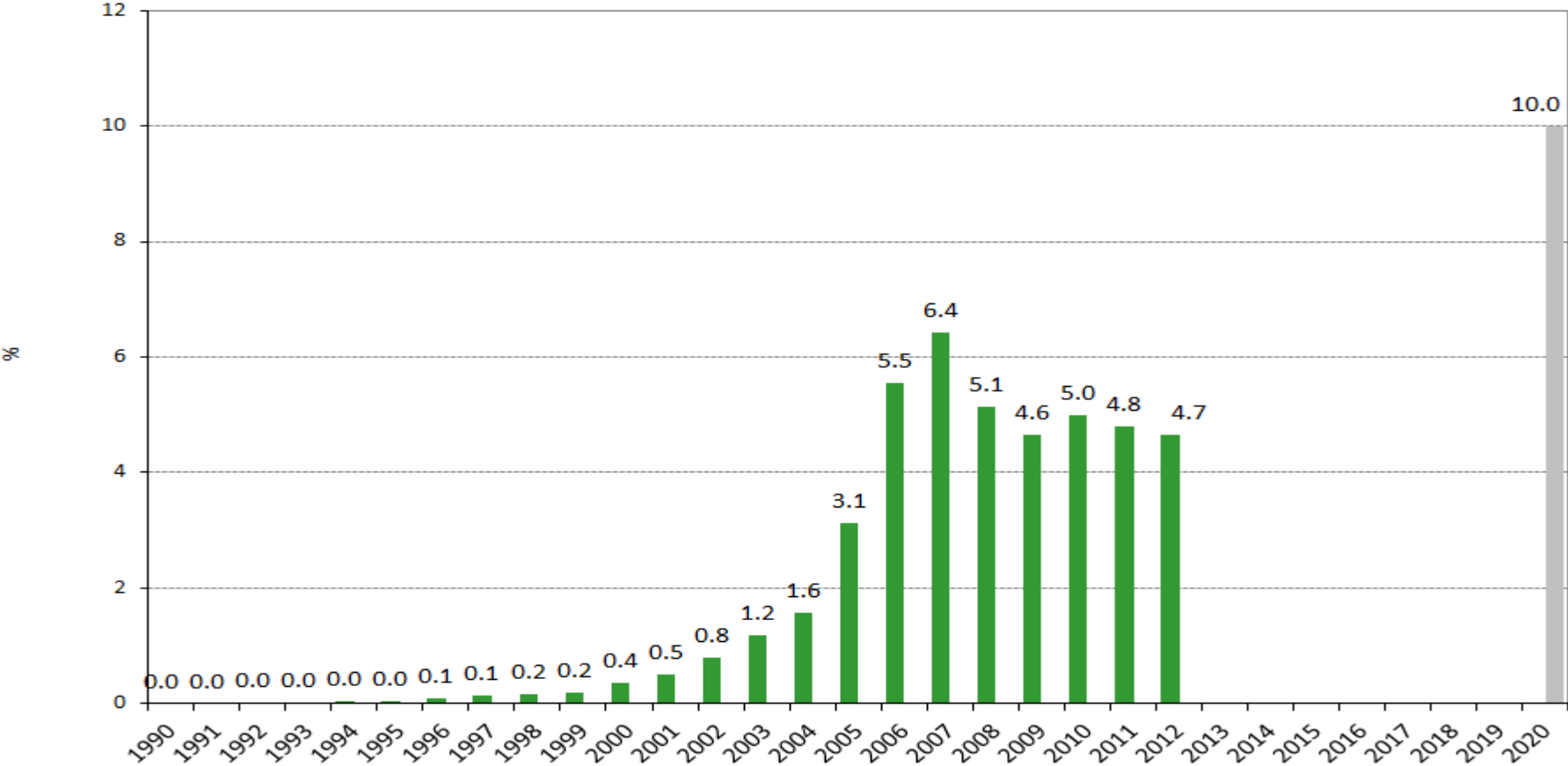
# Monitoring



# Monitoring Primary Energy in Germany

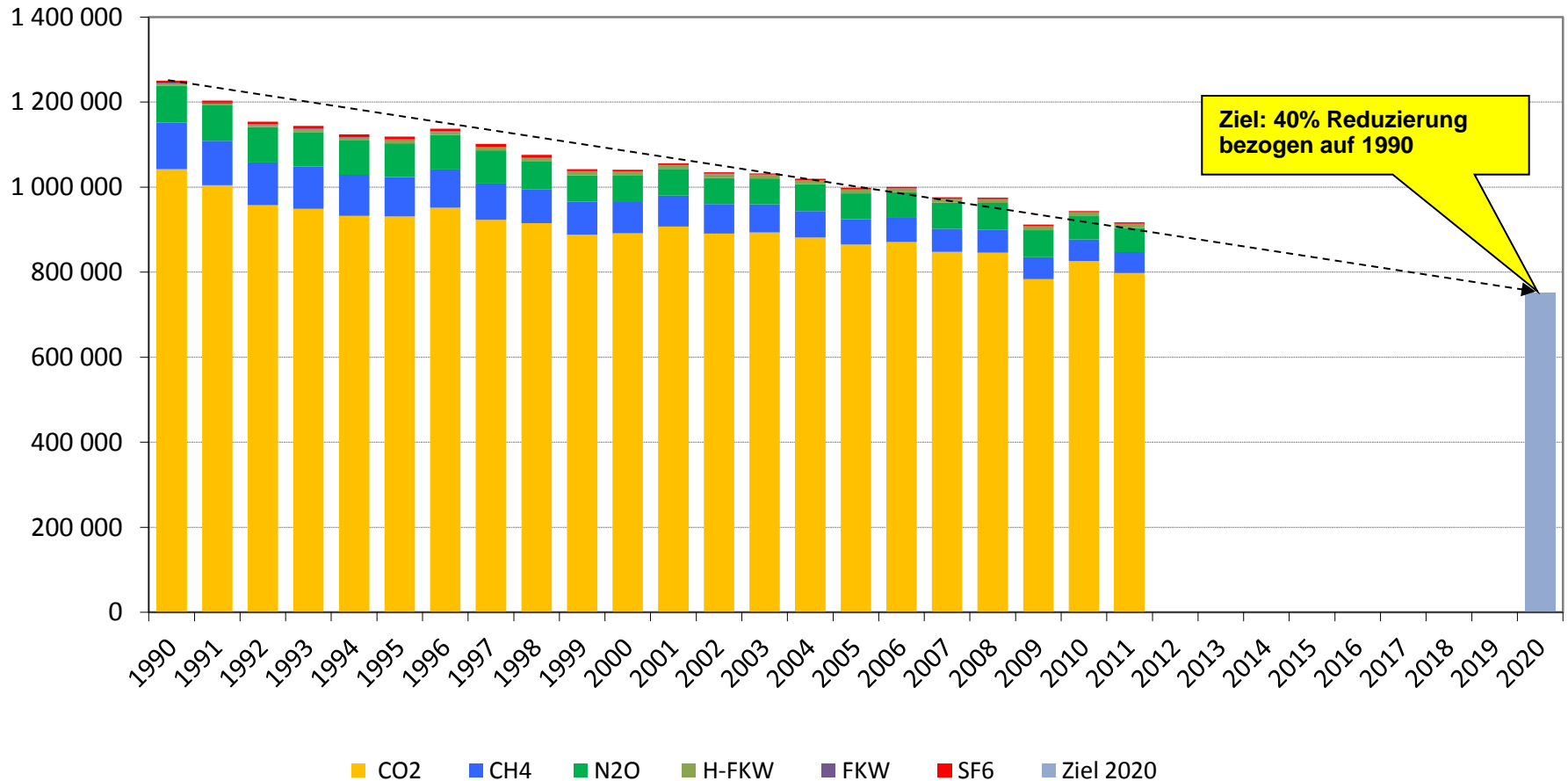


# Monitoring Share of biofuels



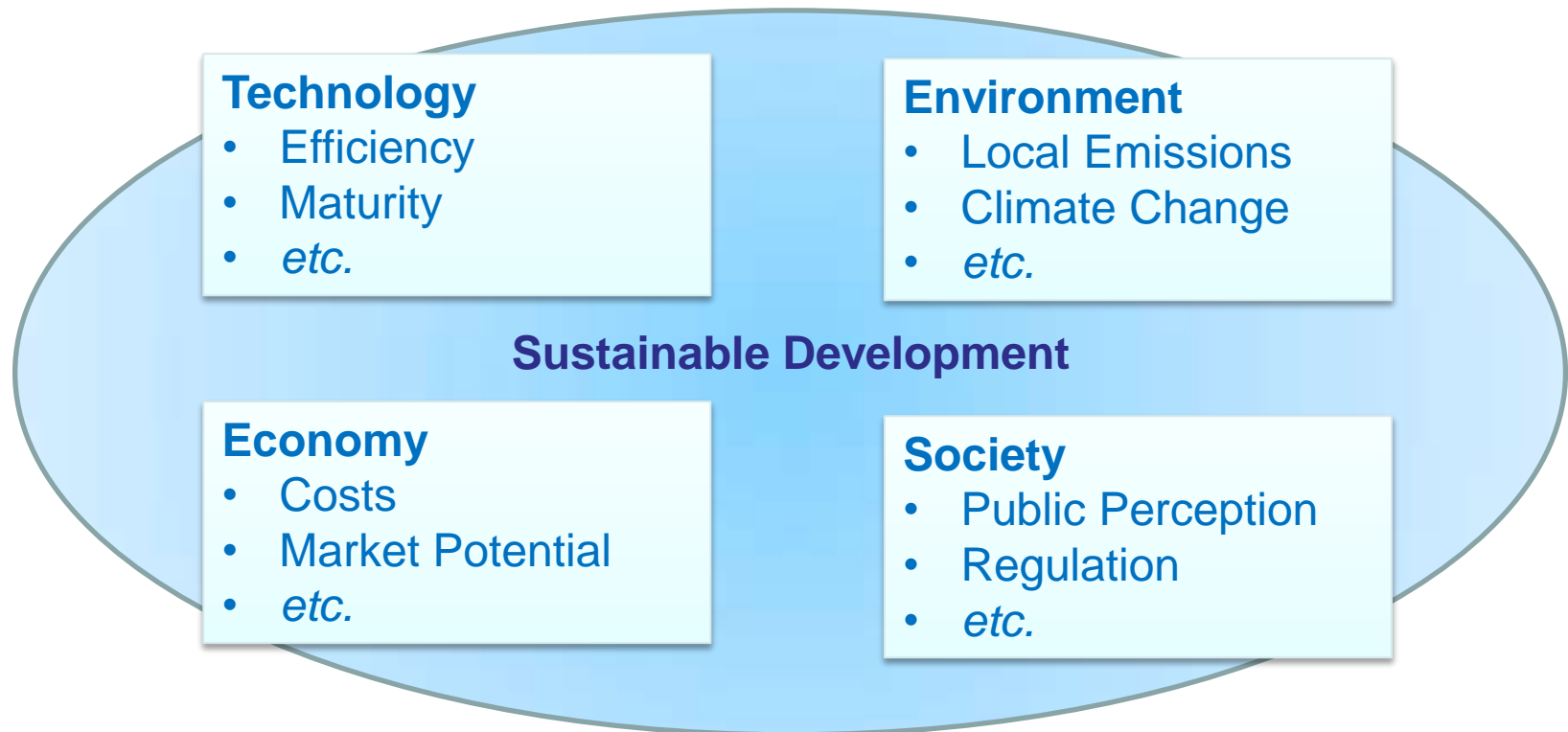
# Monitoring CO<sub>2</sub> Emissions

1000 t CO<sub>2</sub>-Äquivalente



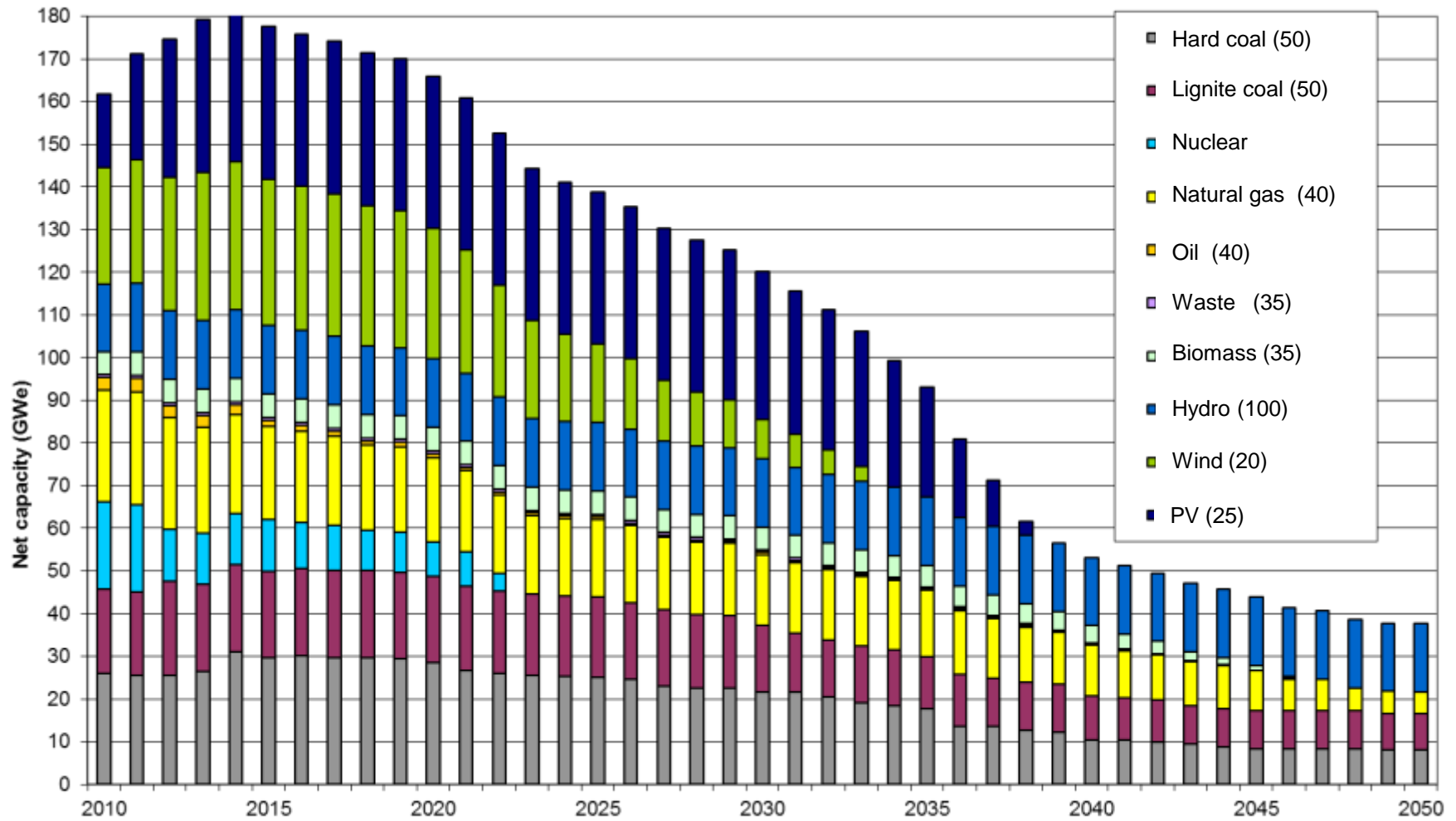


# Assessment of Energy Technologies and Energy Systems



## Scientific Basis for Multi-dimensional and Multi-criteria Societal/Political Decision-Making

## Development of power plant capacity in Germany



Advice: Numbers in parathesis(...) = technical lifetime

# Approach for security of electricity supply

Figure: Power flows and Grid Development Plan - grid topology 2022

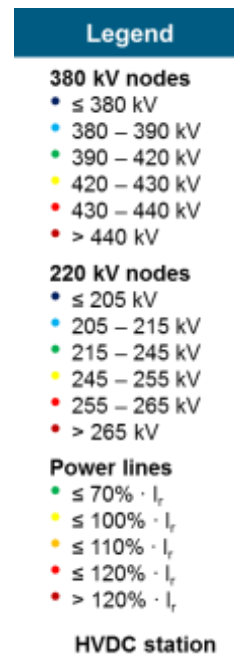
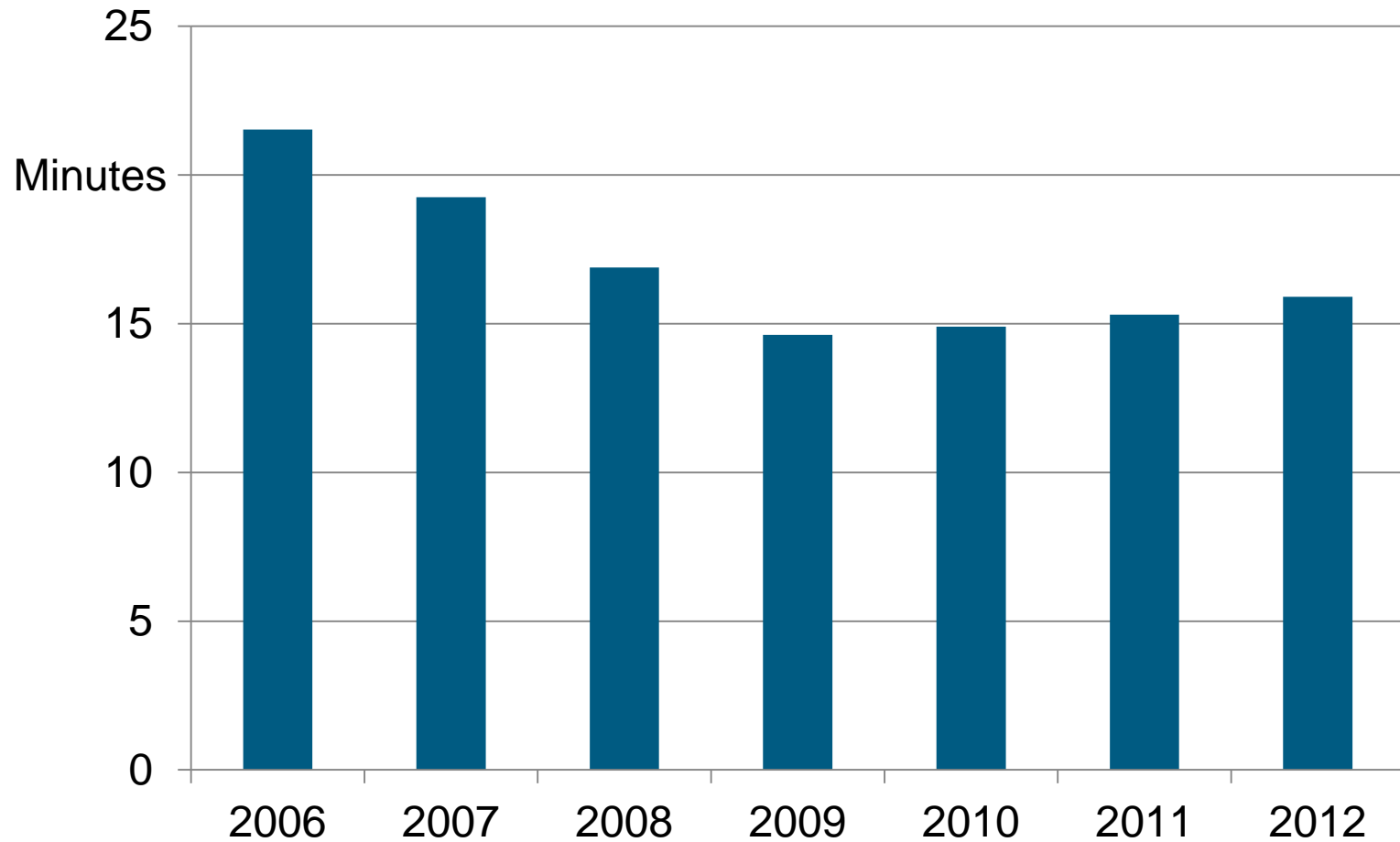


Figure: Power flows and Energy Concept - grid topology 2012



T. Pesch – H.J. Allelein – J.-Fr. Hake (2014): Impacts of the transformation of the German energy system on the transmission grid. The European Physical Journal Special Topics 1-15

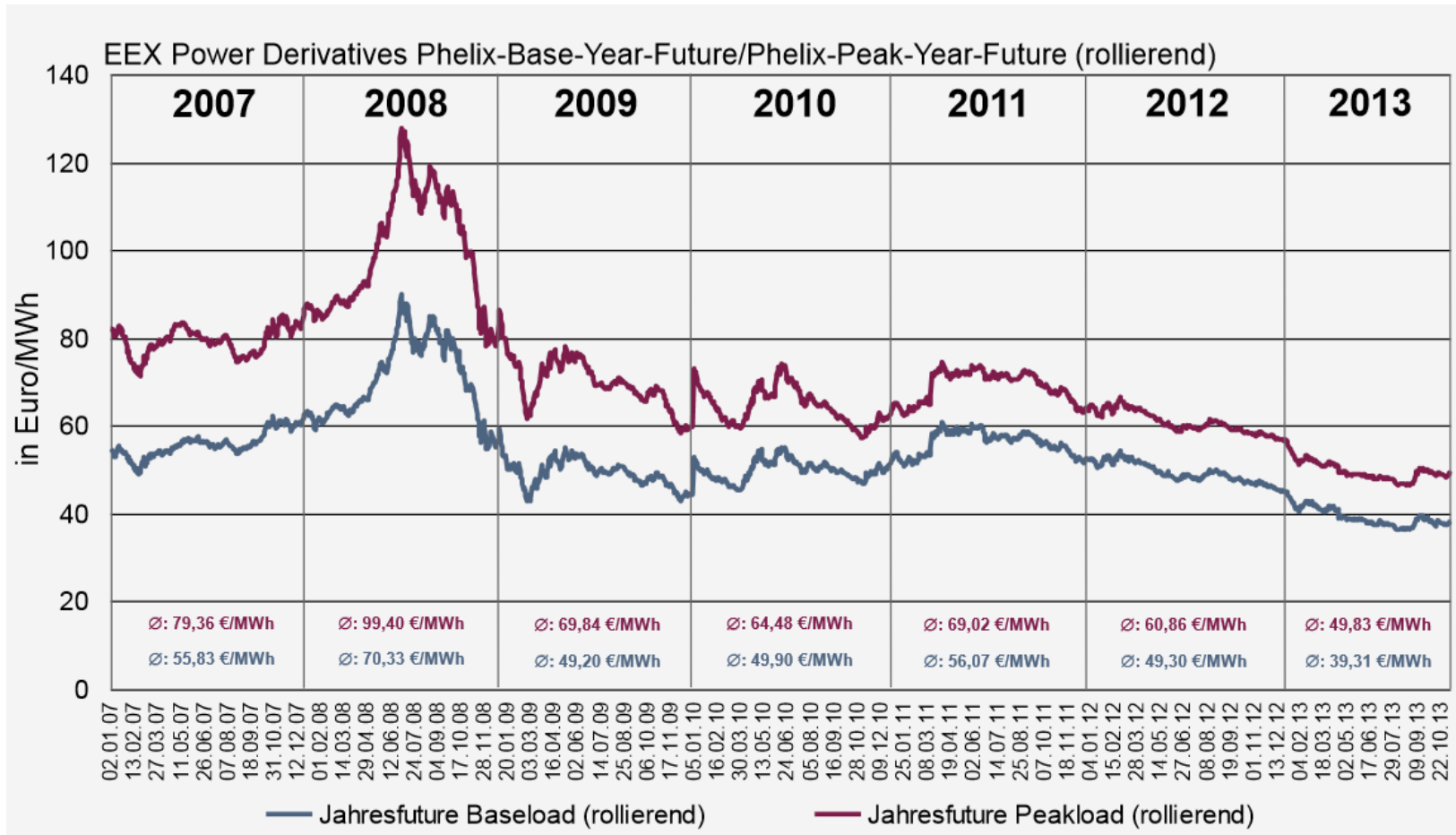
# Supply interruptions in Germany (SAIDI)



Source:  
Bundesnetzagentur: Monitoringbericht 2013

# EEX Price Development

Futures market

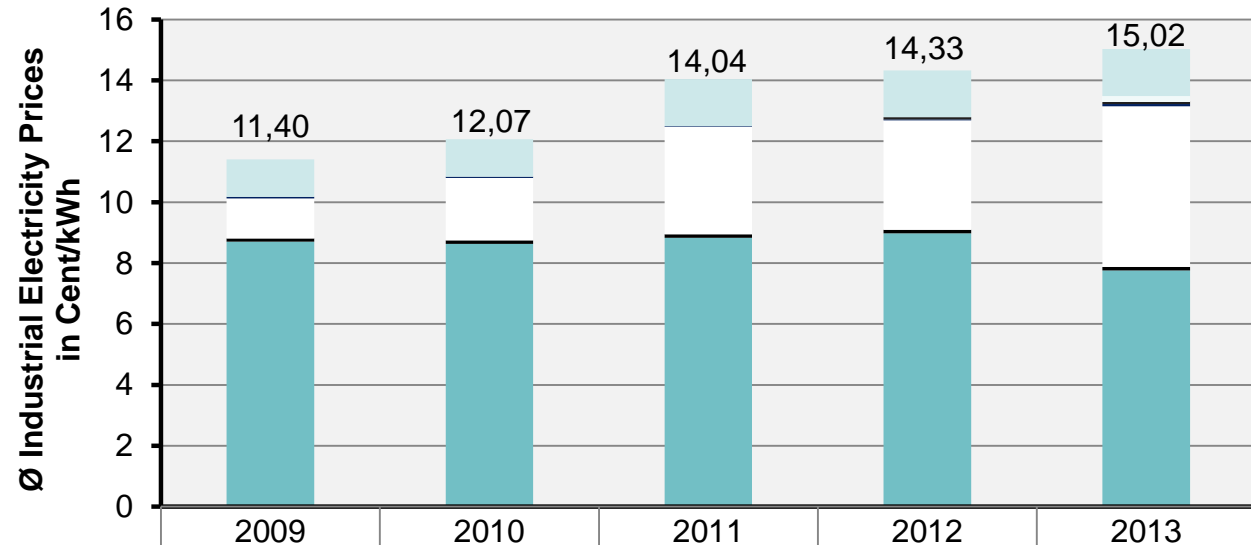


➤ Futures market is decisive for long-term procurement costs

Source: BDEW, Strompreisanalyse, Nov. 2013, mit Daten der EEX

# Industrial Electricity Prices

Annual consumption: 160 to 20.000 MWh, supply at medium voltage level



	2009	2010	2011	2012	2013
■ Electricity Tax	1.230	1.230	1.537	1.537	1.537
■ Offshore Liability Apportionment	0.000	0.000	0.000	0.000	0.170
■ §19-Apportionment	0.000	0.000	0.000	0.070	0.100
■ CHP Surcharge	0.050	0.050	0.030	0.040	0.070
■ EEG Apportionment*	1.310	2.050	3.530	3.592	5.277
■ Concession Fee	0.110	0.110	0.110	0.110	0.110
■ Generation, Transmission, Distribution	8.700	8.630	8.830	8.980	7.760

\* Since 2010: Application AusgleichMechV

Source: BDEW, Strompreisanalyse, Nov. 2013

# Development DAX 30, RWE, E.ON

Historical day opening price from 2009 to 2013, normalized to the beginning of 2009

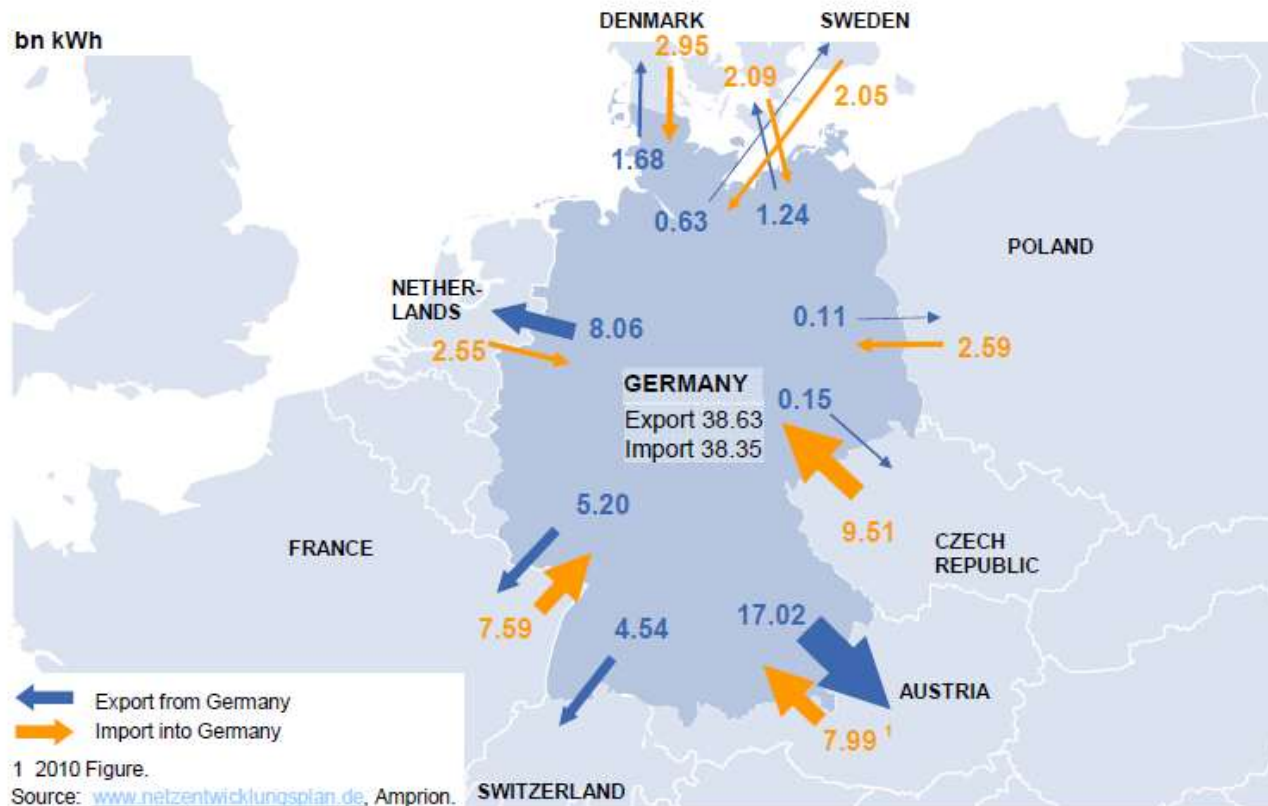


- Development DAX 30: + 97,38%
- Development RWE AG St.: - 58,47%
- Development E.ON SE: - 53,26%

➤ Opposite price development from RWE, E.ON and DAX 30

Source: finanzen.net (Abgerufen: 16.06.2014)

# German Electricity Exports/Imports



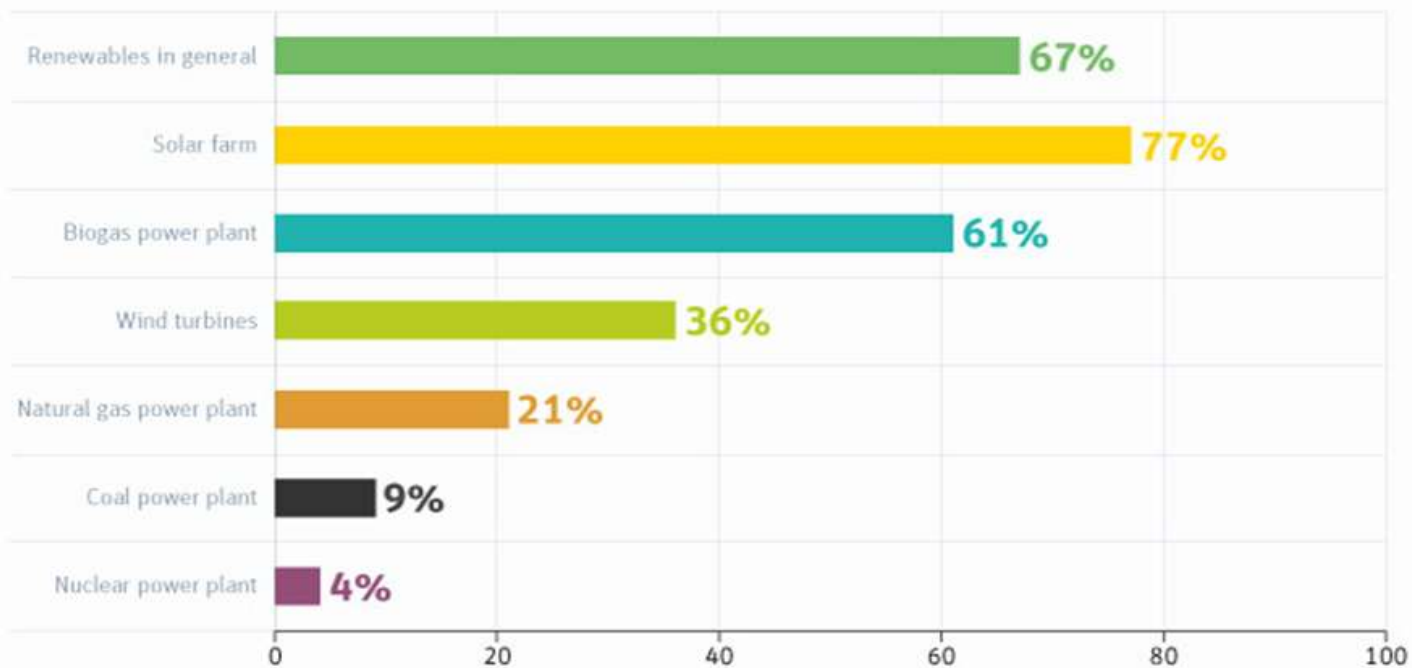


# Public Opinion about Power Plants

## Renewables have broad support in Germany

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

Source: [www.unendlich-viel-energie.de](http://www.unendlich-viel-energie.de) 



# PERSPECTIVES

# Observations - Status and Perspectives

## Technology

- high level of maturity
- competition of concepts
- structural changes

## Policy

- political framework unstable and inconsistent
- measures stimulate high prices
- changing visions

## Environment

- local emissions at low level
- climate protection

## Economy

- prices at high-level/affordability
- new business models

## Society

- public acceptance is given
- local acceptance missing

## Lessons Learnt

- The Energiewende addresses all sectors of the economy.
- The technological basis for the transformation exists. Changes to the existing infrastructure are required.
- Higher shares of volatile energy sources require a smarter management.
- Energy security has remained at a very high level.
- Time represents an important factor for structural changes.
- Economic impacts ... Business cases change according to new priorities in governmental and parliamentary decision making.
- Strong public support for the Energiewende.
- In Europe, a transformation of national energy systems must be compatible with the neighboring energy systems.

# Warning

There is no RESET-  
key!



**Thank you very much!**

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