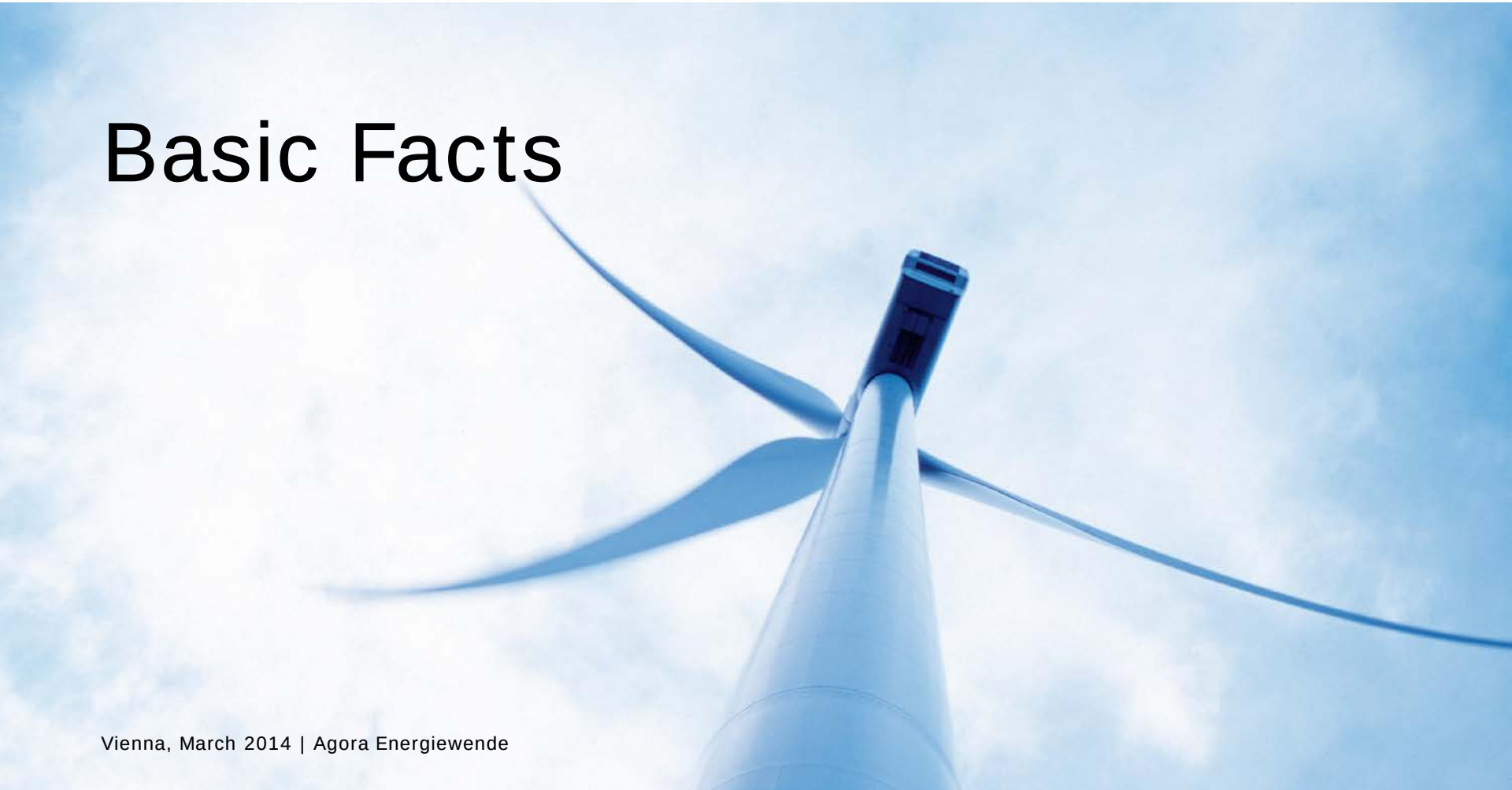
Agora Energiewende

Germany‘s Energiewende

at a glance

Vienna, 4 MARCH 2014

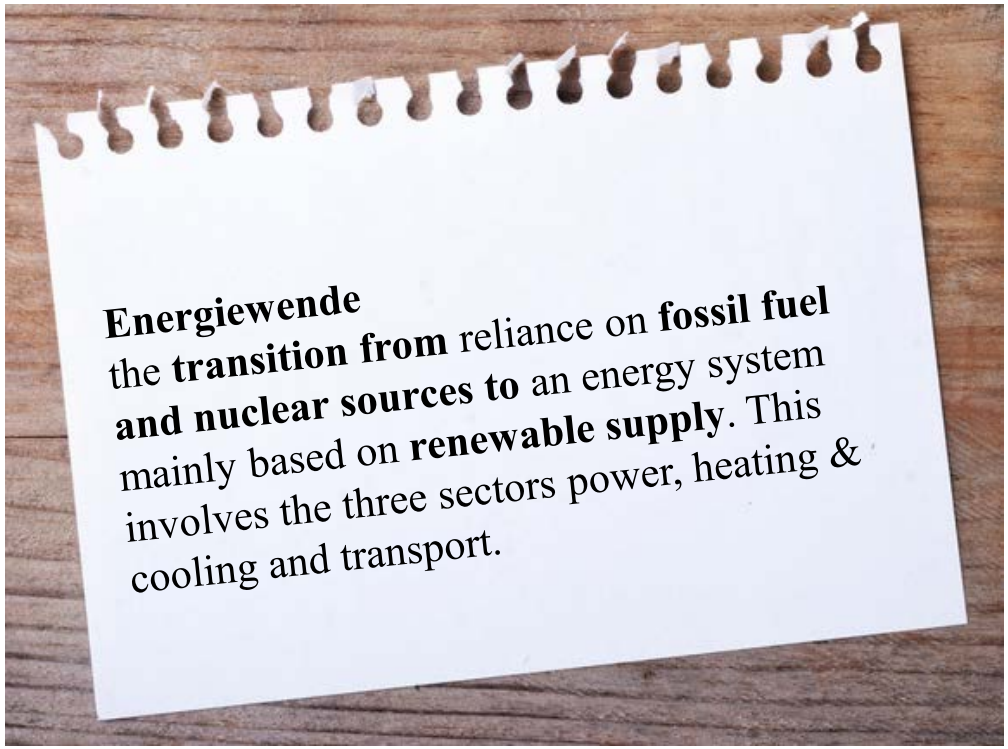
Basic Facts



Vienna, March 2014 | Agora Energiewende

1| What is it all about?

A Definition of the ‘Energiewende’



Picture: Cora Müller – Fotolia.com

In order to realise high shares of Renewables in the entire energy system, a quick and almost complete transition of the power sector is crucial. The transport and heating & cooling sectors will have to be electrified (fuel shift) and thus increase the overall need of renewable electricity.

2 | What are the main drivers?

Driven by climate change, jobs and safe energy

- ✓ Reducing nuclear risk
- ✓ Taking advantage of new industrial opportunities
- ✓ Reducing fuel dependency
- ✓ Creating jobs
- ✓ Protecting the climate

Germany's motivation to implement the Energiewende is a mélange of climate protection, nuclear safety, reduced import dependency, industrial policy and job creation.

3 | When did it start?

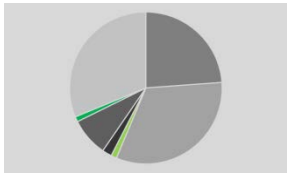
Energiewende started more than three decades ago

since 1950s
anti-nuclear movement

1980
first study on the *Energiewende*

1986
Chernobyl accident

1990
1st feed-in tariff (StrEG)



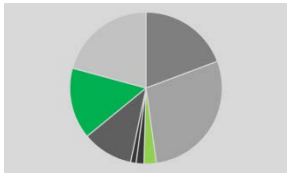
1990
2.3% renewable electricity

1997
Kyoto Protocol

2000
2nd feed-in tariff (EEG)

2005
EU emission trading scheme (ETS)

2011
Fukushima accident



2013
24.7% renewable electricity

Sources: AG Energiebilanzen; H. Weingartz, Öko-Institut, C. Montgomery, B. Gagnon, F. Tomás, Vogone, Digital Globe

Targets

4 | What are the goals?

Climate Protection and nuclear phase out as main goals

1st order goals

- Full nuclear phase-out by 2022
- Emissions*:
  - 40% by 2020
  - 80/95% by 2050

2nd order goals

- Renewables (el.):
  40-45% in 2025
  > 80% in 2050
- Electricity demand**:
  -10% by 2020
  -25% by 2050

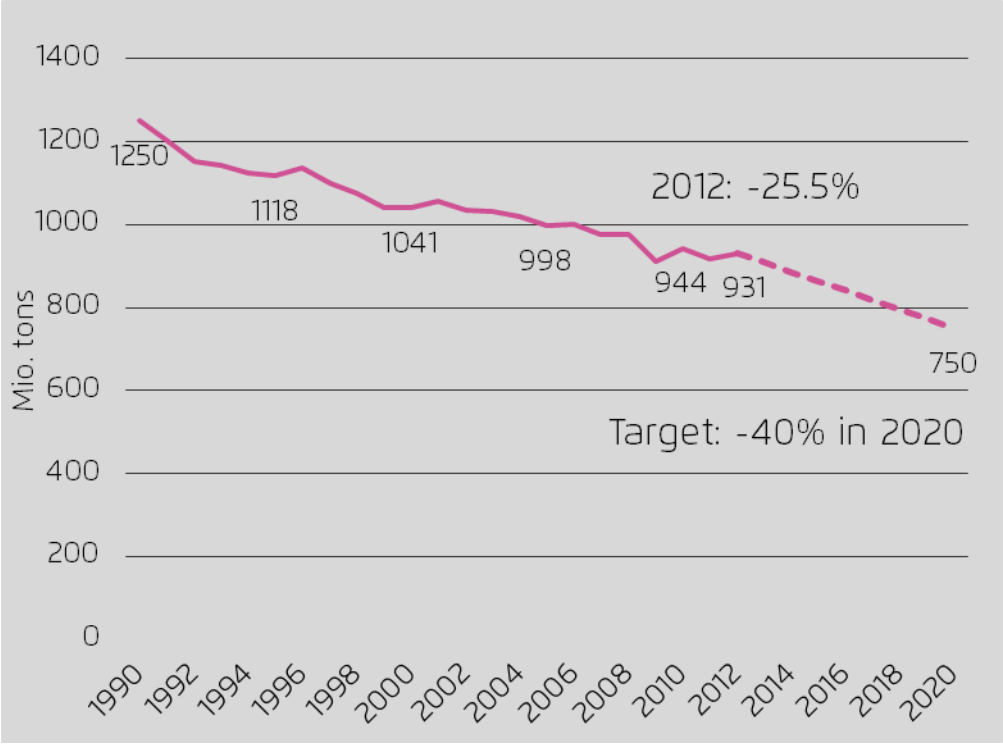
Reduction of greenhouse gases (GHG) and the nuclear phase out are the main targets; expansion of renewable energy and better energy efficiency serve as targets of 2nd order and thus means to achieve climate targets and a nuclear-free power system.

Targets either set by law, stated in the coalition treaty or in the energy concept of 2010

* against 1990
** against 2008

5 | Is Germany on track regarding its climate target?

Significant reduction of emissions since 1990

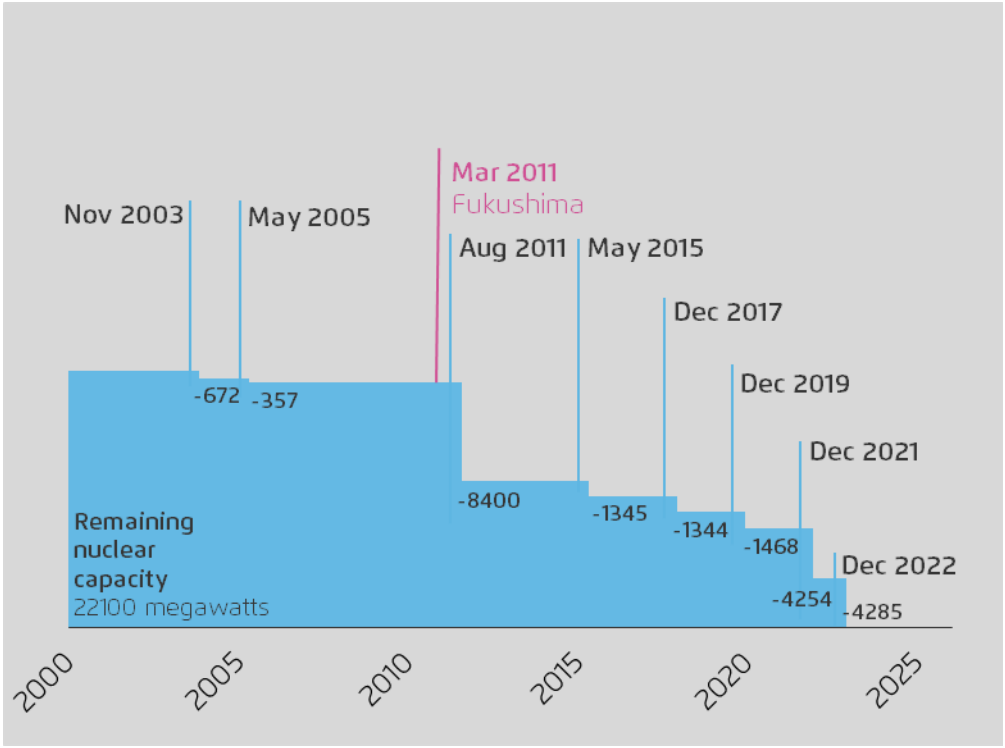


Since 1990, Germany reduced its greenhouse gas emissions by roughly 25%. However, in 2012, emissions rose again by 2% compared to 2011. If the 2020 target of -40% will be met, remains to be seen.

Source: EEA 2013; Umweltbundesamt

6 | What timeline for phasing out nuclear?

Remaining nuclear plants will be stepwise decommissioned until 2022

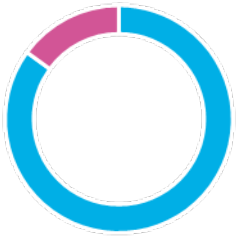


Source: energytransition.de

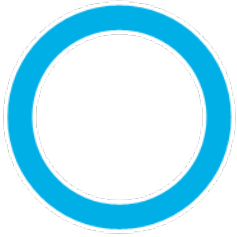
In 2000, the government decided to phase out nuclear energy. In 2010, lifetime of the remaining plants was extended. After the nuclear accident in Fukushima the phase out was renewed – with almost exactly the same timeline as in 2000.

7 | Is the nuclear phase out irreversible?

Broad 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)



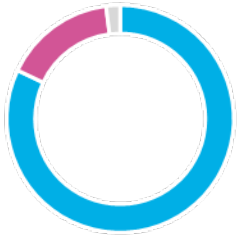
100 % of political parties in parliament agree that there will be no lifetime extension of nuclear power plants

A reversal of the phase out decision is not impossible, but highly unlikely as politically very unpopular. So far, nuclear generation has been fully offset by other sources.

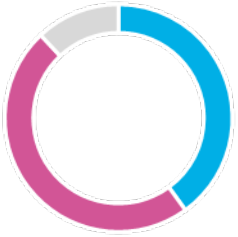
The people‘s view

8 | What do German citizens think about the Energiewende?

Germans back the Energiewende, but criticise its management



82 % of German citizens think that the goal of the Energiewende is right



48 % of German citizens think that the Energiewende is not properly managed

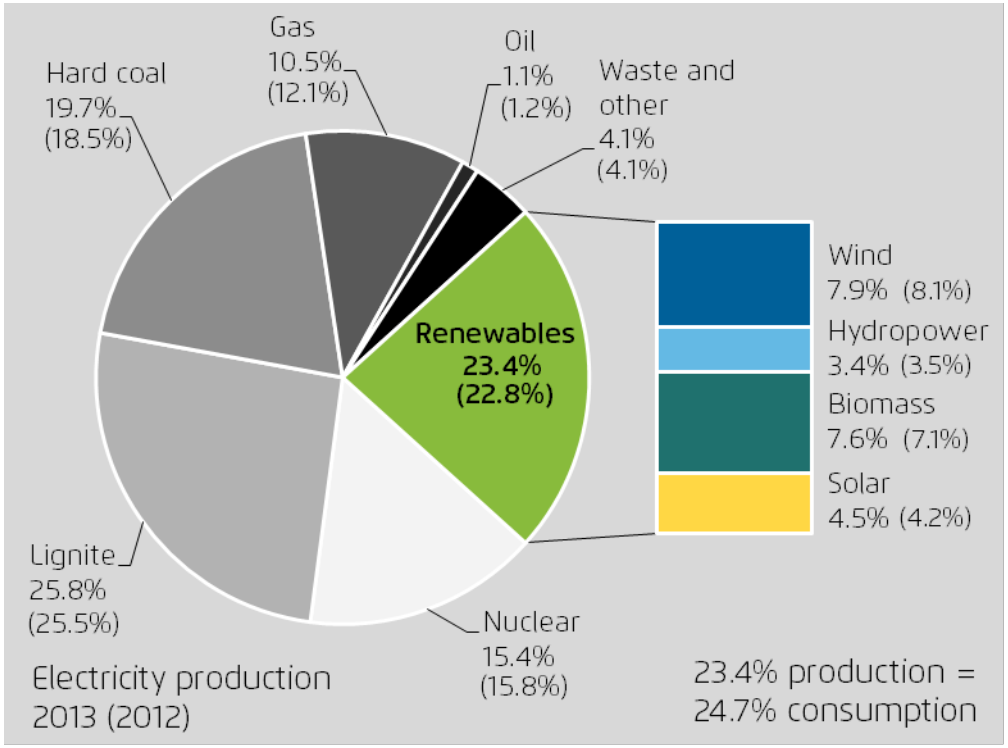
German citizens support the Energiewende. However, they criticize how it is managed. The big debates in Germany are not about the “if” but about the “how”.

Source: Forsa 2013

Germany‘s Energy Mix (Electricity)

9 | What is Germany's current energy mix?

Coal, Lignite and Renewables as dominating technologies

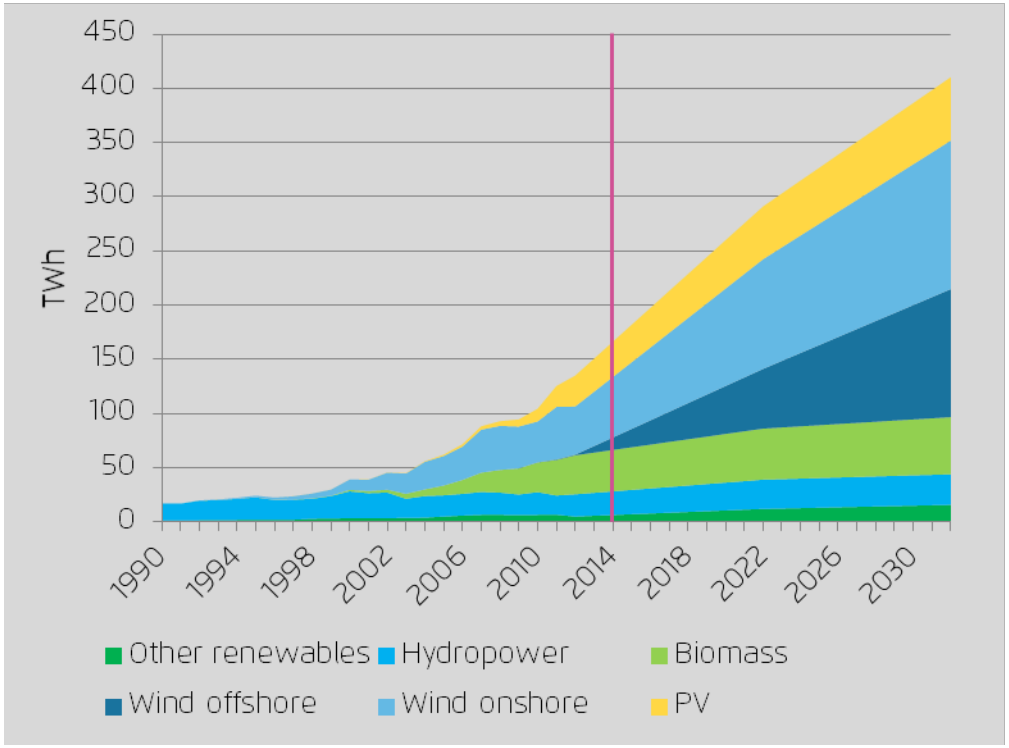


Coal/lignite and renewables increasingly dominate Germany's energy mix. With 23.4% of production and 24.7% of consumption, RES provide almost one quarter of the electricity. Nuclear is reduced according to the plan. Gas is loosing shares due to unfavourable market conditions.

Source: AG Energiebilanzen

10 | What future role for renewables?

Renewables, especially Wind and PV, expected to continue growing

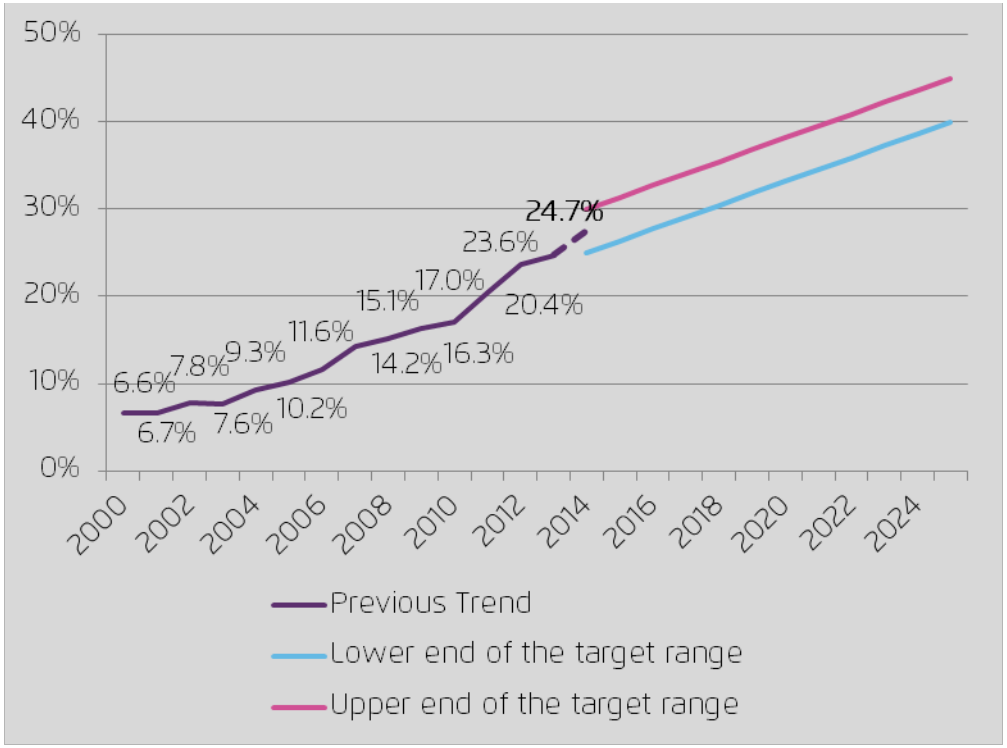


Since 1990, share of Renewables (RES) in the electricity sector rose from less than 3% to almost 25% in 2013. This development was triggered by the feed-in tariff. Strong further growth is expected – with wind and PV as the main technologies.

Source: NEP 2012, BMU / Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat)

11 | Will the new government slow down the growth of Renewables?

Sustained, but slower growth of Renewables in the future



The new government's targets for further expansion of renewables in the power sector are to increase the share of renewables by 1.5% per year. This is in line with the development since 2000, but less than the development of the past 5 years (2% growth rate per year 2009-2013)

12 | Is coal experiencing a renaissance?

No future for coal in spite of increasing use in the short term

Low CO_2 prices

7,34 €/t CO_2 (ø 2012) → -39,1% → 4,47 €/t CO_2 (ø 2013)

Decreasing fuel prices (hard coal)

93,02 €/t SKE (ø 2012) → -18,7% → 75,64 €/t SKE (ø 3rd quartal 2013)

New plants (planned since 2007)

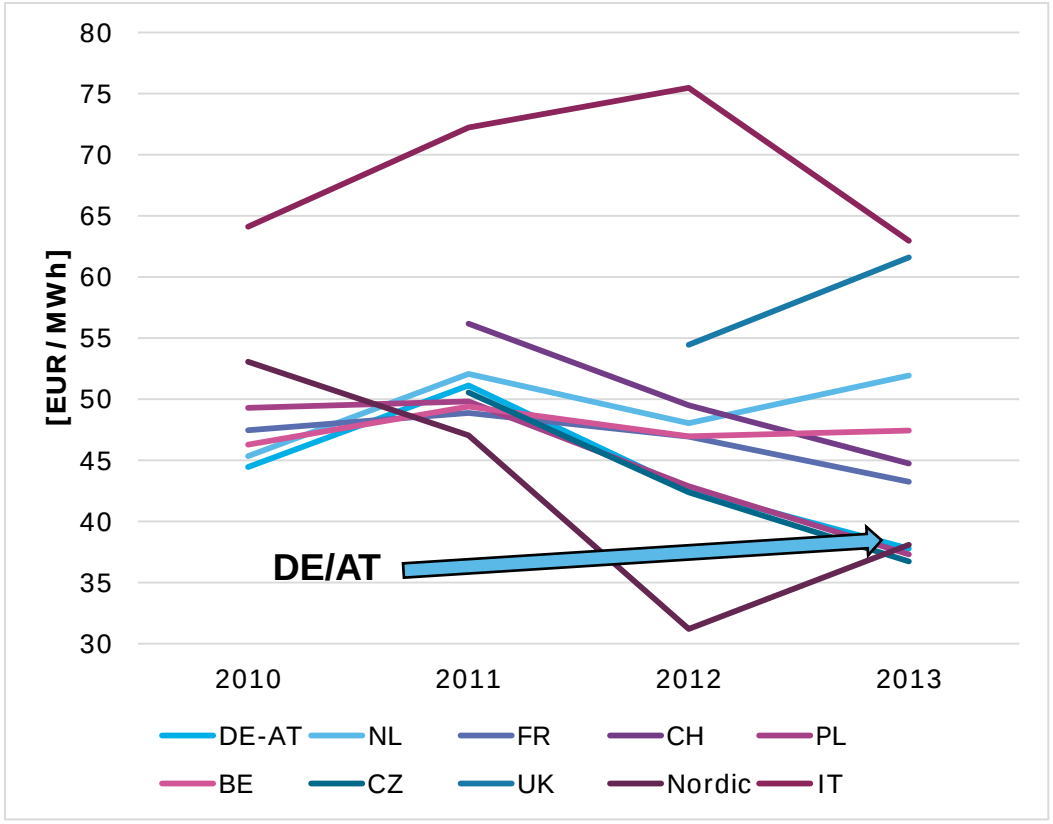
~45 GW (2010) → + 5 GW net → ~50 GW (2015)

Source: BAFA 2013, BDEW 2014, BMWE, BNETZA

In the short term, coal use increases due to favorable economic conditions and new fossil generation capacity that have been planned since 2007. However, the market environment does not provide incentives for building new coal plants as the wholesale market price level is expected to remain too low.

13 | Why do wholesale market prices decline?

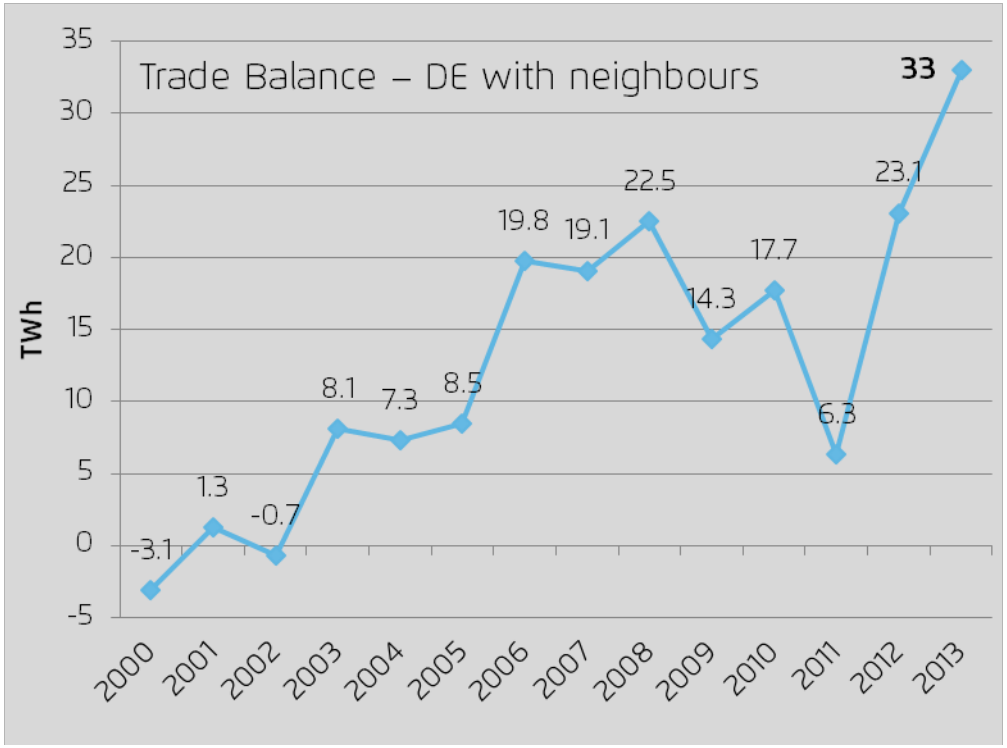
Germany currently seeing lowest wholesale prices in Europe



Wholesale market prices in Germany are declining for years – and are expected to continue to fall. The reasons can be found in large quantities of generation technologies with low marginal costs (lignite, Wind, PV, nuclear). Due to coupled markets, prices in neighbouring countries decline as well.

14 | Is Germany importing electricity due to the nuclear phase out?

Germany is net exporter – despite of shutting down 8.4 GW nuclear



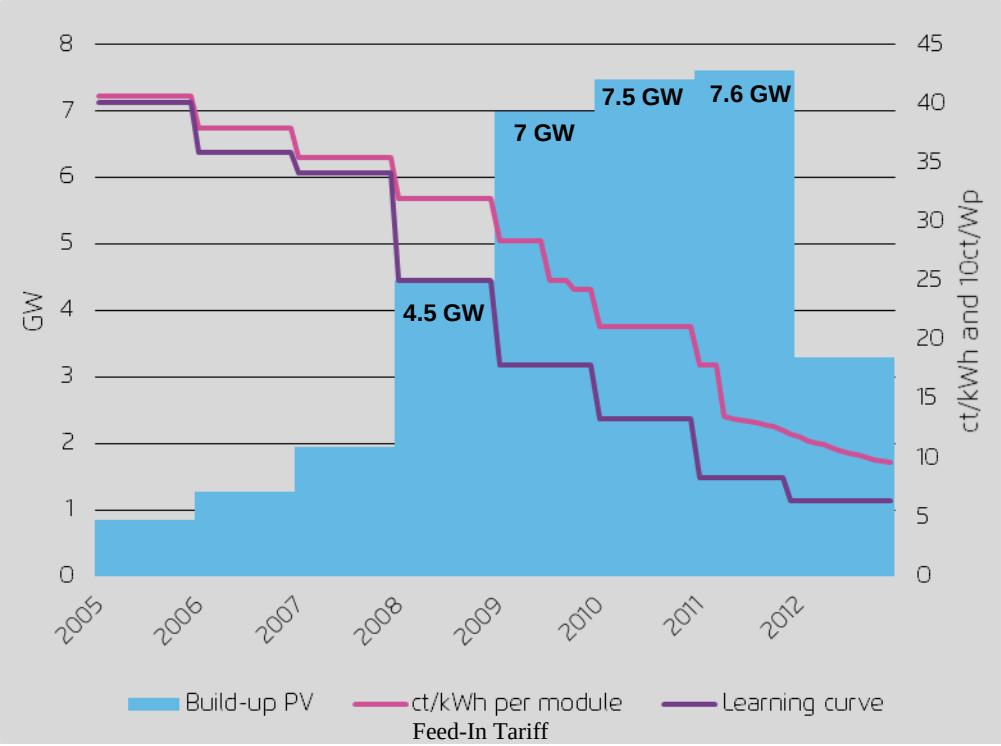
Germany has been net exporter for more than 10 years. Due to increased renewable and conventional generation capacity in recent years, exports reached a record high of 33 TWh in 2013. So far, nuclear power was replaced by other sources.

Source: Entso-E

Costs

16 | What does it cost?

German consumers pay for learning experiences of recent years

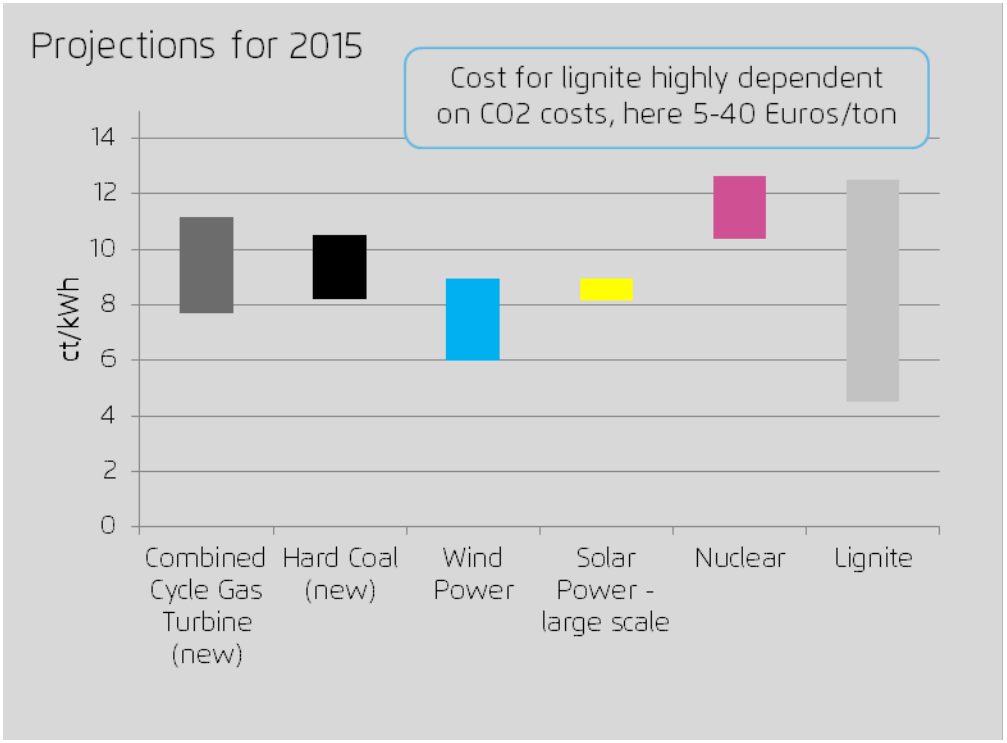


Costs for expanding Renewables have been significant in recent years. Especially for PV in 2009 to 2012, Germany paid more than necessary. Although, technology costs have sunk massively since, German consumers will have to pay for historic costs for many years to come.

Source: SFV (2014), AGEE (2014), Fraunhofer ISE (2014)

17 | What costs to be expected for the future?

Renewable energy soon competitive with conventional generation



Sources: EWI, EDF/Reuters, DIW, IAEW, own calculations

Technology costs for wind onshore and photovoltaic sunk significantly. Already they are on the same level as new coal and gas plants. However, inherited costs from the past will burden consumers for many years to come.

18 | How large is the burden for industry?

Companies face wide range of different cost levels

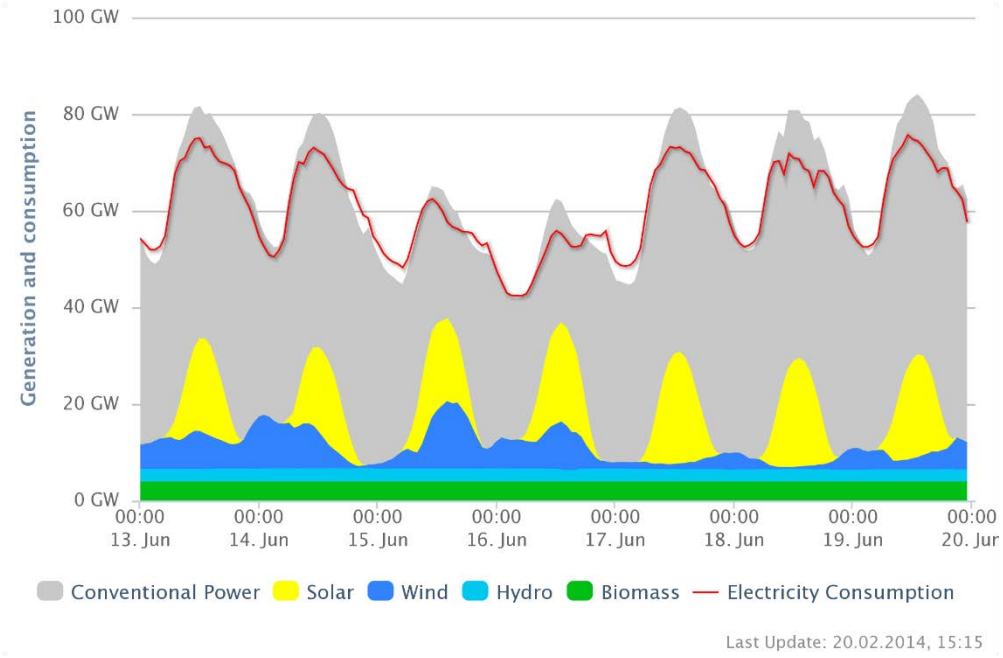
Source: BdEW, Eurostat

Triggered by low market prices and comprehensive exemptions from taxes and surcharges, some big industries enjoy very low electricity prices. However, especially small and medium sized companies face higher costs. Exemptions from the Renewable surcharge are currently subject to in-depth inquiry by the European Commission.

The Challenge

15 | How to cope with variable renewable generation?

Flexibility as the new paradigm of the energy system



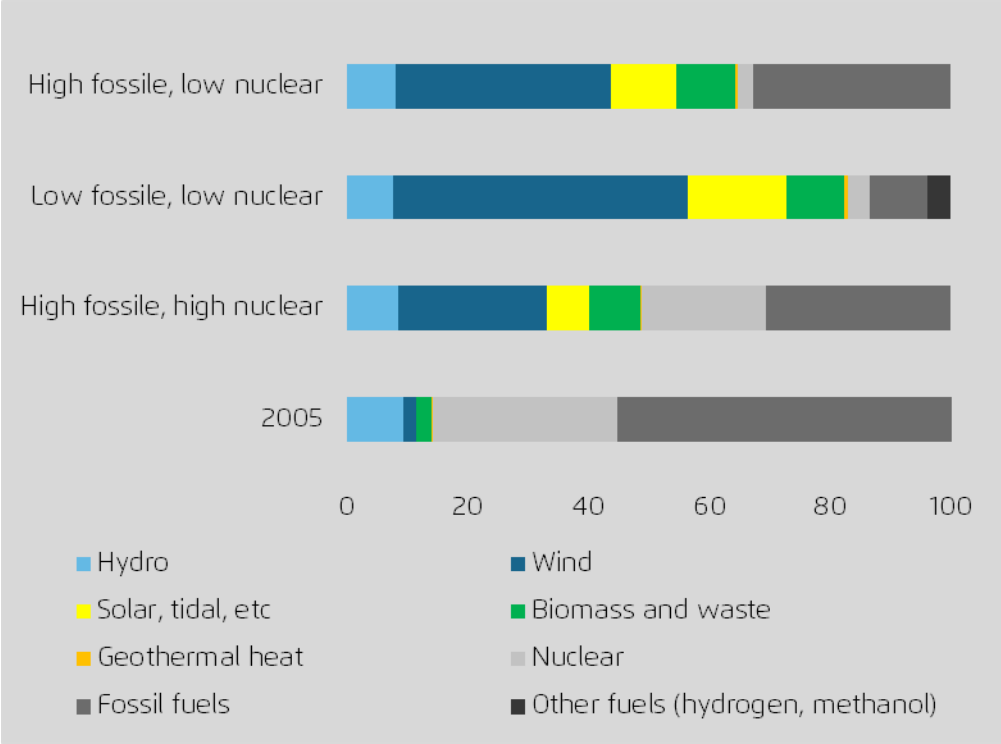
Source: EEX 2014, ENTSO-E 2014

Variable electricity generation from wind and PV forces the remaining system to become more flexible. Different flexibility options exist, but need to be strengthened: grid expansion, activating the demand side, flexible conventional plants, curtailment of Wind and PV installations and storage.

And what about Europe?

21 | Is Germany an exemption or do other countries face similiar challenges?

Renewables will dominate the European energy system in 2050

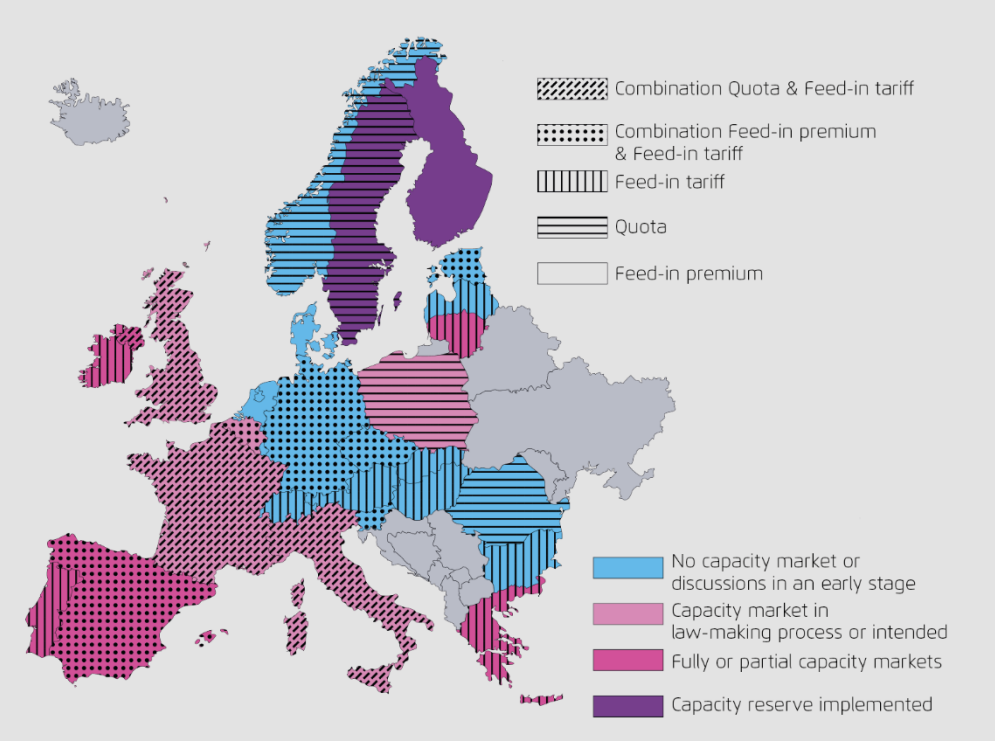


Source: European Commission 2011

According to the European Commission's Energy Roadmap 2050, the European energy mix will include a share of 40 to 83% renewable sources in 2050 – according to different scenarios. Wind and Photovoltaics will provide 25 to 67%. Thus, the challenge to flexibilise the system will be a European one.

22 | Why should Germany cooperate with European neighbours?

European cooperation provides win-win situations



Sharing of resources among European countries and a joint regulatory framework allows for balancing of variable renewable sources over larger geographical areas and reduces the need of reliable capacities to meet peak demand. Thus, cooperation makes the Energiewende easier and cheaper.

Source: Own illustration based on Eurelectric (2012), Öko-Institut (2012), Fraunhofer ISI et al. (2012)

To be continued…

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