

Connecting the dots on Germany's *Energiewende* and its impact on European energy policy

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EU Energy Policy: 20-20-20

- **Climate:** A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels (e.g. Germany minus 40%)
- **Renewables:** 20% of EU energy consumption to come from renewable resources (e.g. Germany 18%)
- **Efficiency:** A 20% reduction in primary energy use compared with projected levels

Principle: effort sharing

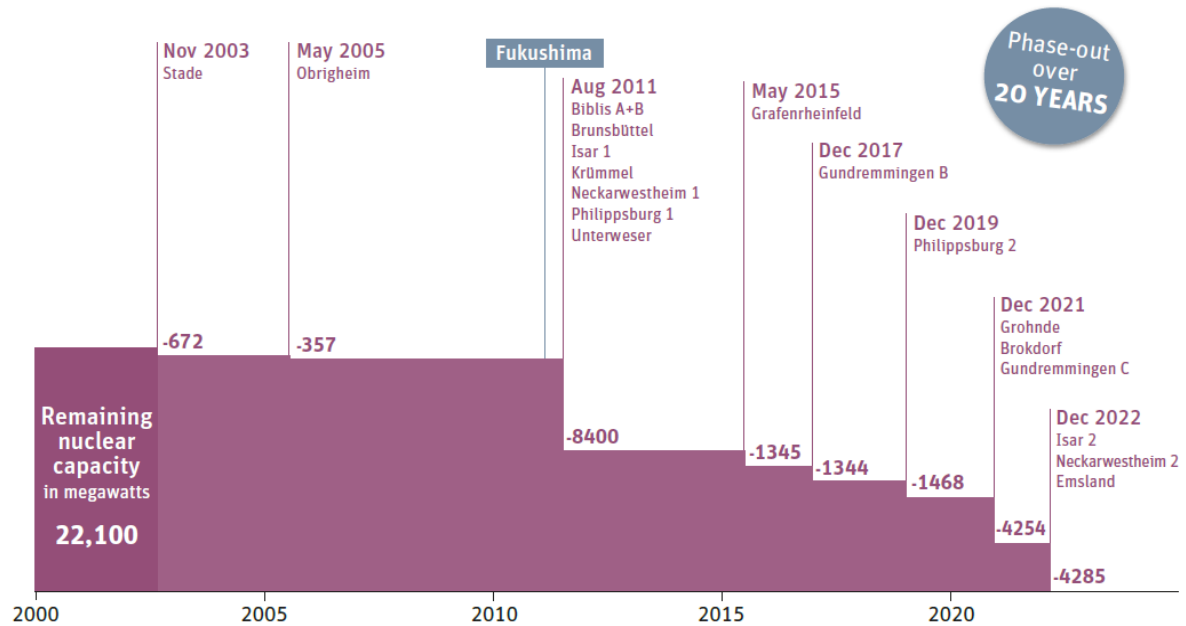
EU Energy Policy: 2030 Goals

- **Climate:** A reduction in EU greenhouse gas emissions of at least 40% below 1990 levels
- **Renewables:** 27% of EU energy consumption to come from renewable resources
- **Efficiency:** No target yet

Germany is gradually shutting down all nuclear power plants

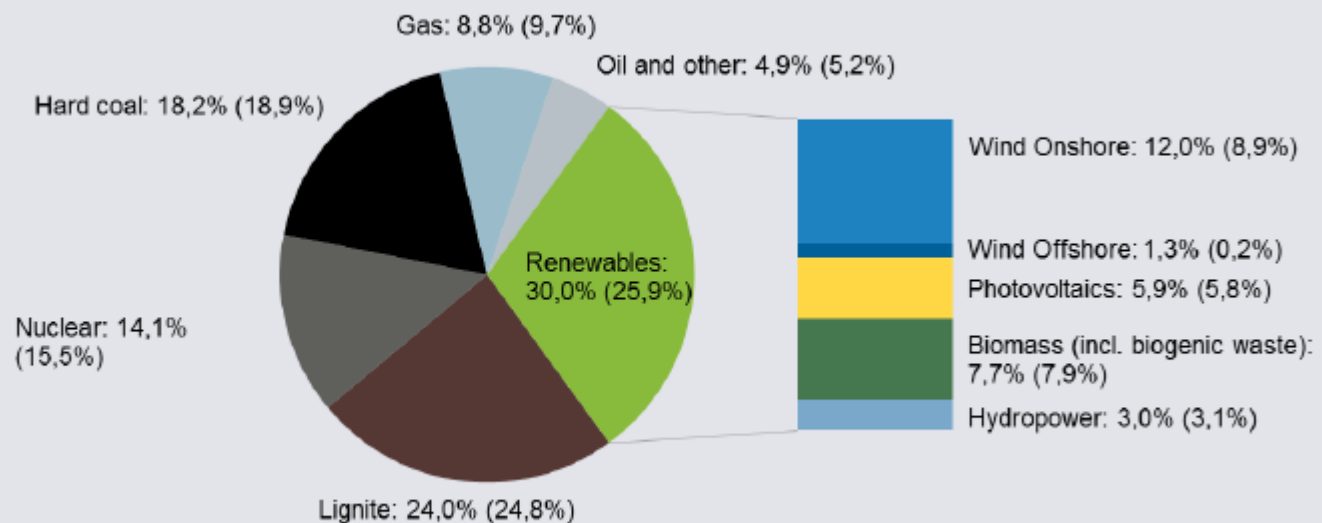
Declining nuclear energy installed capacity in Germany, 2000–2022

Source: Institute of Applied Ecology, BMJ, own calculations



Renewables are Germany's single biggest power resource

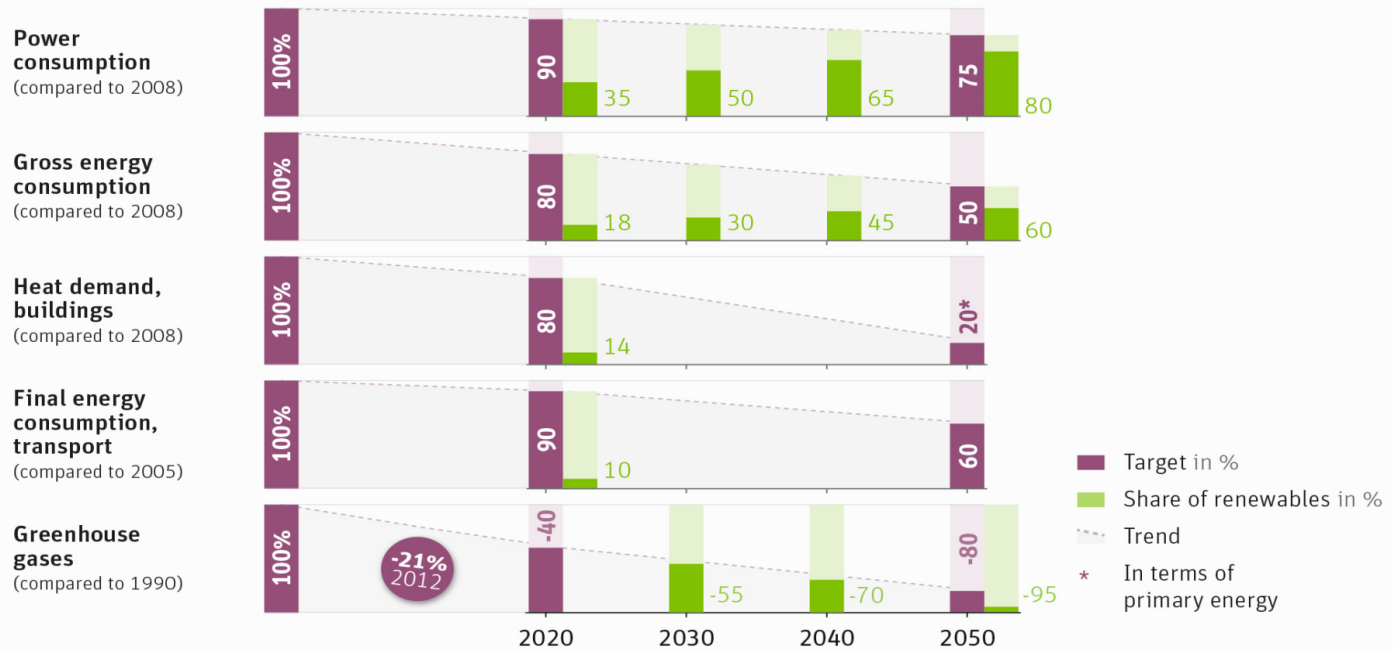
2015 power mix (2014 values in brackets)



German energy transition: high certainty with long-term targets

Long-term, comprehensive energy and climate targets set by the German government in 2010

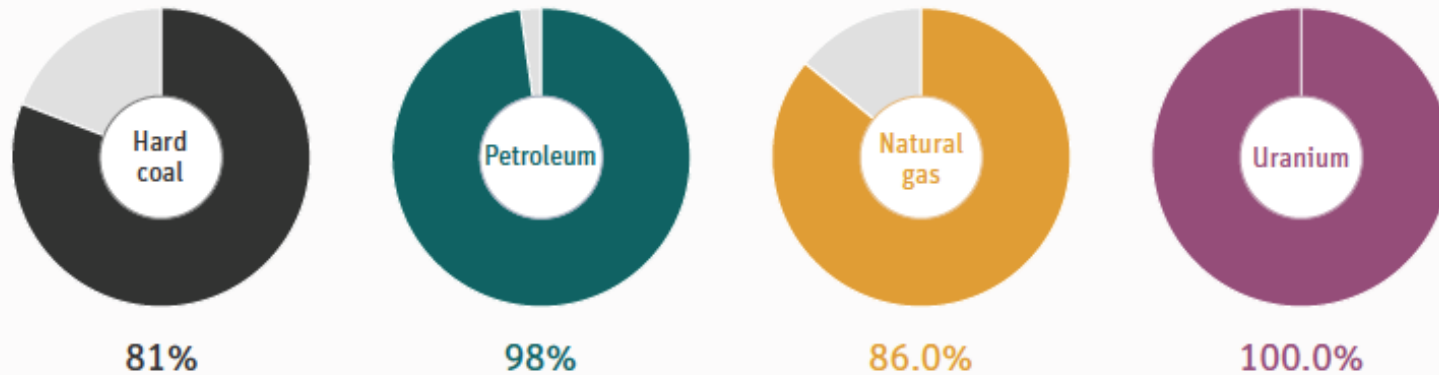
Source: BMU



More renewables strengthen Germany's energy security

Share of imports of conventional energy sources in Germany 2012

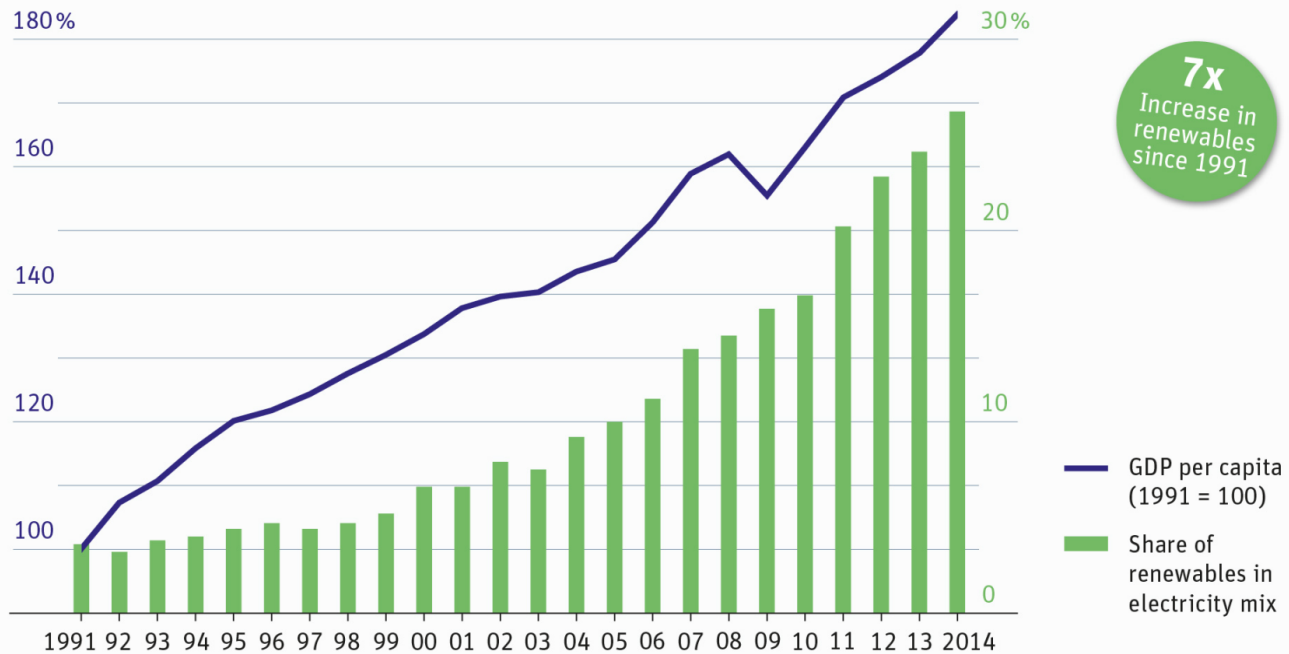
Source: BMWi



Renewables do not hurt Germany's economy

Gross Domestic Product and share of renewables in power generation from 1991-2014, Germany

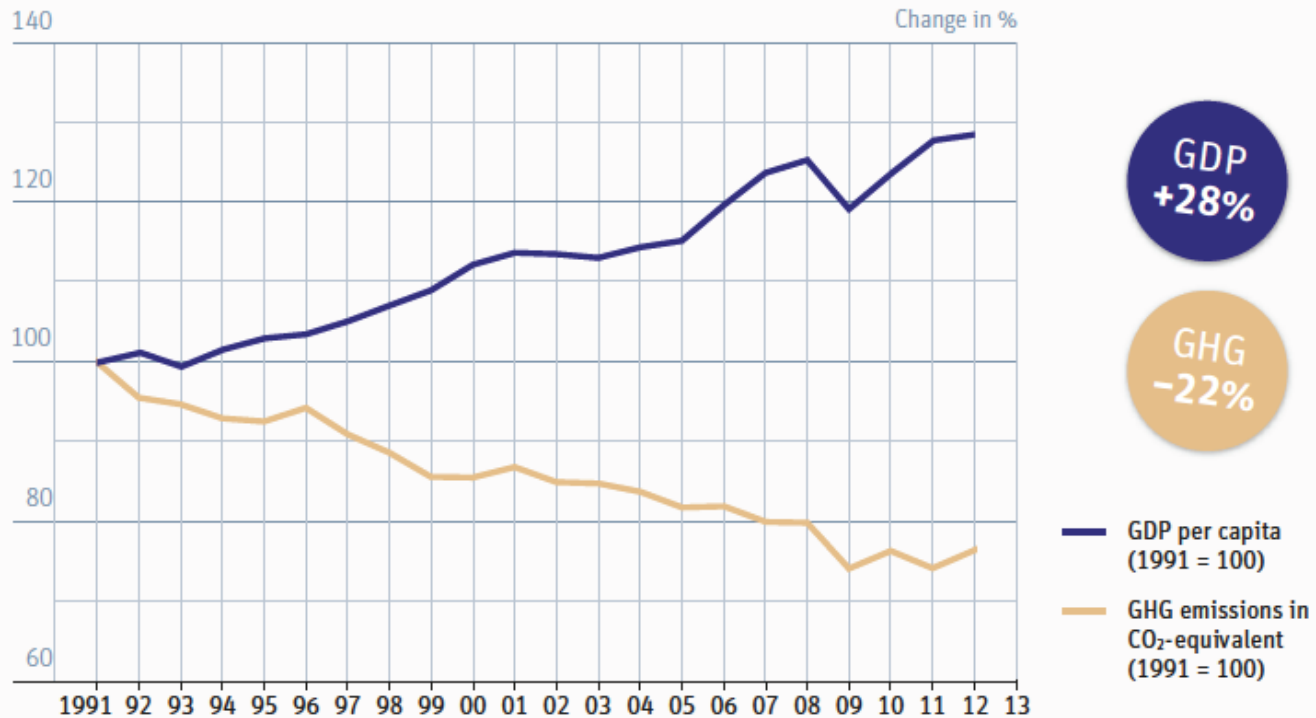
Source: BMWI, AG Energiebilanzen, Destatis



Germany: growing economy, declining emissions

Change of Gross Domestic Product (GDP) and Greenhouse Gas (GHG) emissions in Germany, 1991-2012

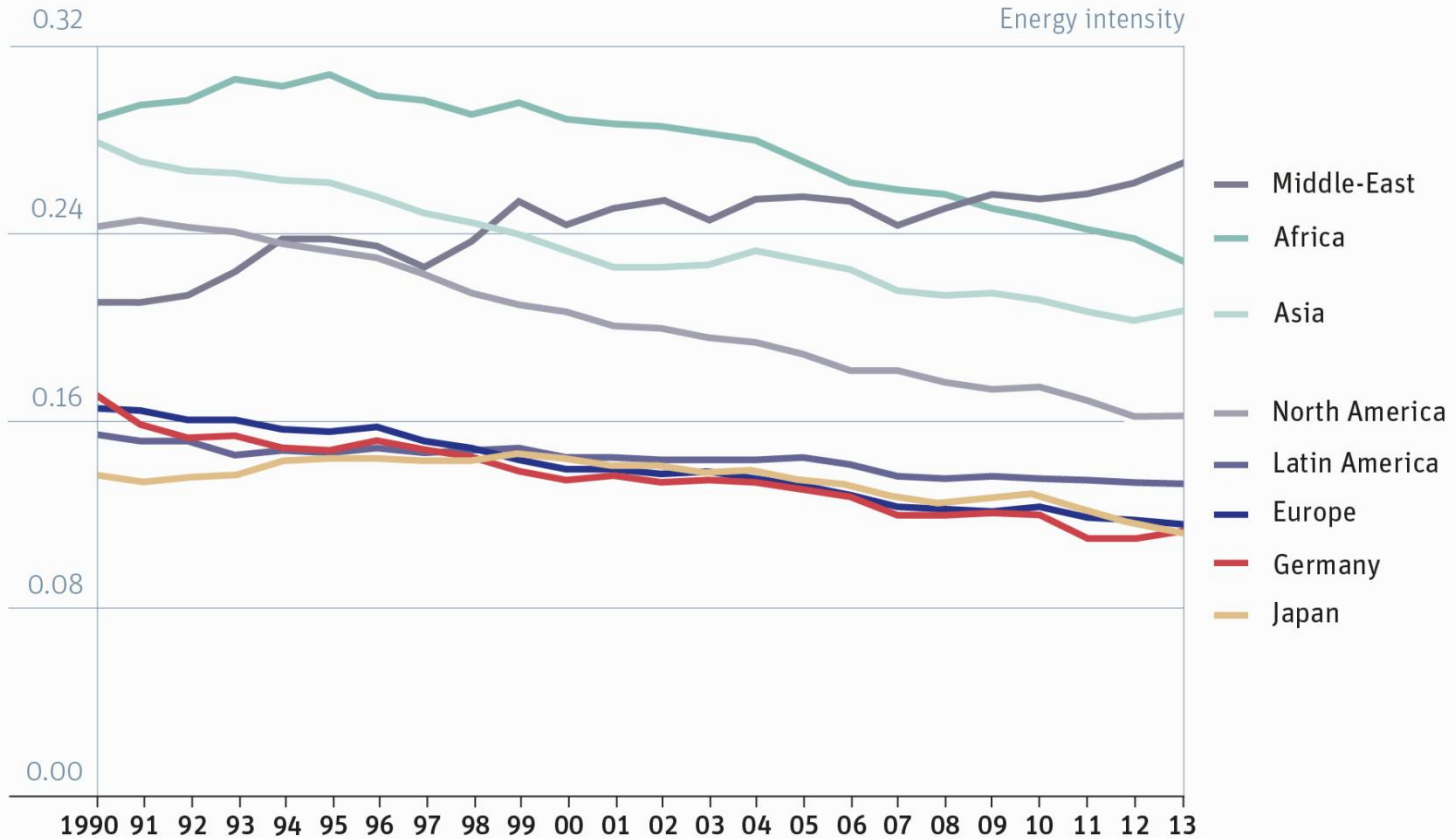
Source: BMU, BMWi, Destatis



Germany continues to produce more GDP with less energy

Energy intensity (=energy use per unit of GDP) of different world regions, 1990-2013

Source: Enerdata Yearbook



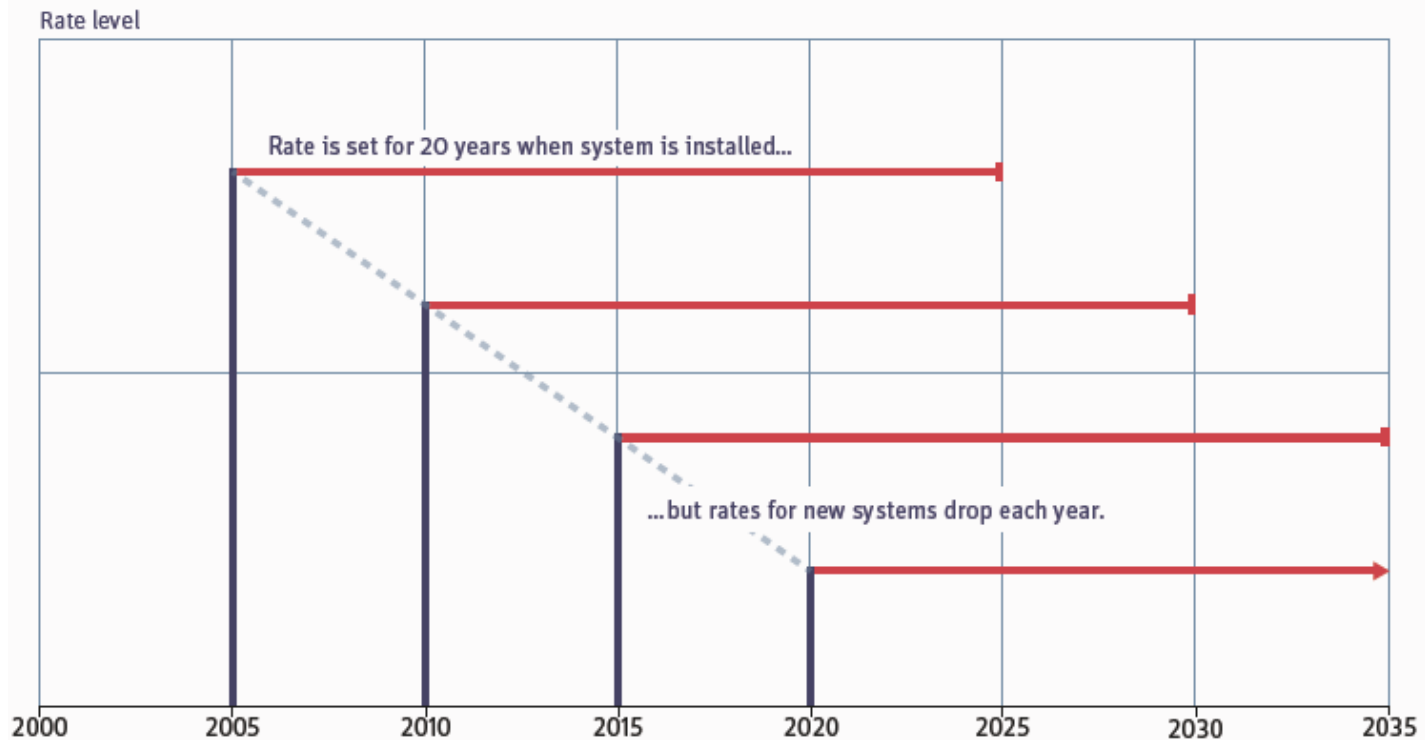
How? Feed-in Tariffs (FIT) – High investment certainty for renewable energy (first phase)

- 1. Fixed payments for 20 years (depending on technology and size) eliminate risks to investors and banks**
 - 2. Guaranteed grid access**
Rewarding renewable electricity production, not investment; open for all citizens; not a government subsidy
- > This has provided market access for all renewables, giving them a fair share to enter the market and become competitive.**

Feed-in tariffs provide investment certainty and drive costs down

Simplified generalization of feed-in tariff with 20 year duration

Source: Own estimates based on WFC



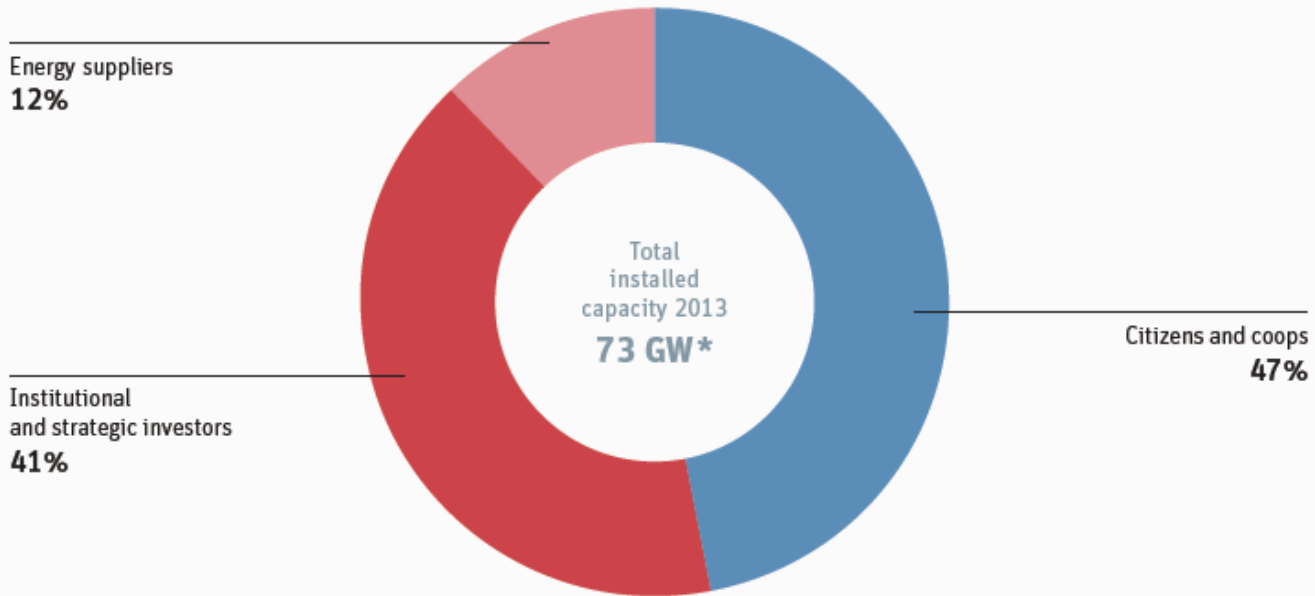
German energy transition is a democratic movement

Ownership of renewables in 2012

Source: AEE, www.unendlich-viel-energie.de



- > 1 out of 60 Germans is now an energy producer (“prosumers”)

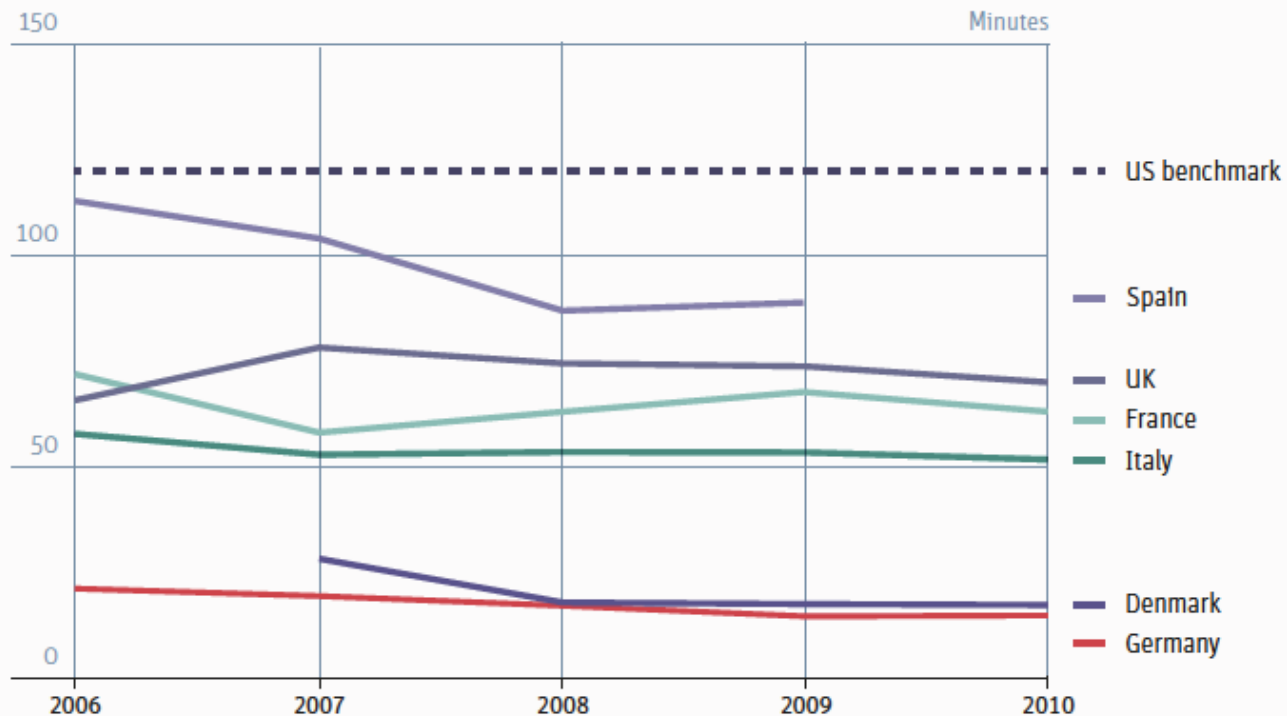


* excluding PSW, offshore wind, geothermal and bio-mass

Grid reliability and renewable growth seem to go hand in hand

Minutes of power outages per year (excl. exceptional events), based on Saidi

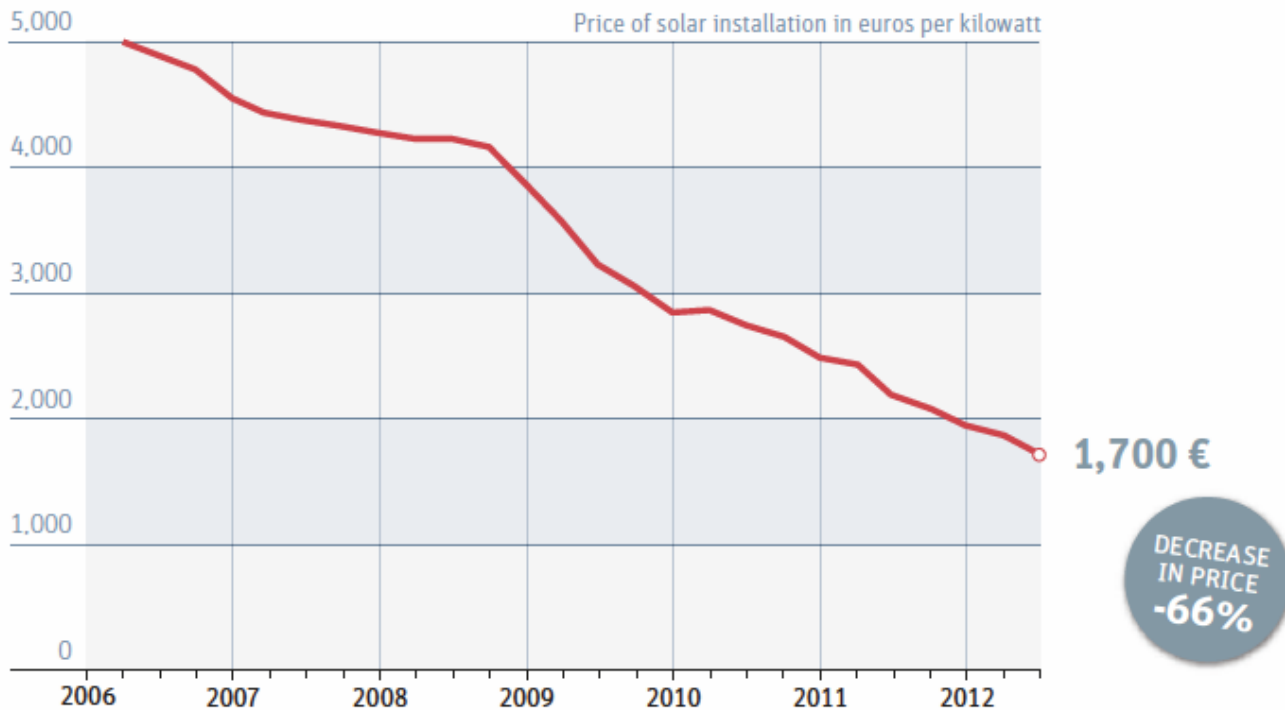
Source: CEER and own calculations



Price of solar down in Germany by 66% since 2006

Average system price for installed rooftop solar of up to 100 kilowatts

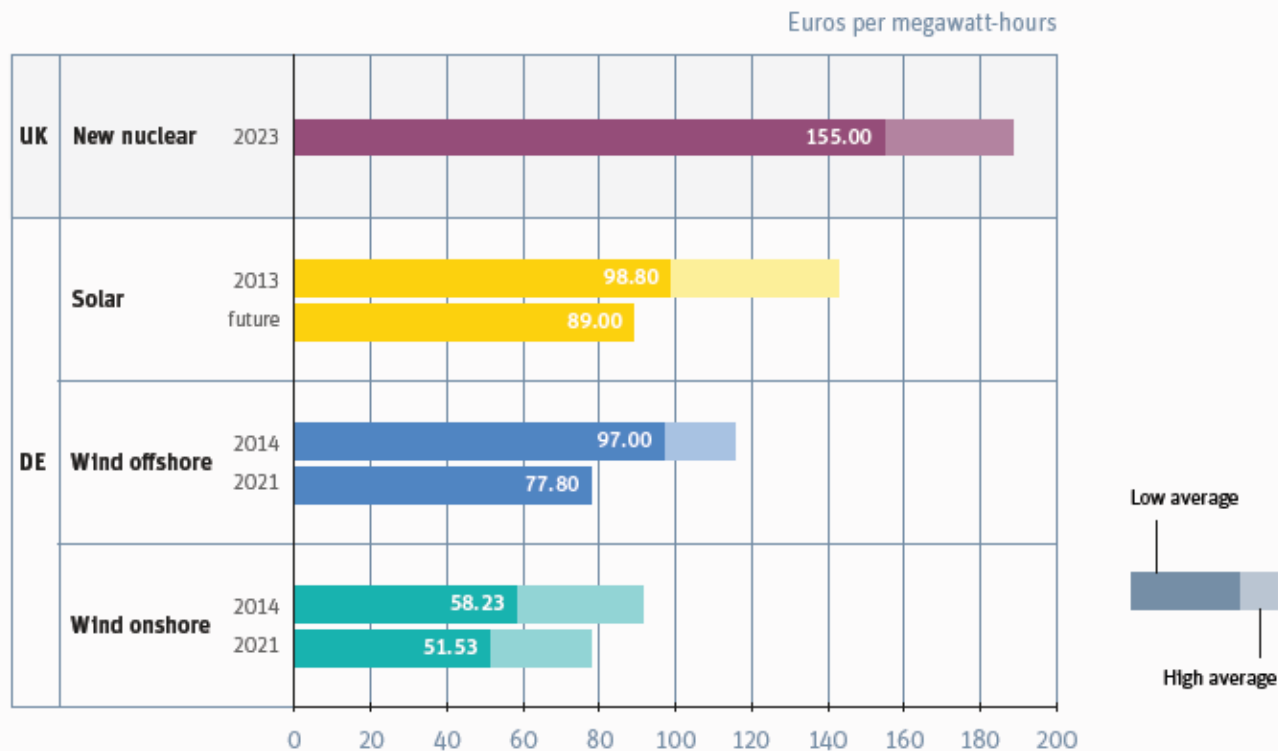
Source: EUPD Research and BSW-Solar



Price of new nuclear already higher than solar and wind

FITs for current and future solar and wind in Germany with strike price for nuclear at Hinkley

Source: Thomas Gerke, DECC, Agora Energiewende



What are the main characteristics of the German energy transition?

- 1. ...there is an all-party agreement that climate change is real and needs to be addressed;**
- 2. ...there is broad support to switch to a renewable energy economy (priority for RE, no nuclear power);**
- 3. ...the energy policies are geared not towards large corporations, but SME and citizens which are driving the energy transition.**

...yet some challenges remain (second phase):

1. How to build new infrastructure in form of smart new power grids (north-south) and storage systems;
2. How to coordinate the expansion of renewables while controlling the costs (from feed-in tariffs to auctions);
3. How to coordinate renewable power production and distributive generation with the rest of the power system, particularly fossil fuels;
4. How to continue limiting national CO2 emissions effectively (coal);
5. How to think beyond *just* electricity (energy efficiency, transportation, heating);
6. How to coordinate the *Energiewende* with European neighbors and into the Energy Union.

Germany's Energiewende – European Impacts

1. **Germany's geographical location at the center of Europe puts it in a unique position;**
2. **Energy Transition constructed as national policy regardless of its impact on European neighbors, esp. Poland;**
3. **Some changes have been made in recent years (key word: regional cooperation and integration):**
 - **“Baake Prozess” and Electricity Neighbors**
 - **Pentaforum (electricity markets)**
 - **European Network of Transmission System Operators (infrastructure and grid operation)**
 - **increasing regional flexibility**

Hot topics in Brussels – The Energy Union and “Winter Package”

1. Security of supply;
2. Completion of the international energy market,
3. Energy efficiency;
4. Climate protection and emissions reductions,
5. Research and Innovation

→ no shared common energy vision among EU Member States

Thank you!

German Energy Transition

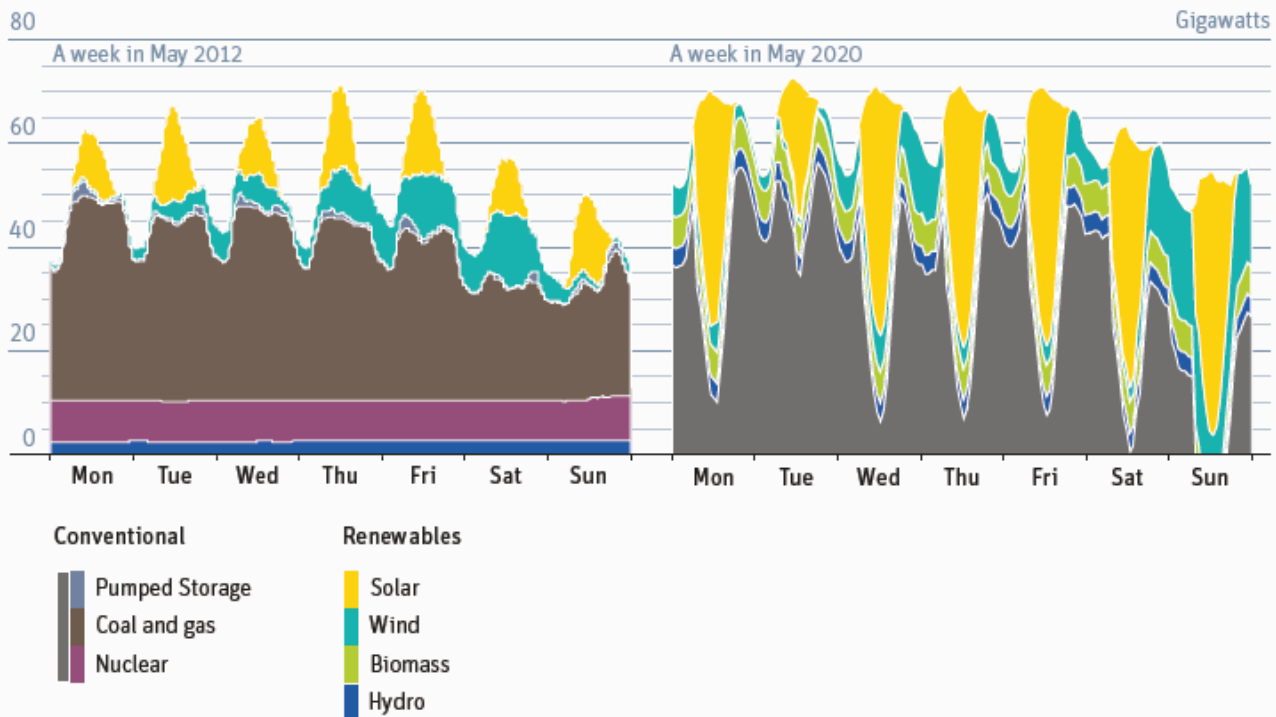
Arguments for a renewable energy future.



Renewables need flexible backup, not baseload

Estimated power demand over a week in 2012 and 2020, Germany

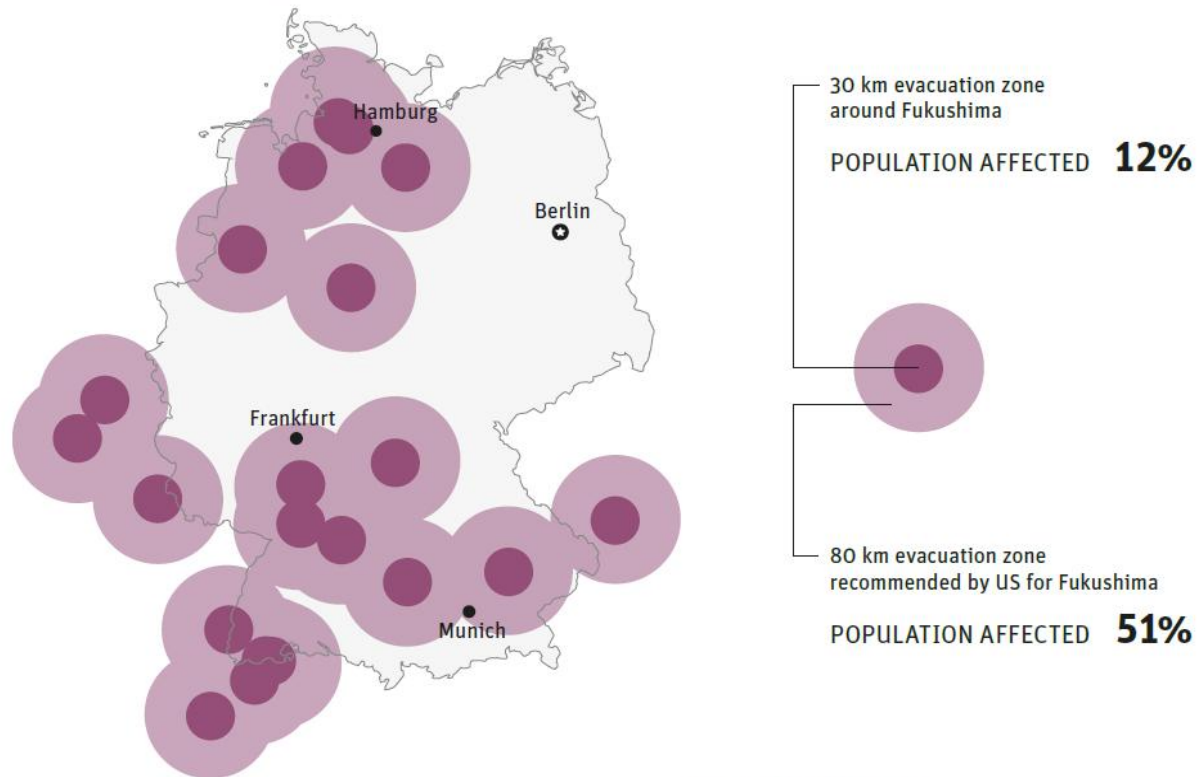
Source: Volker Quaschnig, HTW Berlin



Recognizing the danger of nuclear power

30/80 km zones around nuclear reactors in Germany and nearby reactors of neighbouring countries

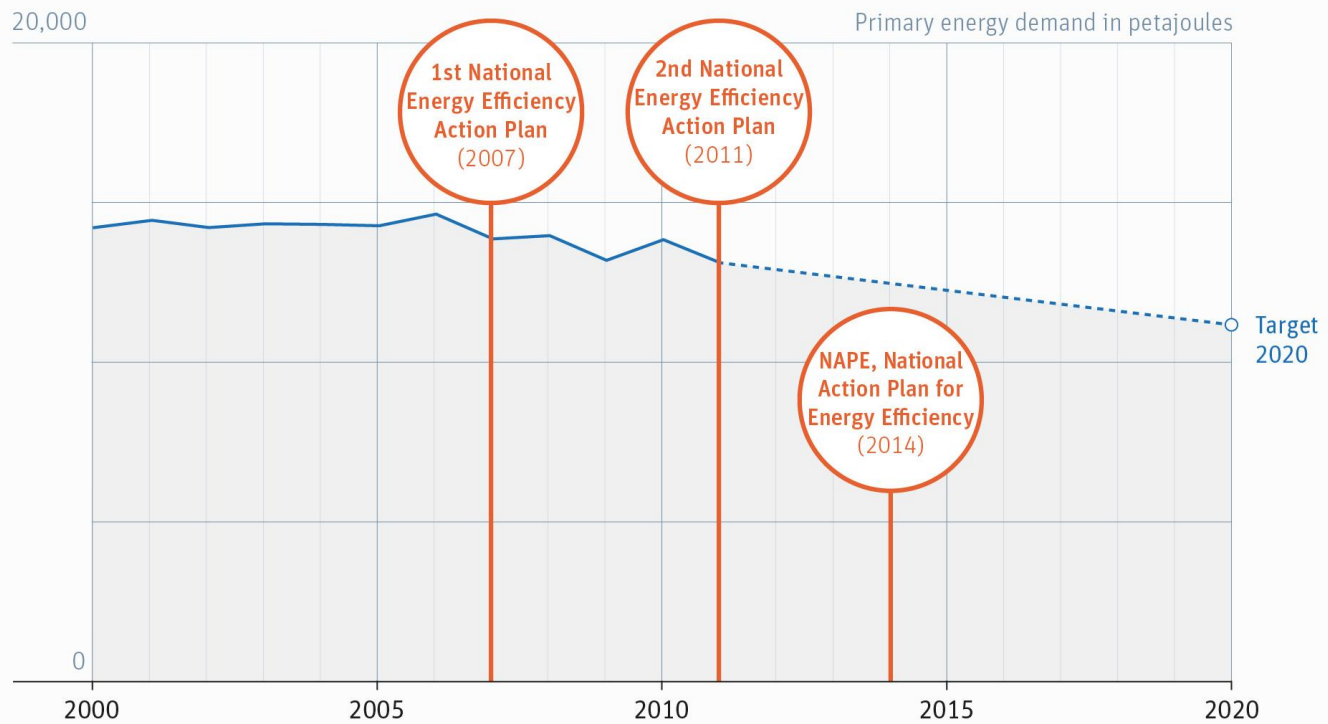
Source: <http://opendata.zeit.de/atomreaktoren>



Germany's plan: drive down energy demand

Primary energy demand in Germany, 2000-2020

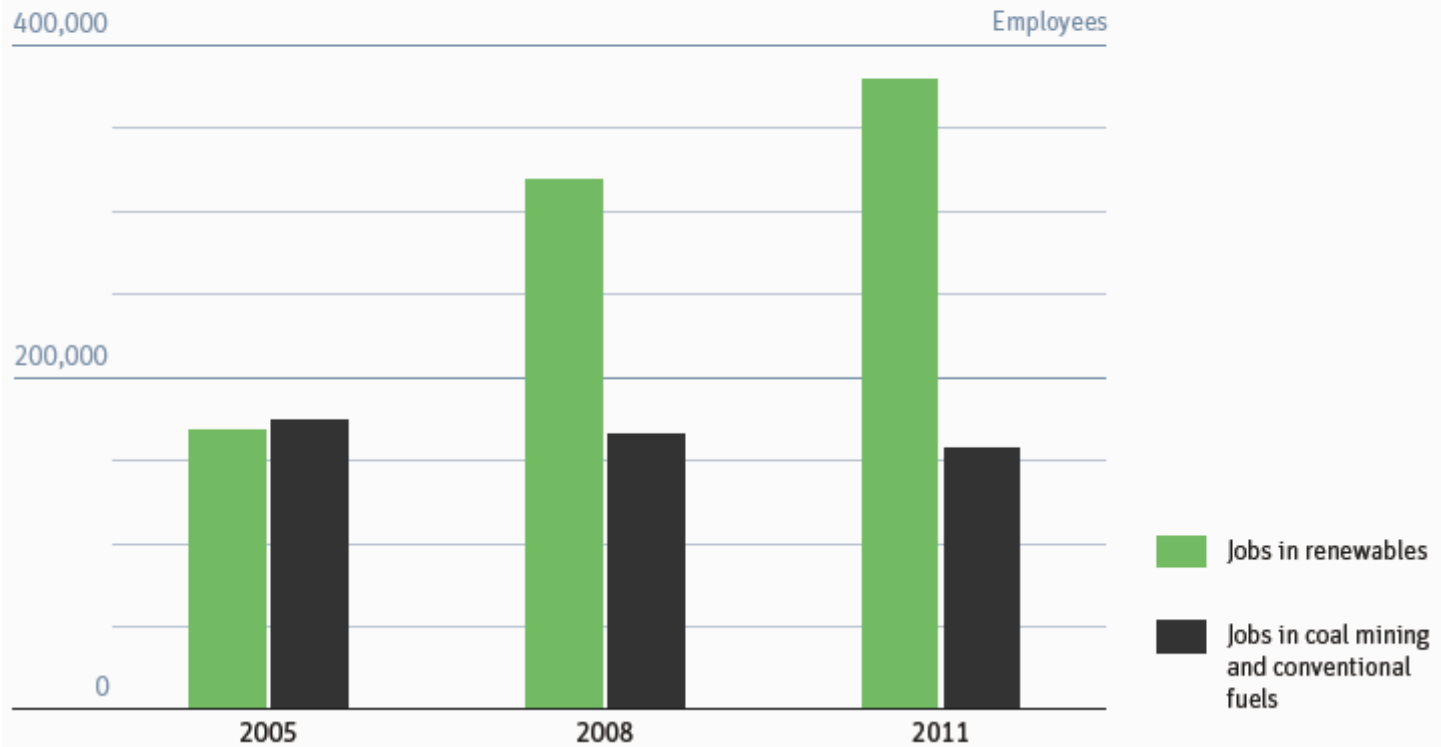
Source: AGEB, BMWi



Renewables create more jobs than conventional energy does

Employment in Germany in renewable and conventional energy sectors, 2005-2011

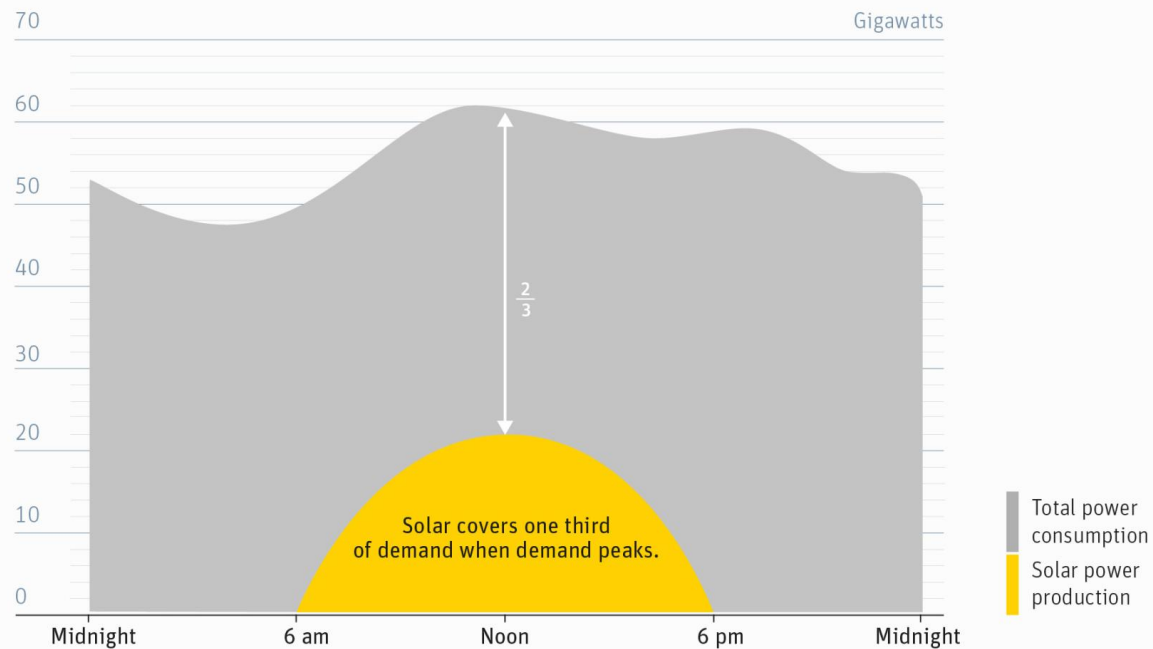
Source: BMU, BMWI



Solar PV can already cover a third of peak power demand

Power demand and solar power production in Germany. Estimate based on actual data from May 2012

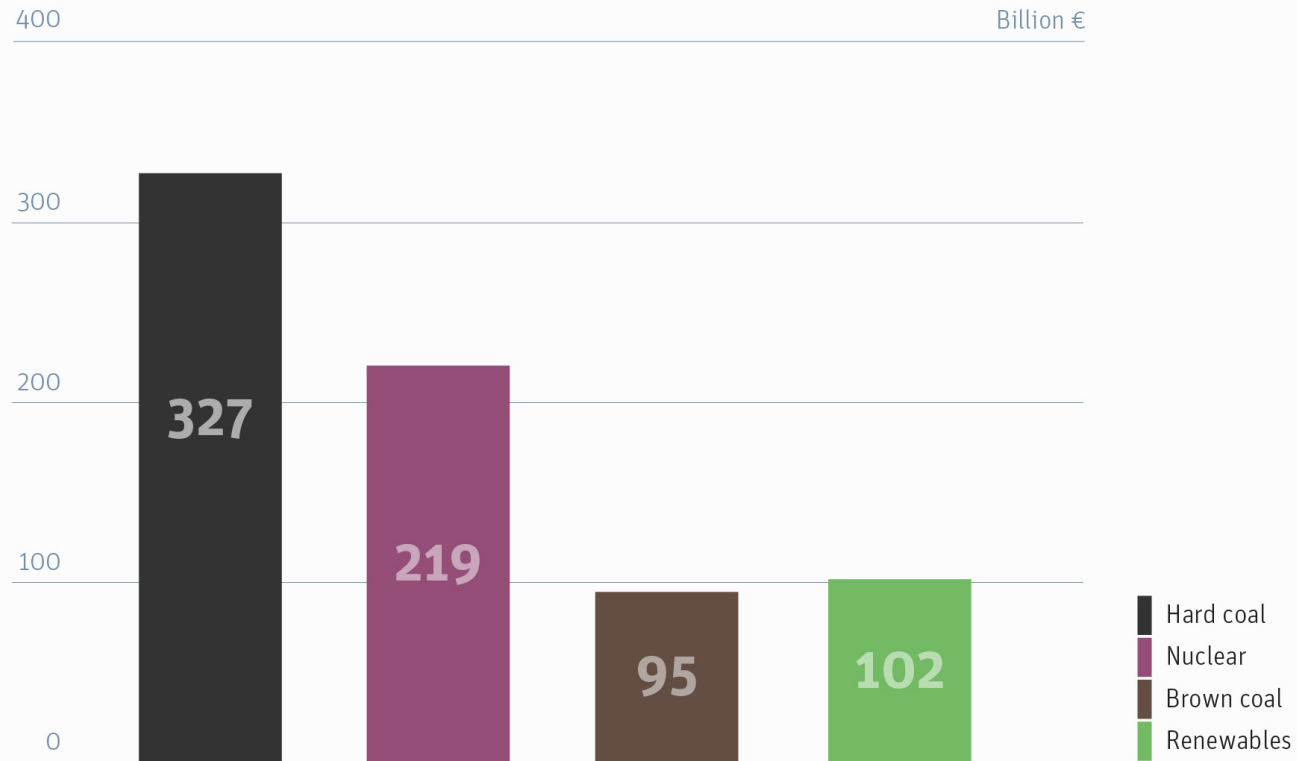
Source: Fraunhofer ISE, EEX



Fossil and nuclear have received by far more subsidies than renewables

Energy subsidies in Germany, 1970-2014

Source: *Was Strom wirklich kostet*, FÖS, 2015



Renewable energy offsets expenses for fossil fuel imports

Benefits of renewables in energy use, Germany

Source: AEE

