

Insights from Germany's Energy Transition

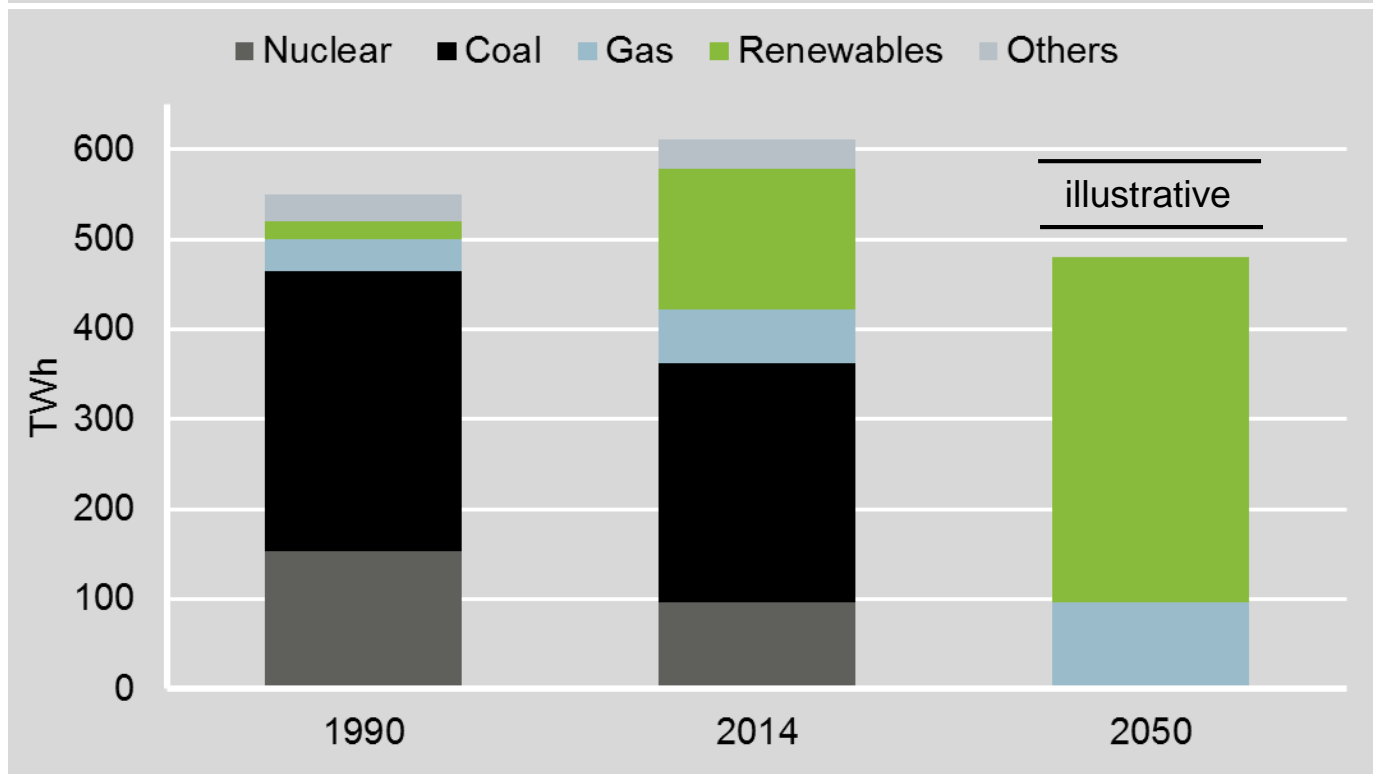
CHRISTIAN REDL
ALPBACH, 28 AUGUST 2015



Energy transition 1.0: A fundamental transformation of the German power system.

Societal consensus on nuclear and climate change risks as starting point, energy policy as a key enabler

Gross power production in Germany in 1990, 2014 and 2050



AG Energiebilanzen (1990, 2014); illustration based on current targets for 2050

Targets

Domestic greenhouse gas emissions

Reduction of 40% by 2020 and 80% to 95% by 2050 below 1990 levels

Nuclear phase-out

Stepwise shut down of all nuclear power plants until 2022

Renewables

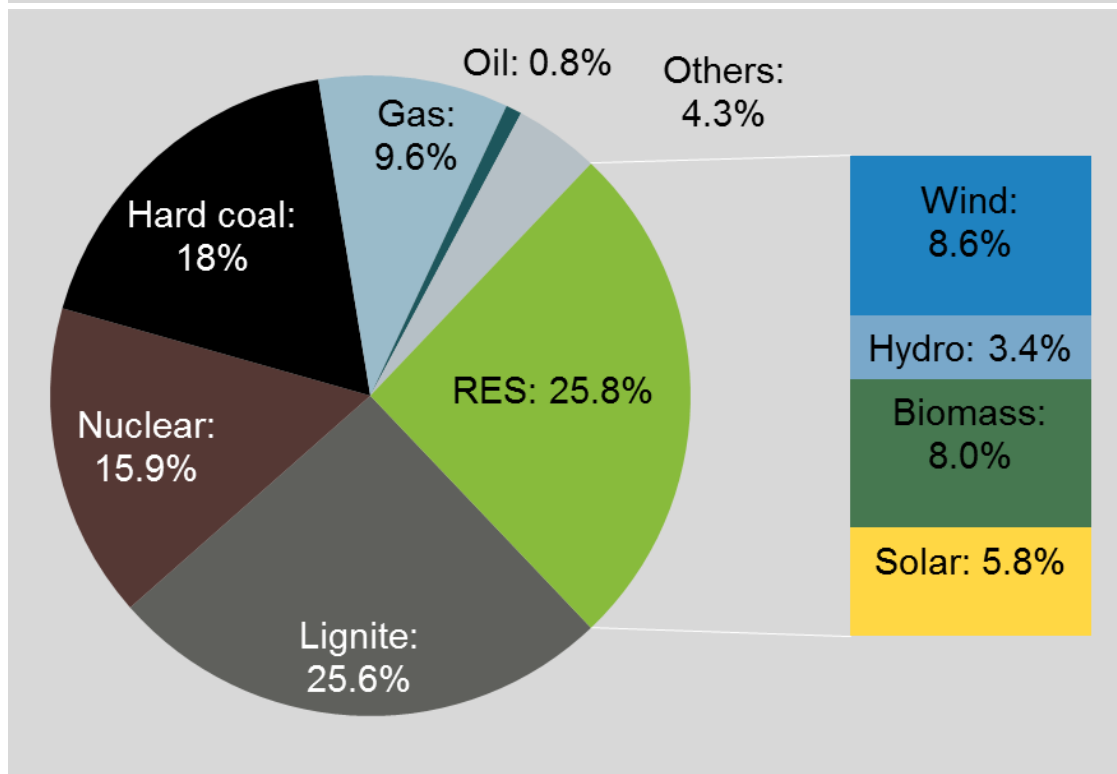
Share in gross electricity consumption of 40-45% by 2025; 55-60% by 2035; at least 80% by 2050

Efficiency

Reduction of electricity demand by 10% by 2020 and 25% by 2050 below 2008 levels

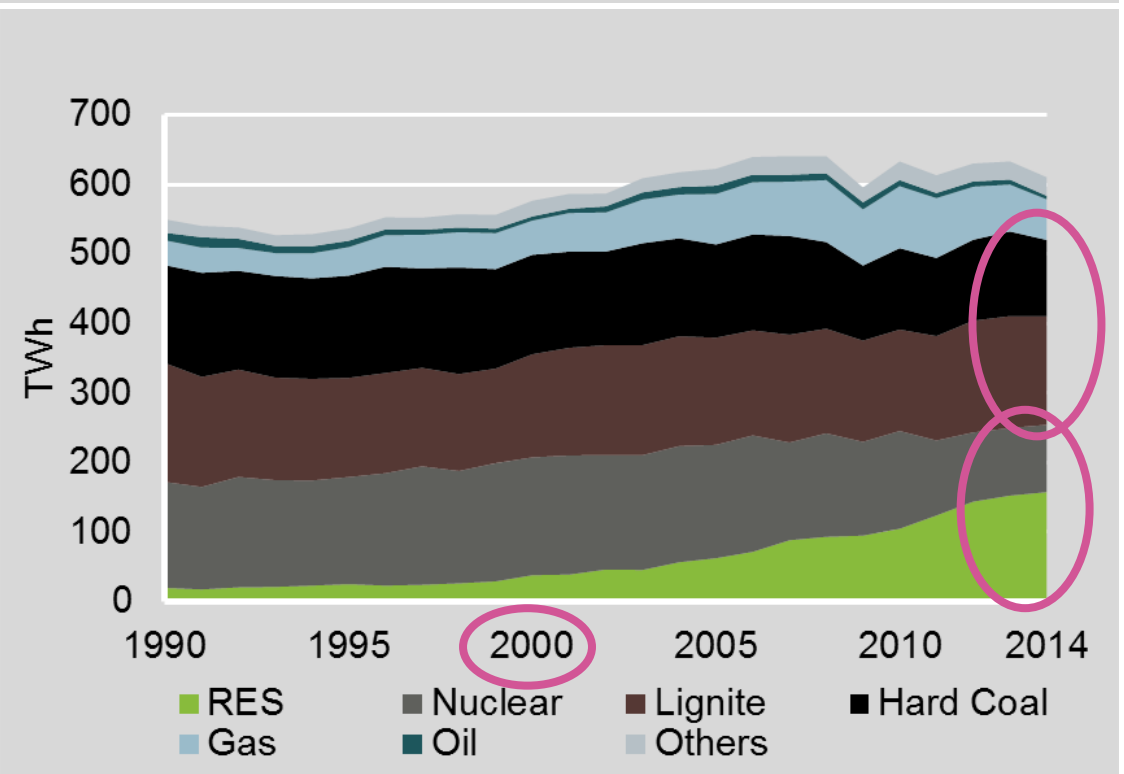
Renewables: Largest share in the 2014 power mix triggered by Renewable Energies Act

Share of energy sources in gross power production in 2014



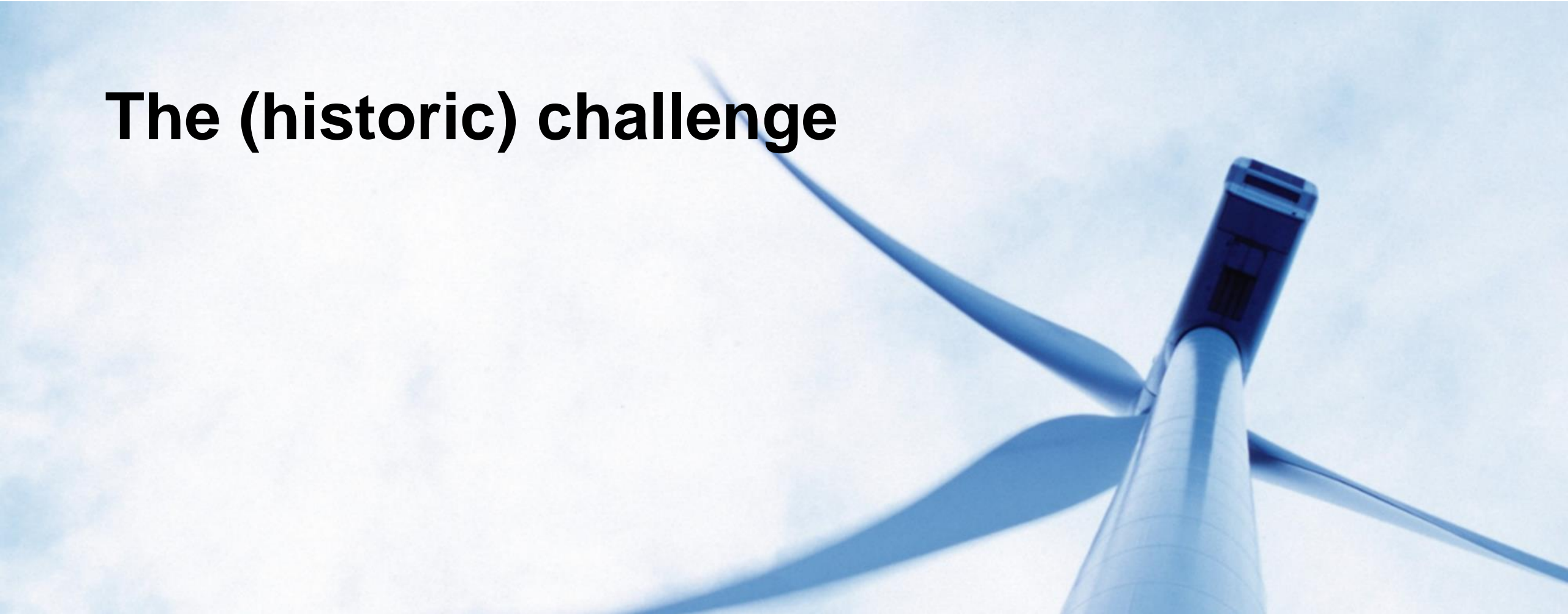
AG Energiebilanzen (2014)

Development of gross power production 1990-2014 in TWh

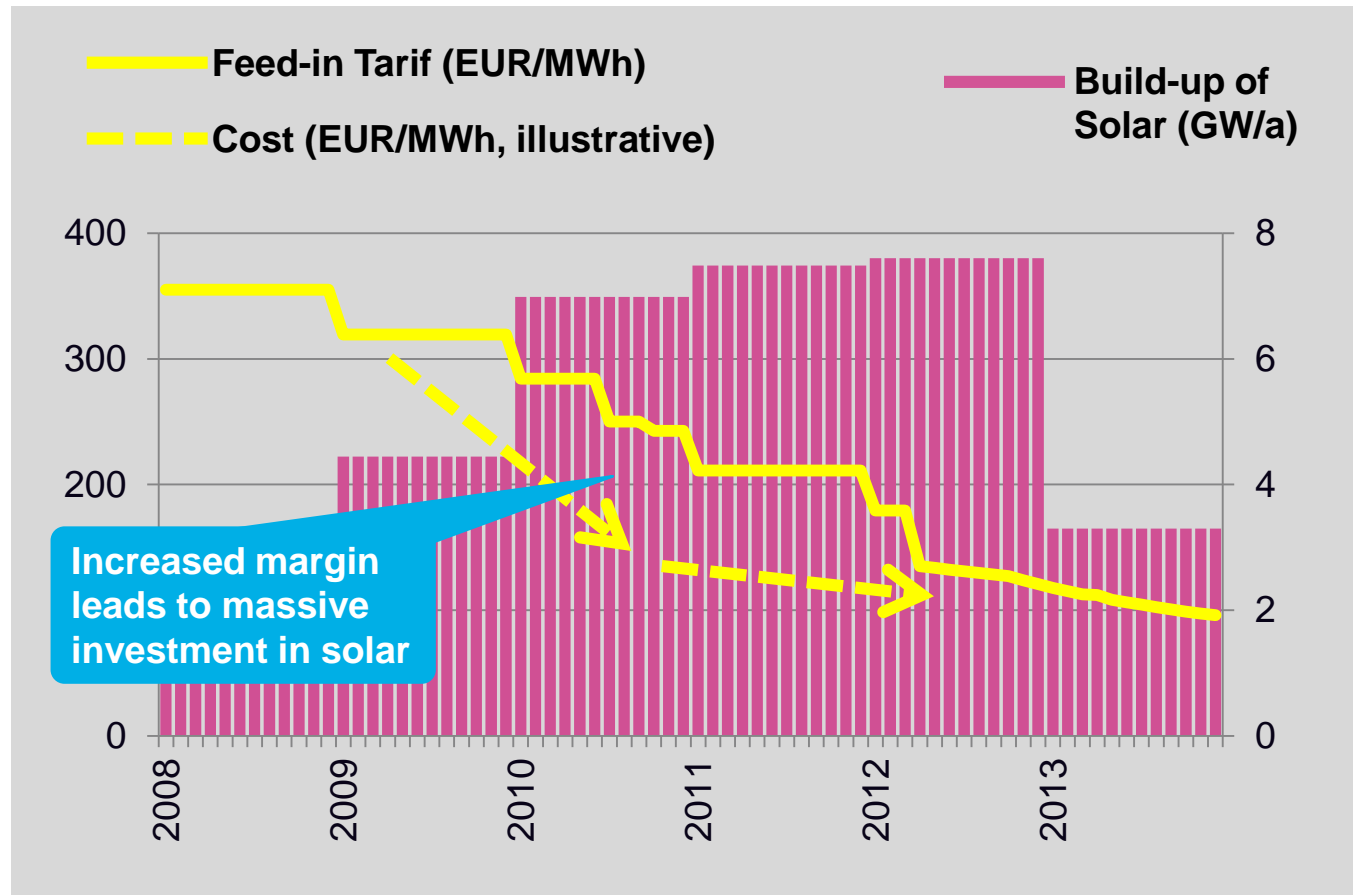


AG Energiebilanzen (2014)

The (historic) challenge



German consumers pay for the “solar years” 2009-2012 which bought solar PV (globally) down the learning curve



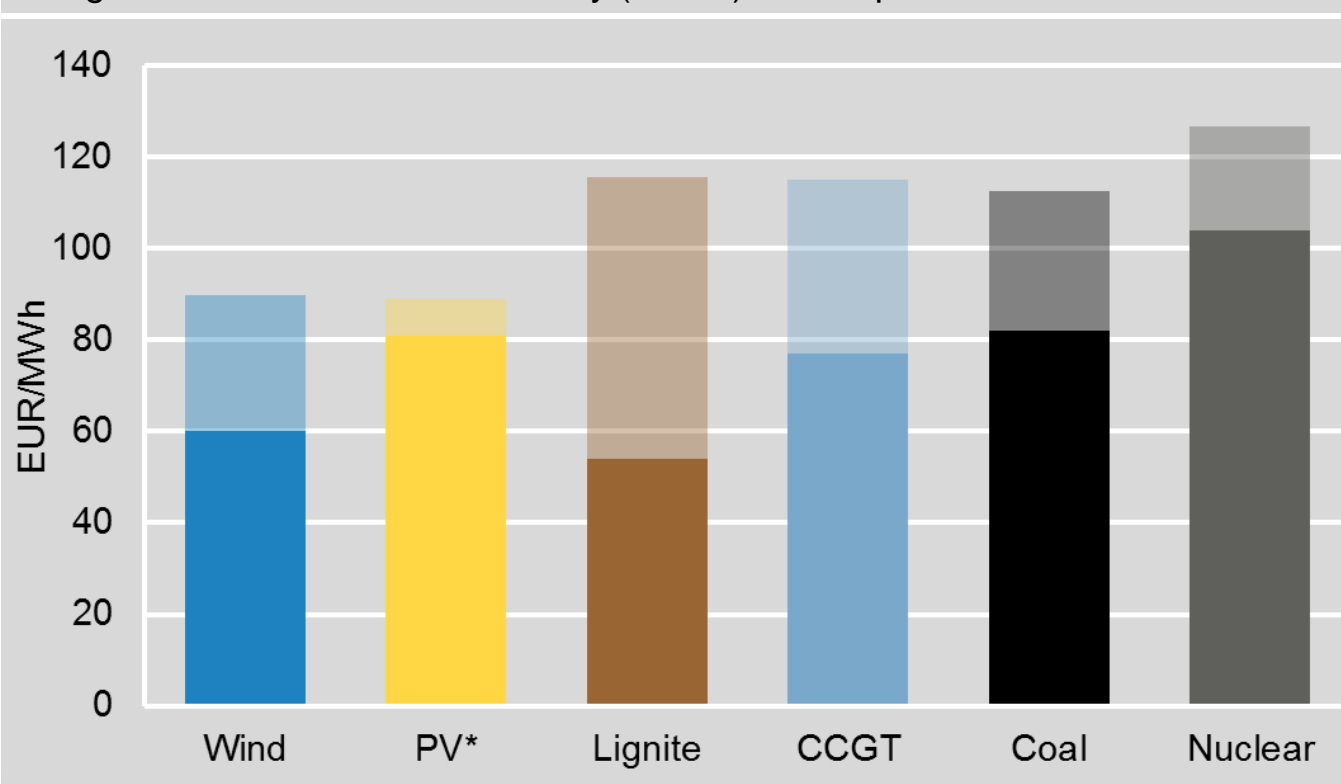
- ~ 25 GW solar built in 4 years when feed-in tariff was still very high
- “Race“ between investors and policy: market moved faster

The (future) challenges and opportunities



Onshore wind power and large-scale solar PV are cost competitive compared to other new conventional generation technologies – in Germany and beyond

Range of levelised cost of electricity (LCOE) of new plants in 2015 in EUR/MWh

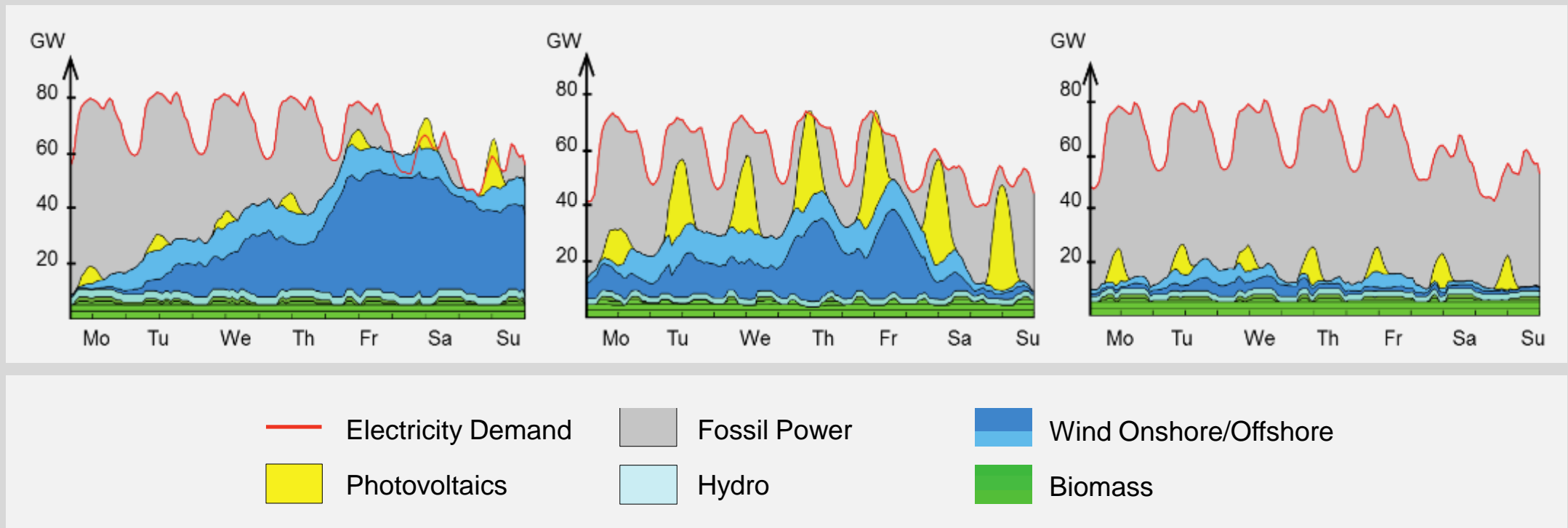


A mix of wind onshore, PV with gas turbines as backup costs ~70 EUR/MWh

- Generation cost decrease from current 6-9ct/kWh for wind onshore and 8-9ct/kWh for large PV to 4-6ct/kWh for wind and PV during the next 10-15 years
- Also considering integration costs, RES are cost competitive with new conventional plants
- In countries with good wind and solar conditions, wind and PV will be cheaper than other generation options
- Power system transformation towards high RES shares will occur

Power system and power markets will need to cope with fluctuating wind and PV: Flexibility as cornerstone of new system, to be triggered by (regional) power market design

Electricity generation and demand in Germany in sample weeks of February, August and November 2023



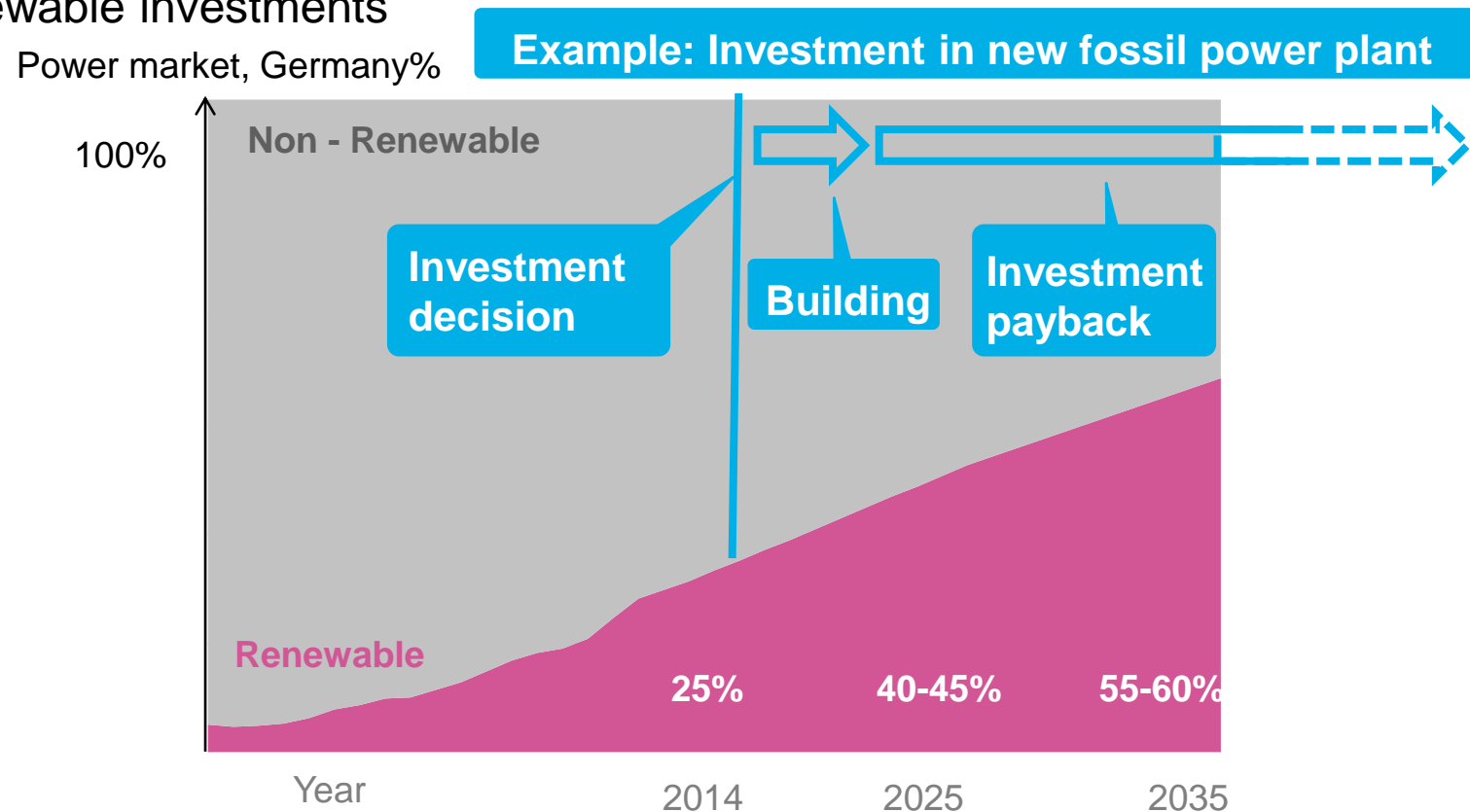
Agora Energiewende (2013)

Key messages from the German experience



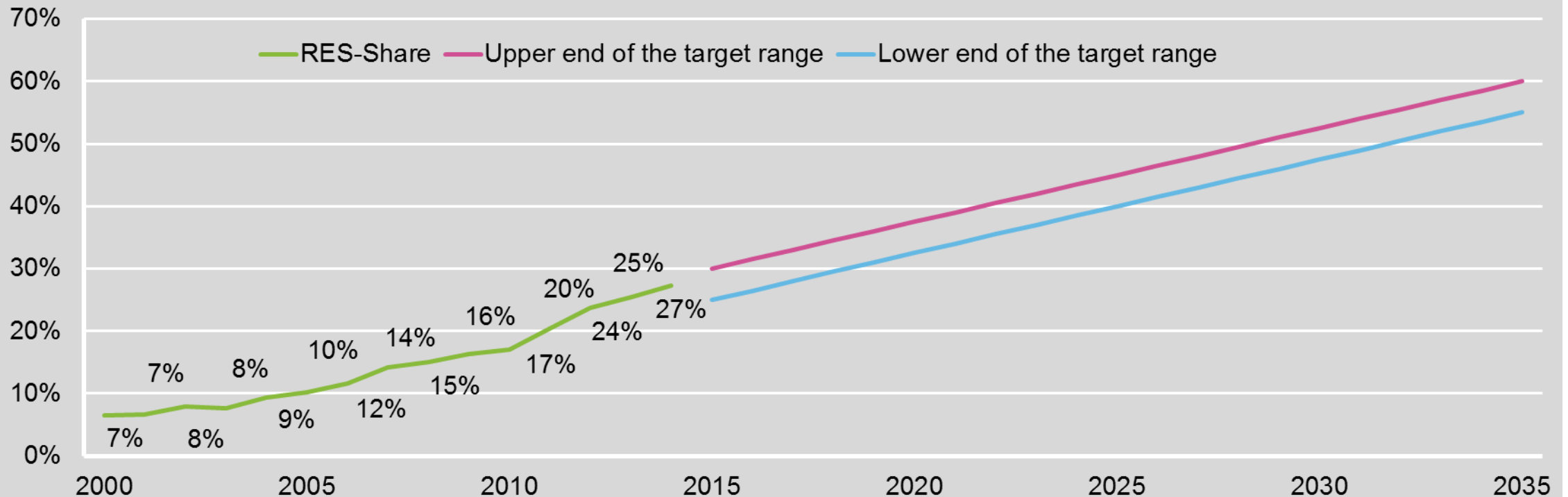
Binding policy targets required to enable the market to find efficient solutions and provide investor certainty

- > Renewable targets allow market actors to make efficient investment decisions – for both non-renewable and renewable investments



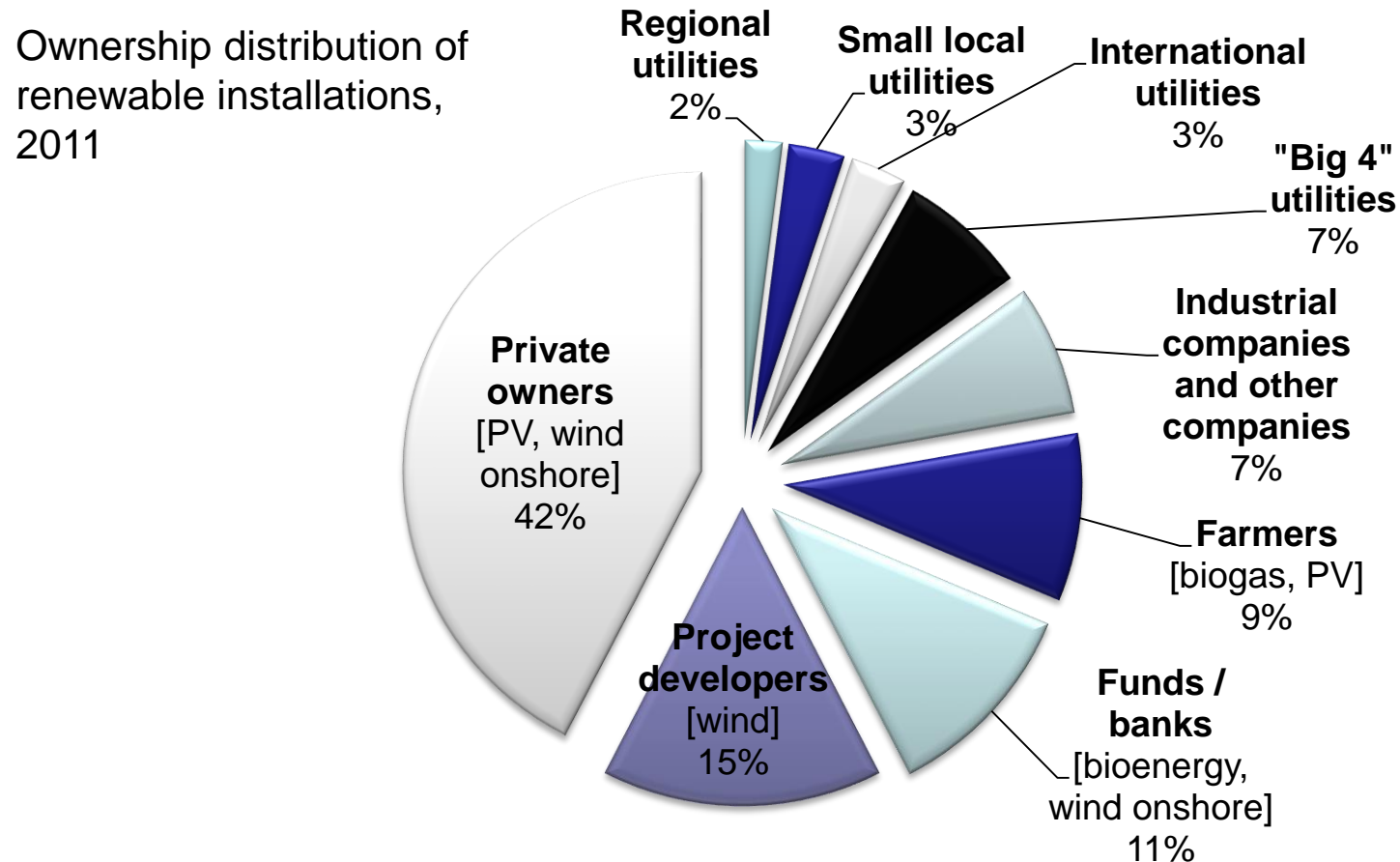
Renewable deployment policies critical. Adjusted along the way considering investment risks and investor clarity: From Feed-in Tariffs to Feed-in Premia

Share of renewables in gross electricity consumption 1990 - 2035



AG Energiebilanzen (2000 – 2014); Renewable Energy Act (2015-2035)

One secret to success: Renewables – especially wind and solar PV – are being installed and owned by citizens enabled by policies: Involvement and acceptance



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Thank you for your attention!

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