New renewable energy policies in Germany and their perspectives

With a focus on the power sector

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Agora Energiewende – Who we are

Think Tank with 20 Experts

Independent and non-partisan

Project duration 2012-2017

Financed with 14 Mio. Euro by Mercator Foundation & ECF

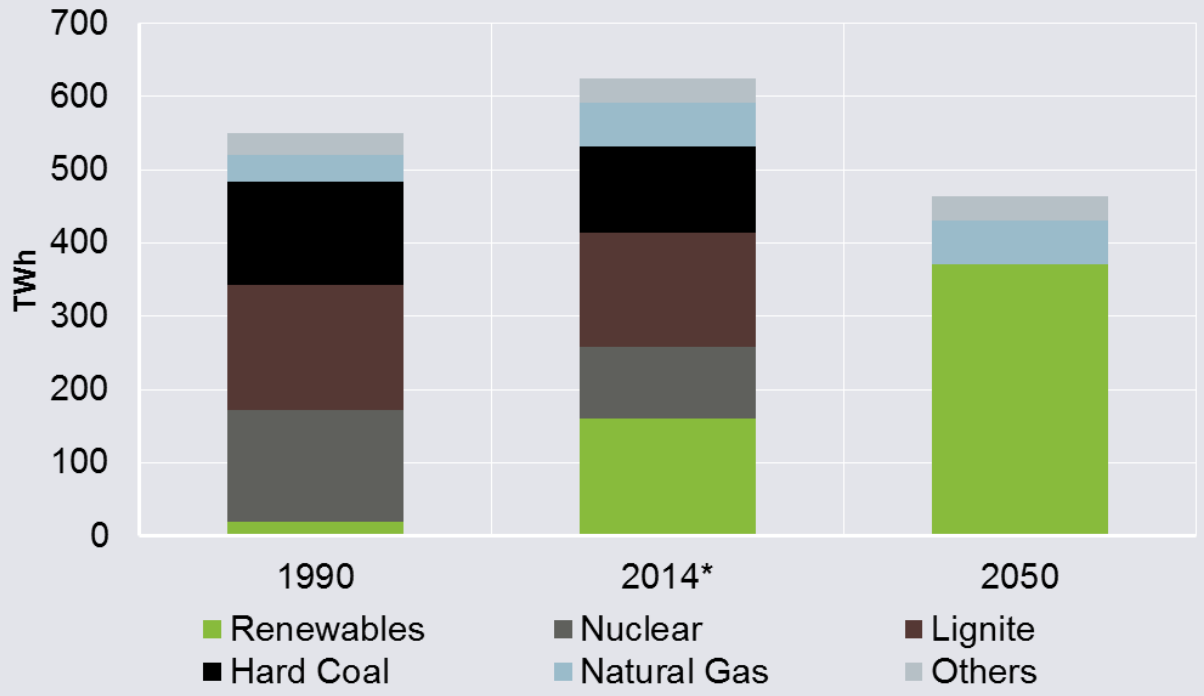
Mission: How do we make the energy transition in Germany a success story?

Methods: Analyzing, assessing, understanding, discussing, putting forward proposals, Council of Agora

The Energiewende in the power sector in a nutshell

The Energiewende means fundamentally changing the power system from coal/nuclear to renewable energies

Gross electricity generation 1990, 2014 and 2050



AGEB (2015a), BReg (2010), EEG (2014), own calculations * preliminary

Phase out of Nuclear Power
Gradual shut down of all nuclear power plants until 2022

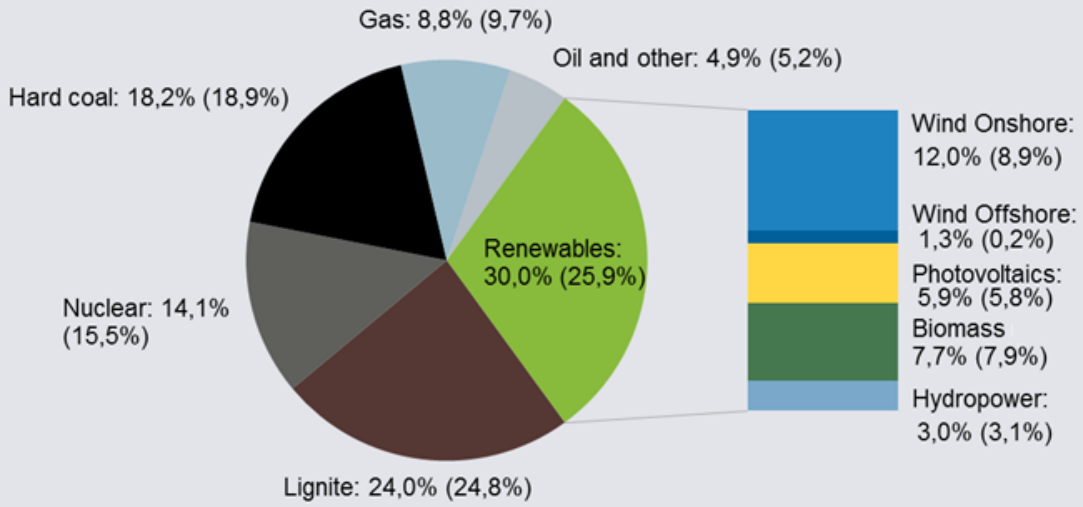
Reduction of Greenhouse Gas Emissions
Reduction targets below 1990 levels:
- 40% by 2020; - 55% by 2030; - 70% by 2040;
- 80% to - 95% by 2050

Development of renewable energies
Share in power consumption to increase to:
40 - 45% in 2025; 55 - 60% in 2035; ≥ 80% in 2050

Increase in efficiency
Reduction of power consumption compared to 2008 levels: - 10% in 2020; - 25% in 2050

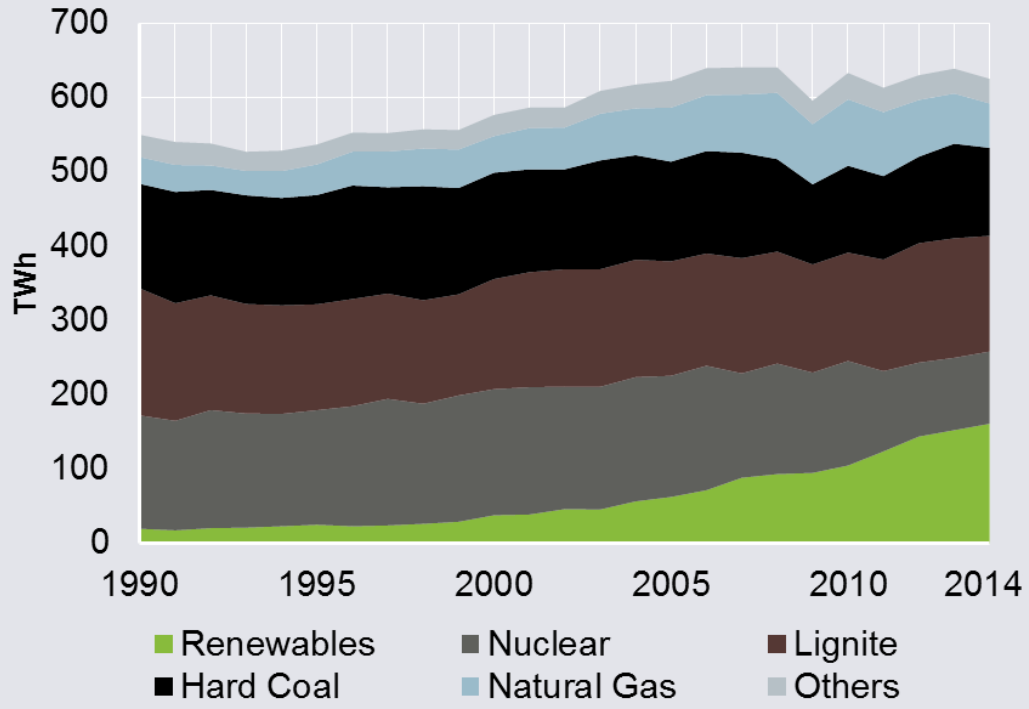
Renewables are the most important source in the electricity system – followed by lignite and hard coal

Share in gross electricity generation by fuel in 2015



AGEB (2015)

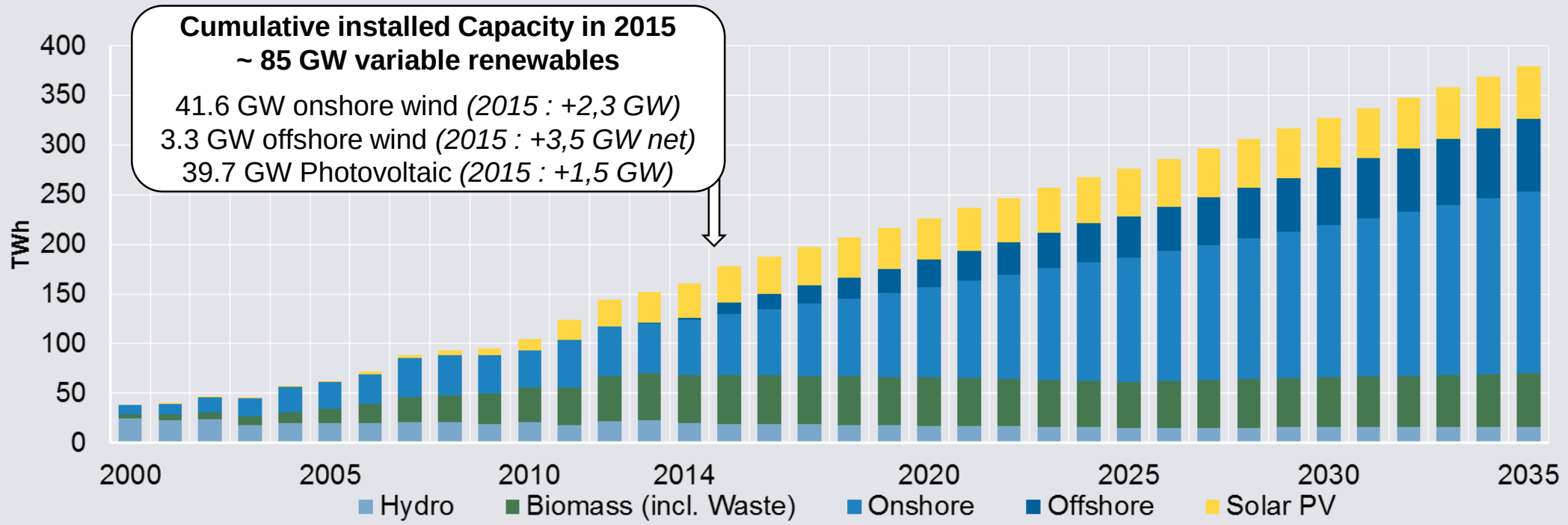
Gross electricity generation by fuel 1990 - 2014



AGEB (2015)

The key insight for the Energiewende: It's all about wind and solar!

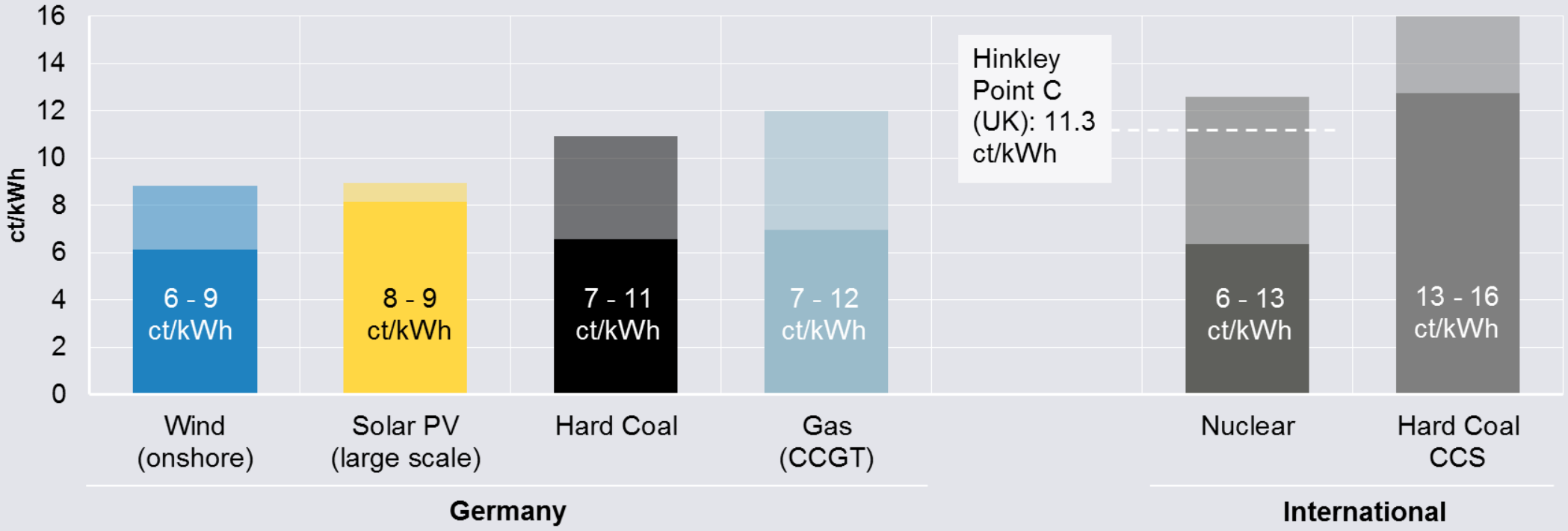
Gross electricity generation of renewable energies 2000 - 2035



2000 - 2014: AGEB (2015a); 2015 - 2035: own calculation on basis of BNetzA (2014)/BNetzA (2015b)

Wind energy and solar PV are in most regions of the world the cheapest low-carbon options and already cost competitive to newly built fossil power plants

Range* of levelized cost of electricity (LCOE) 2015



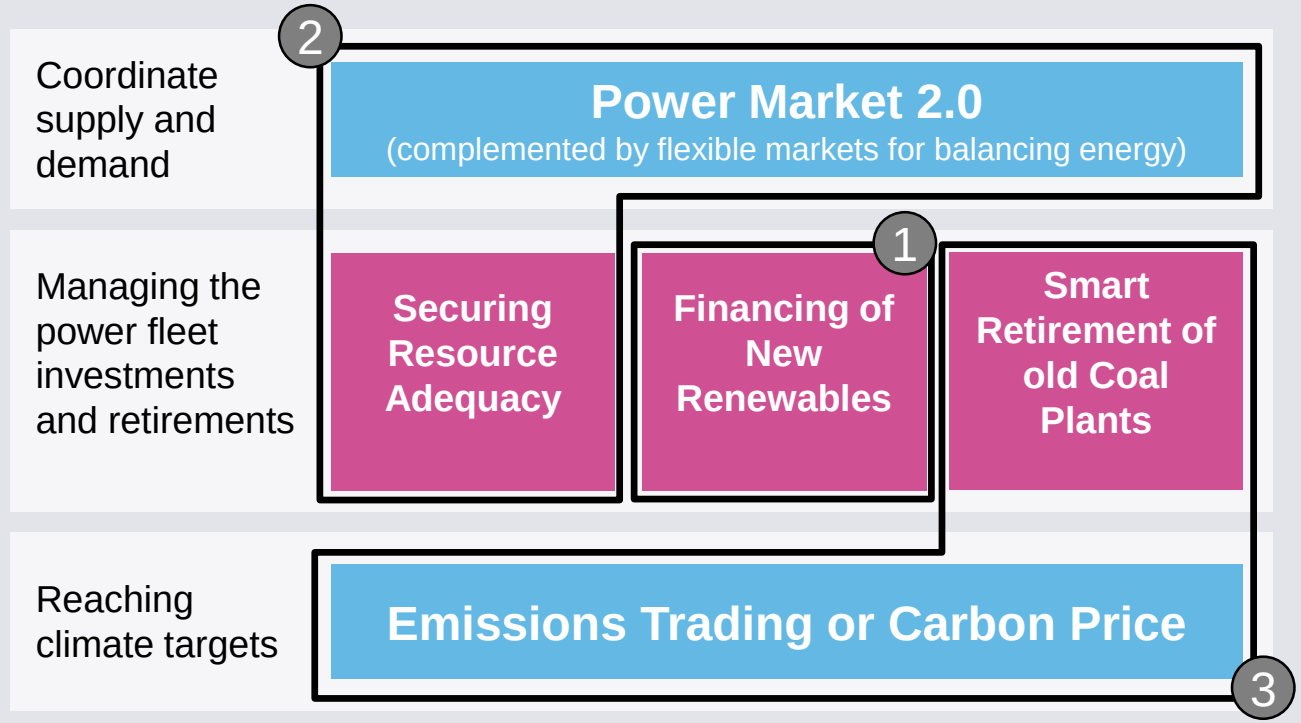
Agora Energiewende (2015e)

* based on varying utilization, CO_2-price and investment cost

New renewable energy policies : moving towards >50% renewables

Germany is currently refining its regulatory framework in order to achieve a reliable power system, with high shares of renewables and at low cost.

Schematic diagram of a new power market design



Own illustration

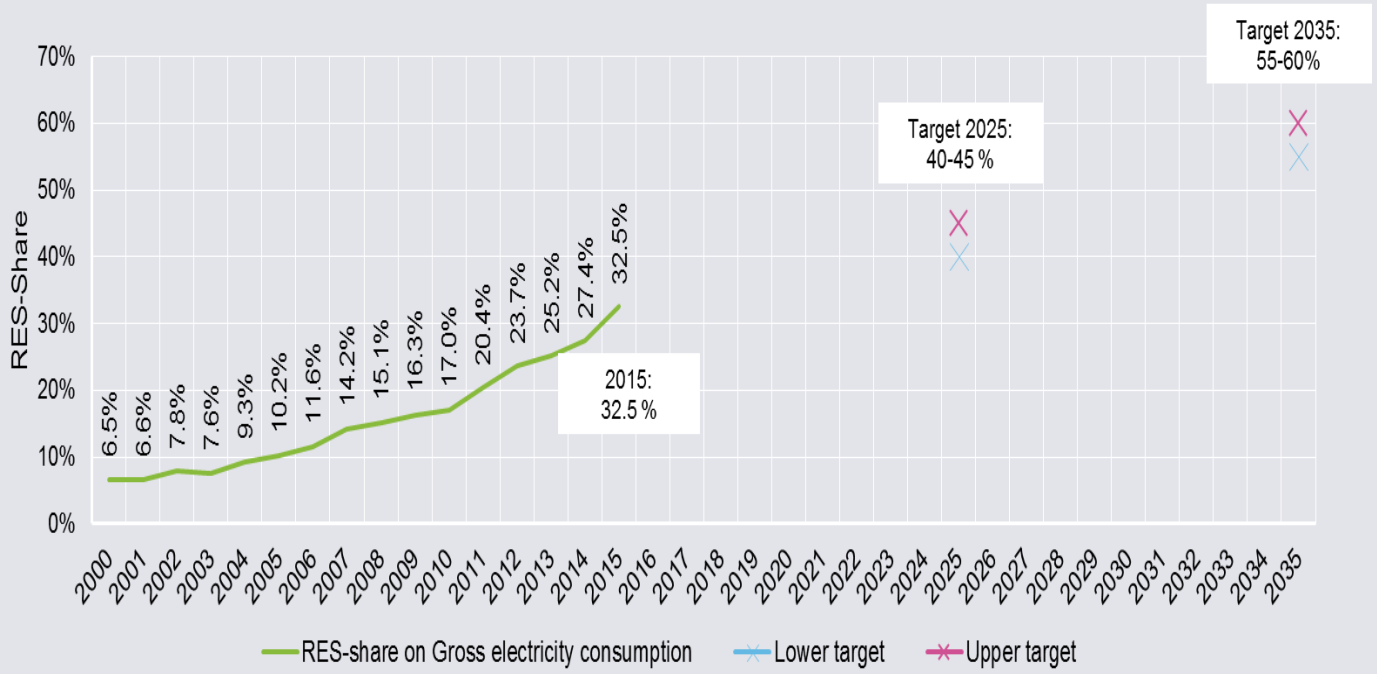
Five elements are needed in order to get a good market design for high shares of renewables. These elements should not contradict each other (e.g. capacity payments for old coal power plants), but be mutually supportive.

Recent and upcoming legislation improve the regulatory framework in this direction :

1. **Reform of the Renewable Energy Act** (EEG 2016)
2. **New electricity market law** → reliance on energy-only-market (EOM 2.0) + reserve to secure supply in emergency situations
3. **Climate Reserve (DE) and reform of the Emission Trading Scheme (EU level)** → "Entering the coal exit" but long-term coal phase-out plan is still missing (Agora proposal)

The Renewable Energy Act (EEG law) ensures a continuous and sustainable growth of renewable energy

Share of renewable energies in gross power consumption 2000-2015 and targets 2025, 2035



Setting long-term renewables targets allows actors to make efficient investment decisions (both for RES and non-RES)

Key objectives of the current and upcoming Renewable Energy Act (EEG law) :

- Paving the way for a sustainable and long-term growth of renewables
- Minimizing deployment costs (in 2016, the EEG Levy (EEG Umlage) reaches 6.354 cts€/kWh (i.e. 7.9 JPY/kWh)
- Maintaining actor diversity (especially citizen cooperatives and small projects developers)

AG Energiebilanzen 2015

Both the previous and ongoing reform of the Renewable Energy Act (EEG) foster market integration and increased competitiveness

Main principles of the Renewable Energy Act (EEG) 2014 and 2016 (starting 2017)

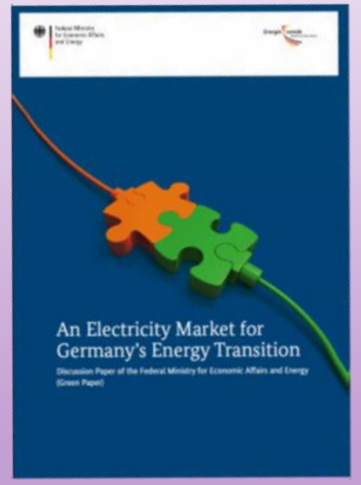
- FIT for small projects
- Mandatory direct marketing (FIP/CfD) for larger projects
- Remuneration to RES is adjusted automatically depending on the target achievement (yearly targets : +2,5 GW PV, + 2,5 GW wind onshore, + 800 MW wind offshore + 100 MW biomass)
- Discontinuation of FIT in periods of negative prices (>6h)
- Pilot phase for PV auctions (400 MW). Last round (Dec 15) delivered a remuneration of 8 cts/kWh (~ 10 JPY/kWh)
- Prosumers pay a small portion of the EEG surcharge / privilege for industrial consumers maintained

- An auction system attributes the remuneration (CfD) for all large PV and wind (onshore and offshore) projects (>1 MW)
- FIT remains for small installations
- Tailored auction for each technology (3-4 rounds a year, pay-as-bid, conducted by Federal Network Agency)
- Yearly capacity volume tendered in line with overall RES targets (PV – 500 MW, Wind onshore – minimum of 2 GW)
- Project fulfillment insurance (collateral to guarantee implementation, sanction when failure to respect commitments)
- Special prequalification regulation for facilitating the participation of citizen cooperatives in wind auctions

On the way to a new Electricity Market Law (*Strommarktgesetz)*

Green Paper

October 2014



White Paper

July 2015

Electricity Market Law

Fall 2015 - Summer 2016 (July)

Referentenentwurf

Entwurf eines Gesetzes zur Weiterentwicklung des Strommarktes (Strommarktgesetz)

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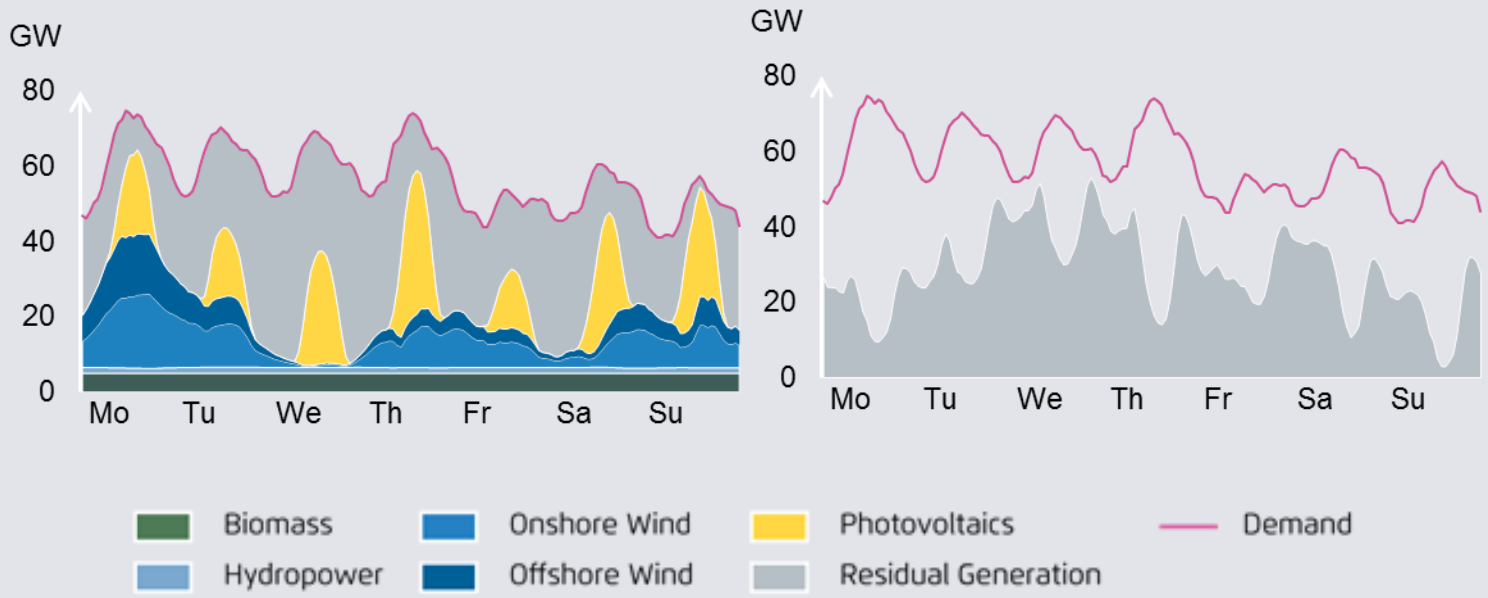
Flexibility is the paradigm of the new power system.

The new Electricity Market Law enhances the flexibility of the energy and balancing markets (EOM 2.0).

Electricity generation and consumption in a sample week with 50% RES share



Own calculations on basis of Agora Energiewende (2015b)

Key principles of the Electricity Market Law

The electricity market law reinforces the role of short-term markets → key coordination mechanism between the large number of actors (RES, fossil power plants, demand side, storage)

It enhances the flexibility of these markets, with short trading products (15-minutes), delivery close to real-time, and removal of price caps.

Balancing market design is refined (technology neutrality allowing access to DSR and RES) and balancing responsibilities are strengthened.

Better integration of markets across borders

The new Electricity Market Law introduces also new reserves to secure supply in ”emergency” situations (”belt and braces approach”)

Grid Reserve
- Security of supply and grid reliability (accounting for congestions in the grid)

INTERPLAY

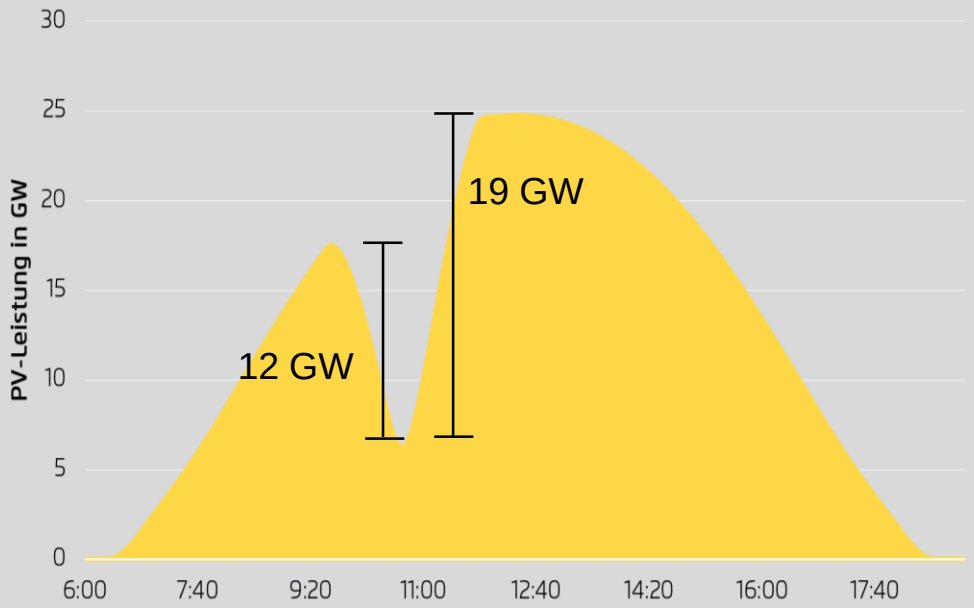
Capacity reserve
- Security of Supply (4.4 GW, through auction)
- Activated after market closure (only if no clearing prices on day-ahead)

„Climate reserve“
- Transition period: the capacity reserve has an additional function of ”climate reserve” (2.7 GW lignite for four years) to contribute to reduction in emissions

New!

Don‘t be afraid of the flexibility challenge: How Germany coped with the partial solar eclipse in March 2015

Solar power production on March 20, 2015



Agora Energiewende (2015): Die Sonnenfinsternis 2015

Due to the solar eclipse, electricity production from solar PV ramped down 12 GW within 65 minutes, and ramped up again roughly 19 GW within 75 minutes

These ramps are unusual today, but will occur frequently in 2030 in Germany, when roughly 50% of electricity will be produced by renewables

Electricity supply remained stable during the hours of the eclipse. Flexibility was traded in the intraday market.

Prices and volumes traded on the Intraday market, March 20, 2015

www.epexspot.com

How the flexibility challenge is met today: Fossil power plants reacting according to the wholesale power price in the 60%-RES-situation in December 2014

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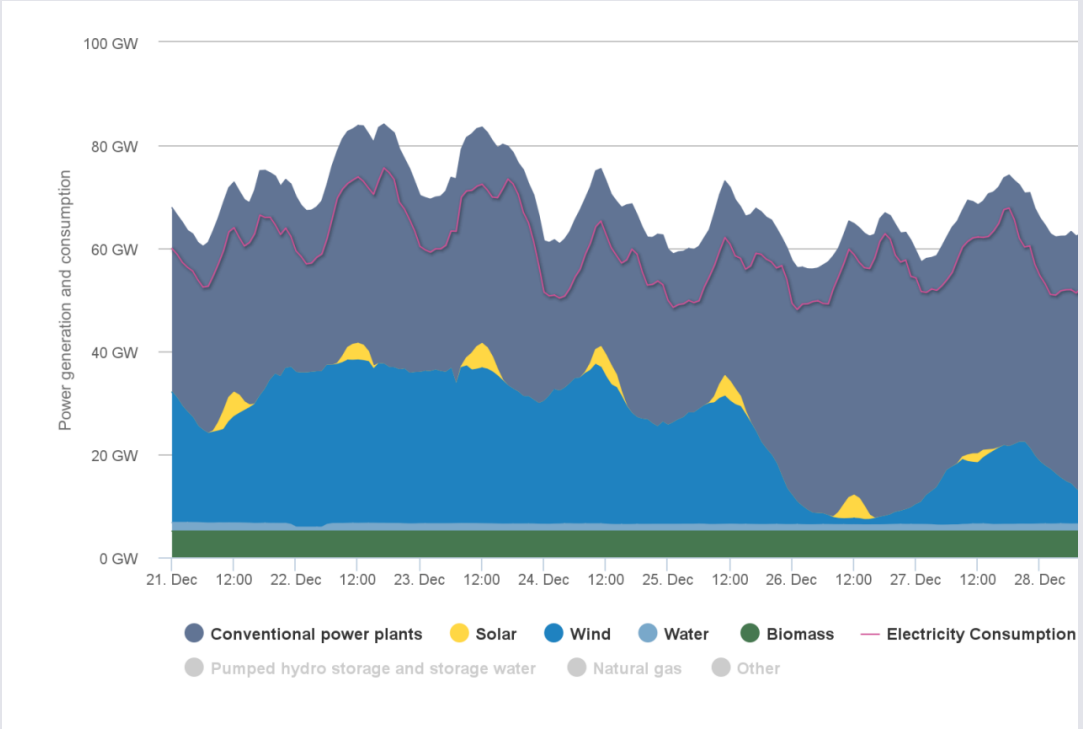
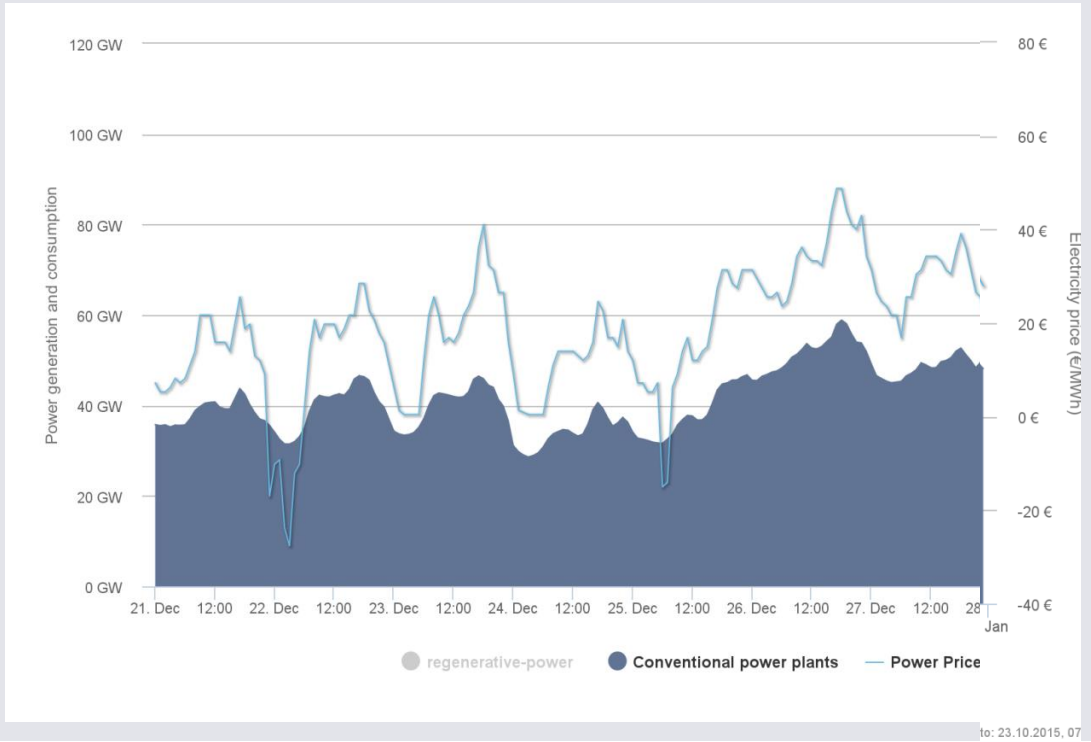
Demand and power production on December 21-27, 2014



www.agora-energiewende.org

Conventional power and spot market price on Dec 21-27, 2014



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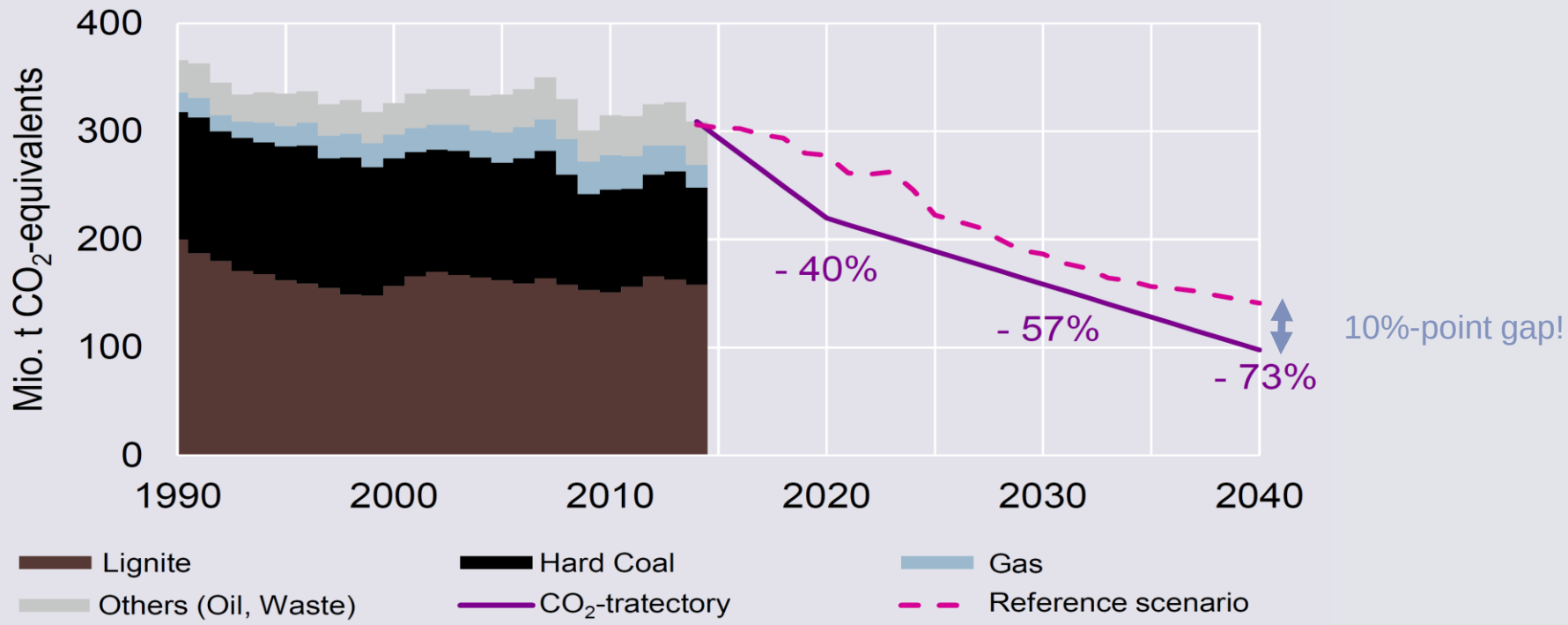
A gradual reduction of coal use is needed – in 2017, a “coal reserve” will be implemented, for 2030/2040 we need a “coal consensus”

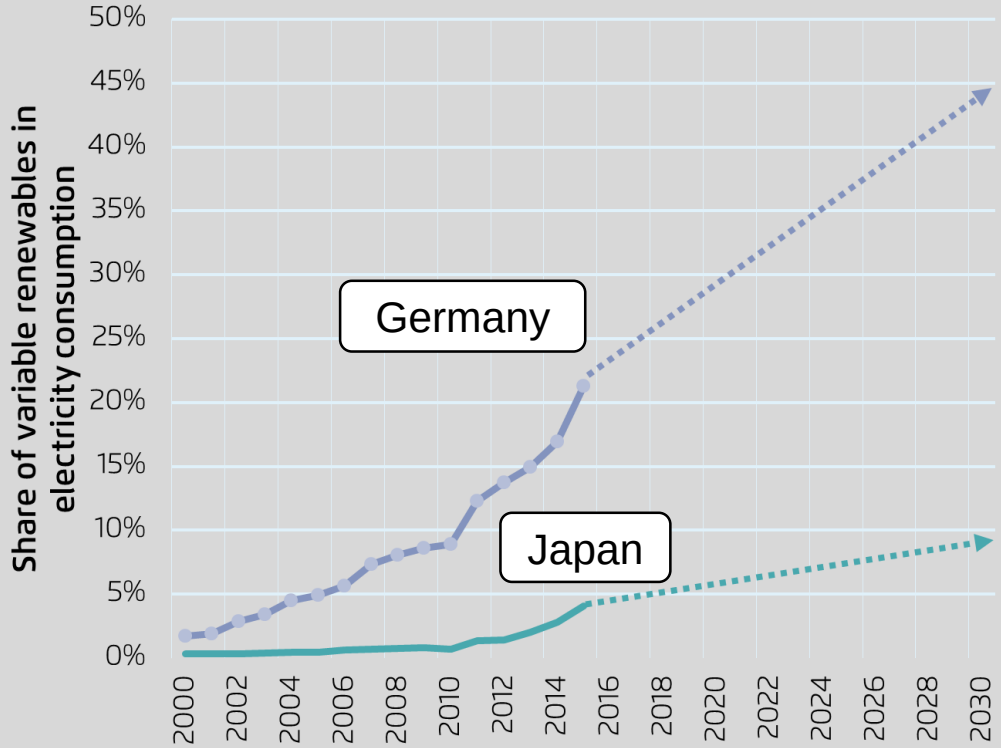
CO_2 emissions from electricity generation 1990 - 2014 and in scenarios 2015 - 2040



Agora Energiewende (2016), Enervis (2016)

To sum up : Germany on its way towards a highly flexible power system based on wind energy and solar PV. What about Japan?

Historic development of variable renewables in Germany and Japan and 2030 targets (based on government objectives)



IEA (data for 2015 runs until 11/2015), German and Japanese objectives (indicative)

The German energy transition is an ambitious industrial and societal transformation process, with clear political commitment and long-term targets. It benefits from a strong support within the German society.

The German Renewable Energy Act (EEG law) is the legislative corner stone of the Energiewende. The ongoing reform of the law fosters market integration and increases competitiveness.

Flexibility is the new paradigm of the power system. Competitive and liquid short-term markets are key to value this flexibility.

Reaching mid- and long-term German decarbonization objectives may only be met through a new consensus on the question of coal.

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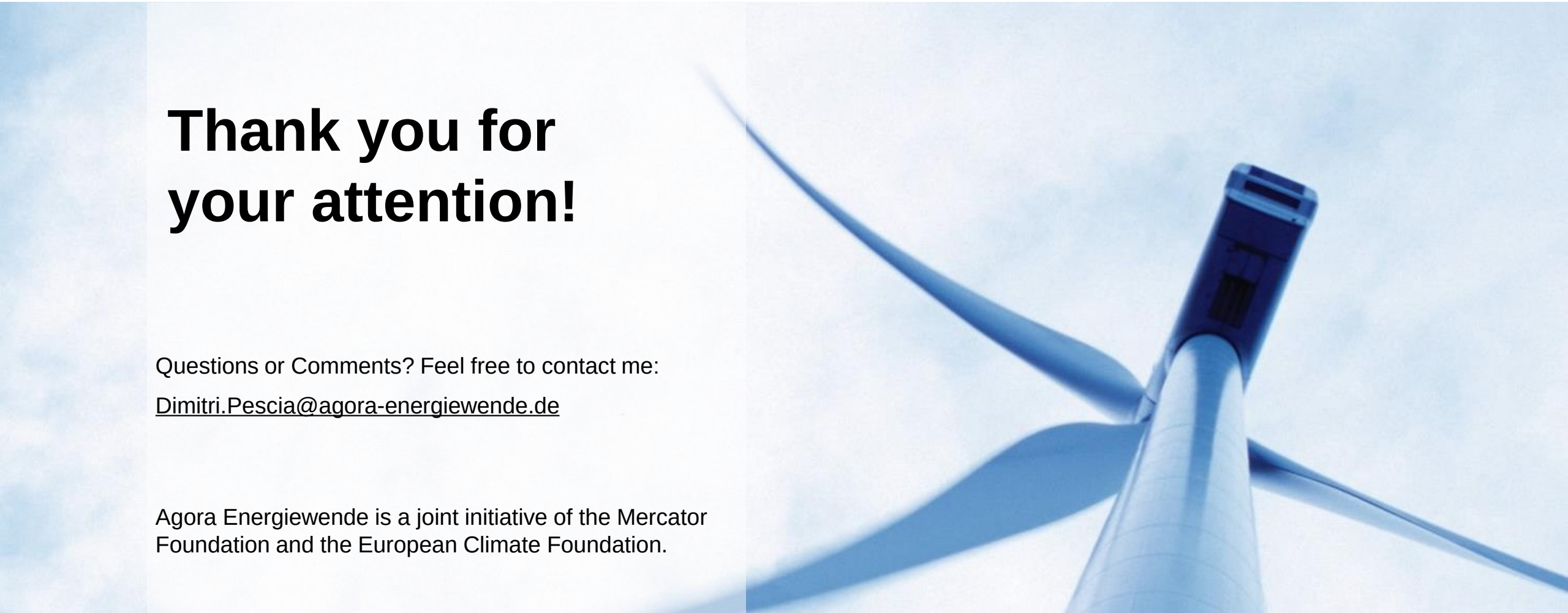

Thank you for your attention!

Questions or Comments? Feel free to contact me:

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Agora Energiewende is a joint initiative of the Mercator Foundation and the European Climate Foundation.

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