

Renewables integration in Germany

Status Quo and Main Takeaways

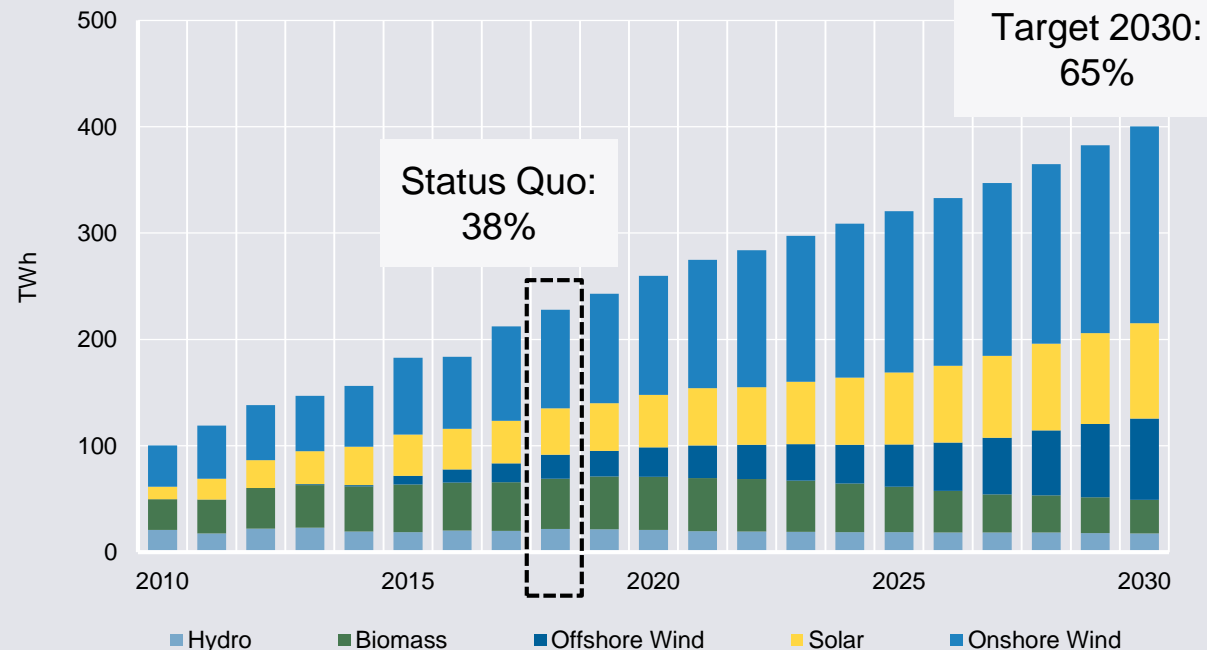
Dimitri Pescia, Agora Energiewende

GEIDCO Conference, 27.11.2019, Tokyo



The key insight for the Energiewende: 重要なのは風力と太陽光！ (It's all about wind and solar!)

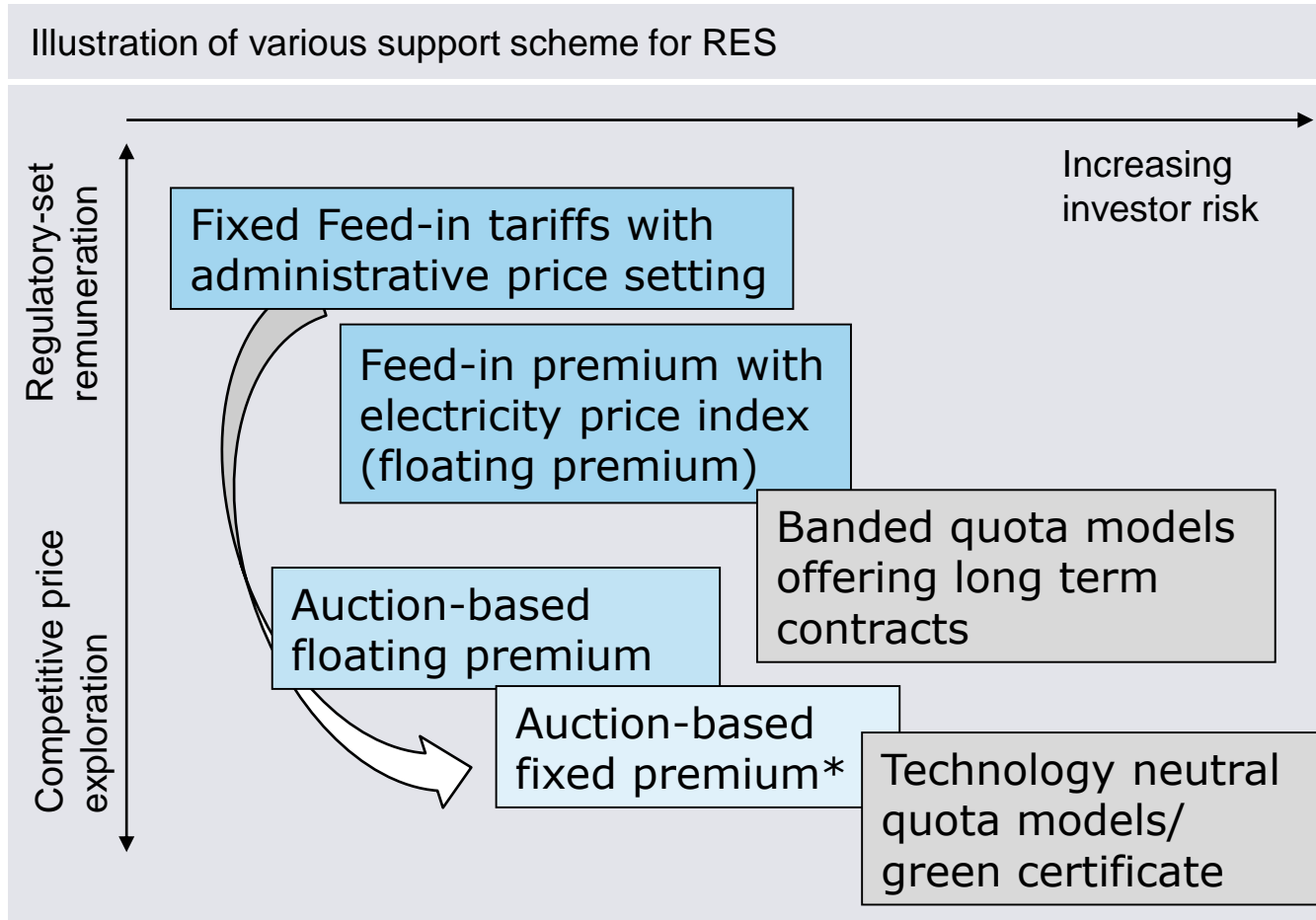
Gross power consumption from renewables, 2015 - 2030



- Share of RES in gross power consumption to grow to 65% in 2030.
- In 2018, 120 GW variable renewables installed (peak demand ~ 82 GW):
 - 54 GW onshore wind (+3 GW since 2017)
 - 6 GW offshore wind (+1 GW since 2017)
 - 46 GW PV (+3 GW since 2017)
- Good news : cost peak in 2021;
- Bad news : slower development of wind power than expected

AGEB, own calculations based on Öko-Institut

Takeaway #1 : Making renewables fit for the market



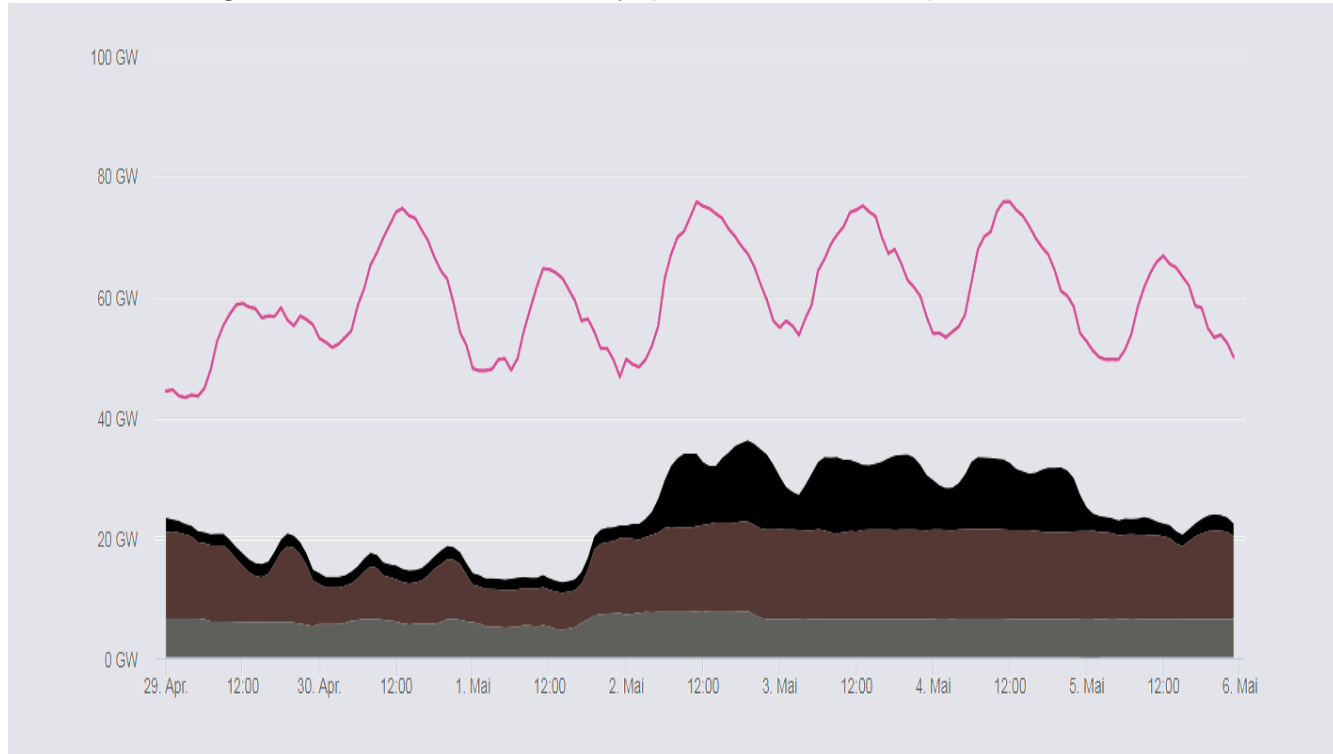
- Step by step integration of RES in system and market. Today, support scheme is FIP (through auctions) for large projects, FIT (for small projects)
- Renewables are balancing responsible parties → strong incentive to be balanced, RES generators active on the market
- Level of support needed to cover the revenue gap decreased, but support still relevant to reduce financing costs
- Growing interest in direct PPA, as well as prosumer models to finance RES

* Not general scheme. Pilot only

Takeway #2 : making markets fit for renewables

(1) Short-term markets help coping with the flexibility challenge

Power generation from nuclear, hard coal and lignite power plants and demand in a week with high renewables in Germany (29.04-06.04.2018)



Agora Energiewende (2018)

Prices on day-ahead, intraday and balancing markets are the key indicator for dispatch and investment decisions:

- inflexibility abated in market rules/products.
- Non-discriminatory market access to all technologies (also to RES, storage, DSR,..)
- Market design gradually aligned across borders

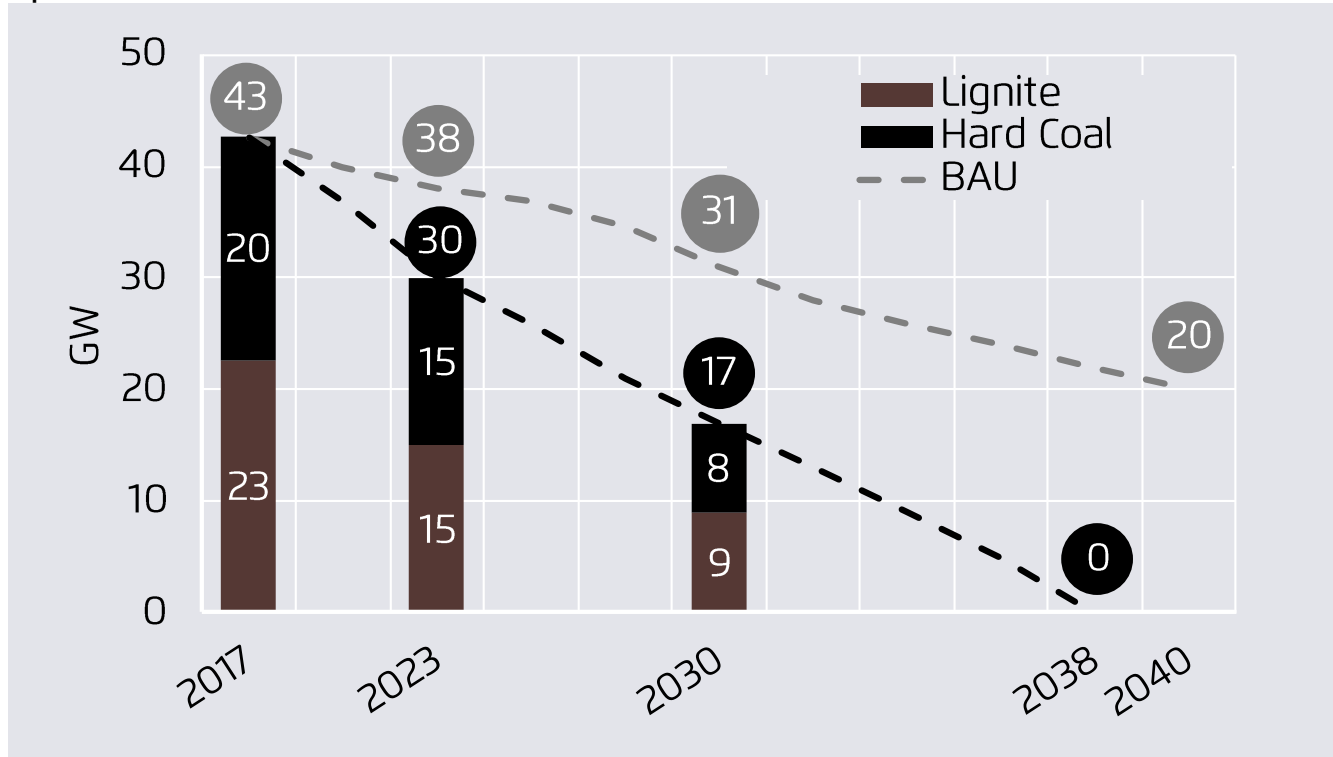
Prices reflecting real value of power incentivize flexibility provisions:

- Number and extend of negative prices decreased*
- Dispatched-based curtailment limited (but it remains as a consequence of grid congestions)

*134 hours of negative prices in 2018, for a minimum price of -14€/MWh)

Takeway #3. A coal-phase-out plan to reduce CO2 emissions and facilitate renewables integration

Installed coal capacities in the German coal consensus path and BAU path



Agora Energiewende (2016)

- Adoption of a coal phase-out plan (end date 2038 at the latest), including comprehensive compensation measures and support from the federal budget (69-93 €bn until 2038)
- National managed retirement of old, high-carbon, inflexible coal capacity is the prerequisite for successful market integration of RES. it support the shift to a more flexible production mix
- Increasing share of flexible resources and decreasing share of inflexible resources should go hand in hand with a growing RES

Takeaway #4 : Optimizing cross-border system integration, grid operation and grid planning

EU power flows (yearly import/export in TWh) in 2017 and 2018



EU power system integration “success story”:

- gradual cross-border alignment of market rules
- guarantees security of supply at lower costs
- minimize flexibility challenges due to “smoothing-up” of RES generation

But national grid expansion remains slow:

- In Germany, ~6TWh of RES curtailment and increasing redispatch due to congestions.



Innovations to better align VRES and grids:

- RES peak shaving in grid planning (up to 3% of energy output)
- “Grid-friendly” placement of new VRES (zoning in RES auctions, potential price zones split?...)

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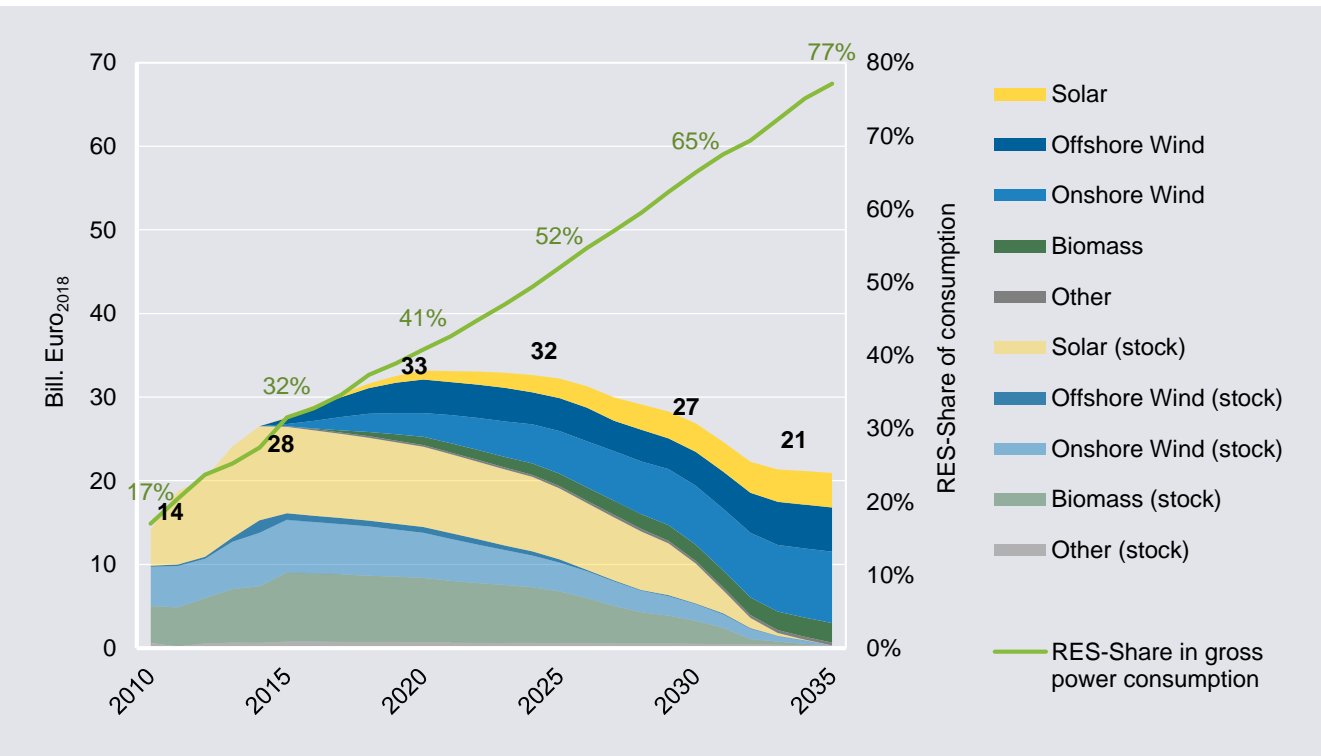
Questions or Comments? Feel free to contact me:
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The good news : costs for supporting renewables is likely to peak in 2021

Compensation for plant operators 2010 – 2035 (with 65 per cent RES target)

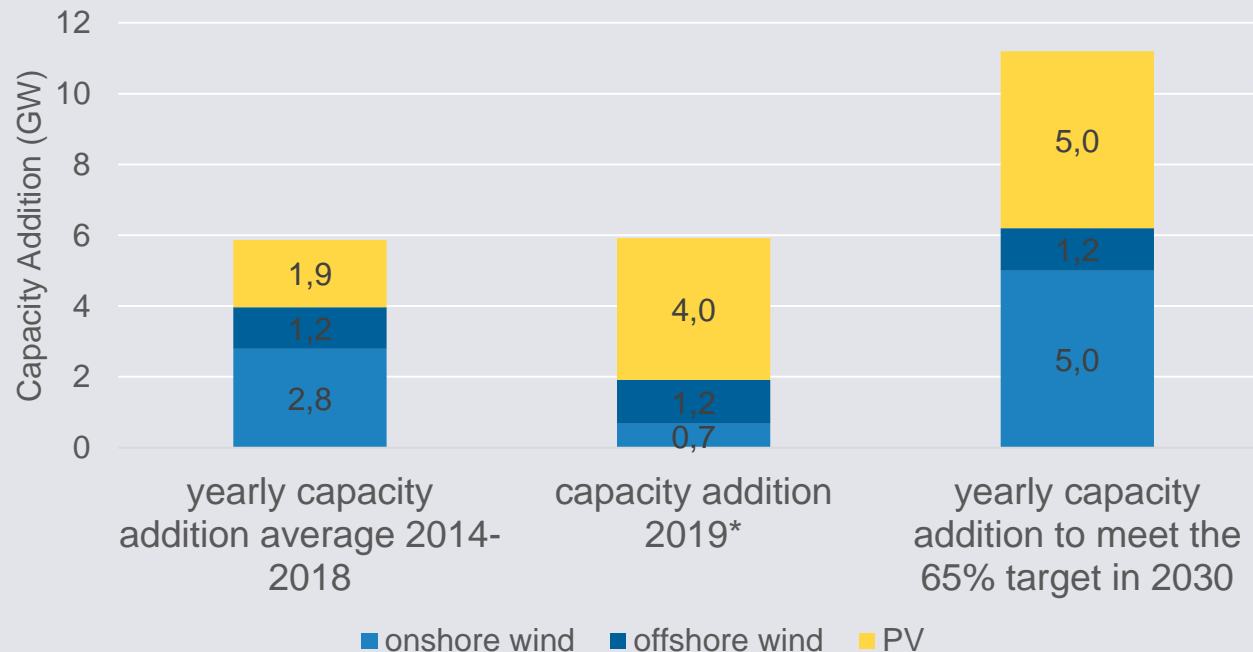


Own projections based on Öko-Institut

- Cost peak expected in 2021.
- Reasons:
 - New RES became cheaper
 - Old plants exiting the support scheme after 20 years
 - Emissions trading system makes power generation from fossil fuels more expensive.
- In 2030, Germany will have twice as much renewables as today (65%) for a cost lower than today

The bad news : current RES deployment clearly not on track to reach the 2030 target

Yearly capacity addition of wind and solar power in Germany (GW) - historic trends, expected growth in 2019 and capacity needed to meet the 65% target

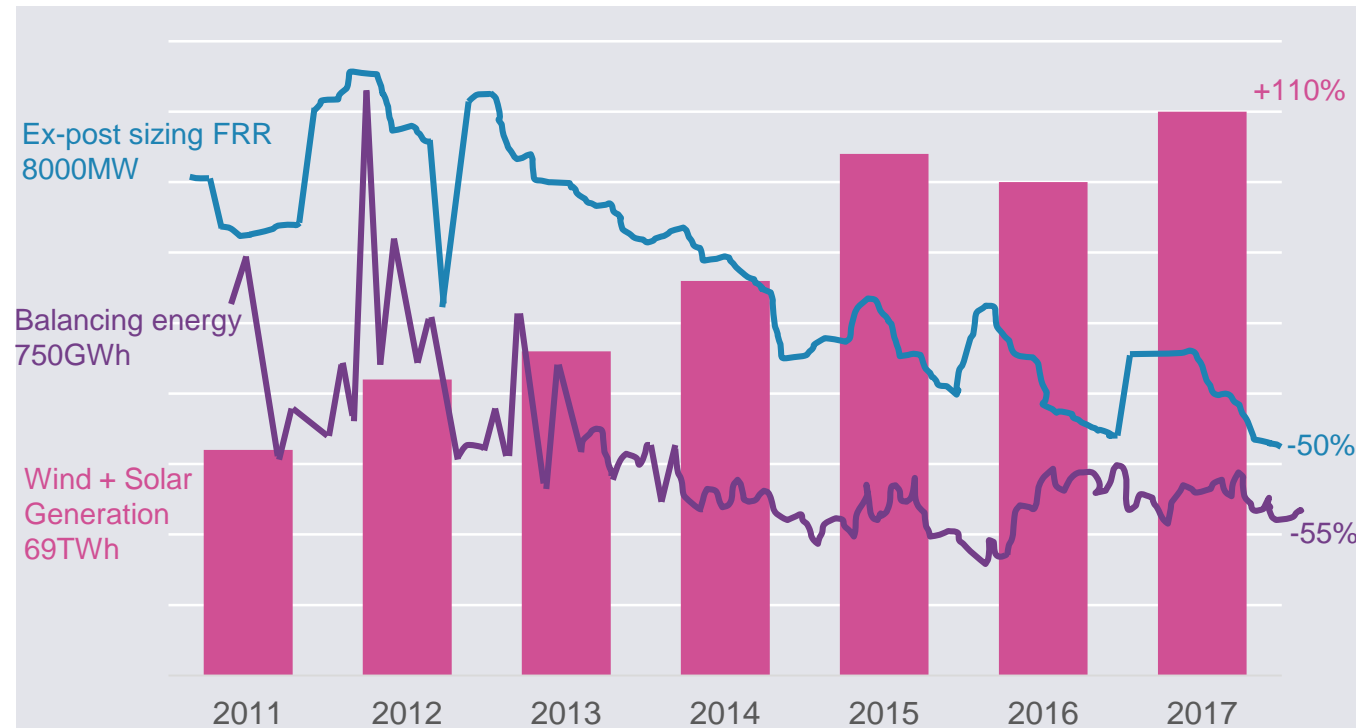


- Annual RES deployment of 10 to 12 GW needed to reach 65% in 2030.
- Current reform:
 - higher offshore target (20 GW in 2030)
 - lifting the cap on solar PV
 - easing permitting for onshore wind
- But progress are slower than expected for onshore wind : stricter minimum distance rules, too slow permitting procedures and acceptance issues

* Extrapolation based on BMWi (2019), BSW (2018), IWR (2019), FA Windenergie Land (2019), Own calculations

Takeway #2 : making markets fit for renewables (2) balancing markets can outweigh the impact of increasing renewables

Balancing reserve and cost development in Germany since 2008



Adapted from Hirth et al. (2018)

RES producers are balancing responsible parties → strong incentive to respect their schedule.

Balancing costs have decreased by 50% between 2008-2017, while vRES capacity has been multiplied by three.

Reasons:

- TSO cooperation (larger geographies)
- competitive balancing power markets
- Improvement of forecasts
- More liquid spot markets