Some Views on Integrating Renewable Energies

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Framework 2030

→The EU-2030 target (27% of RES) in fact means: Roughly 50% of electricity will origin from renewable sources

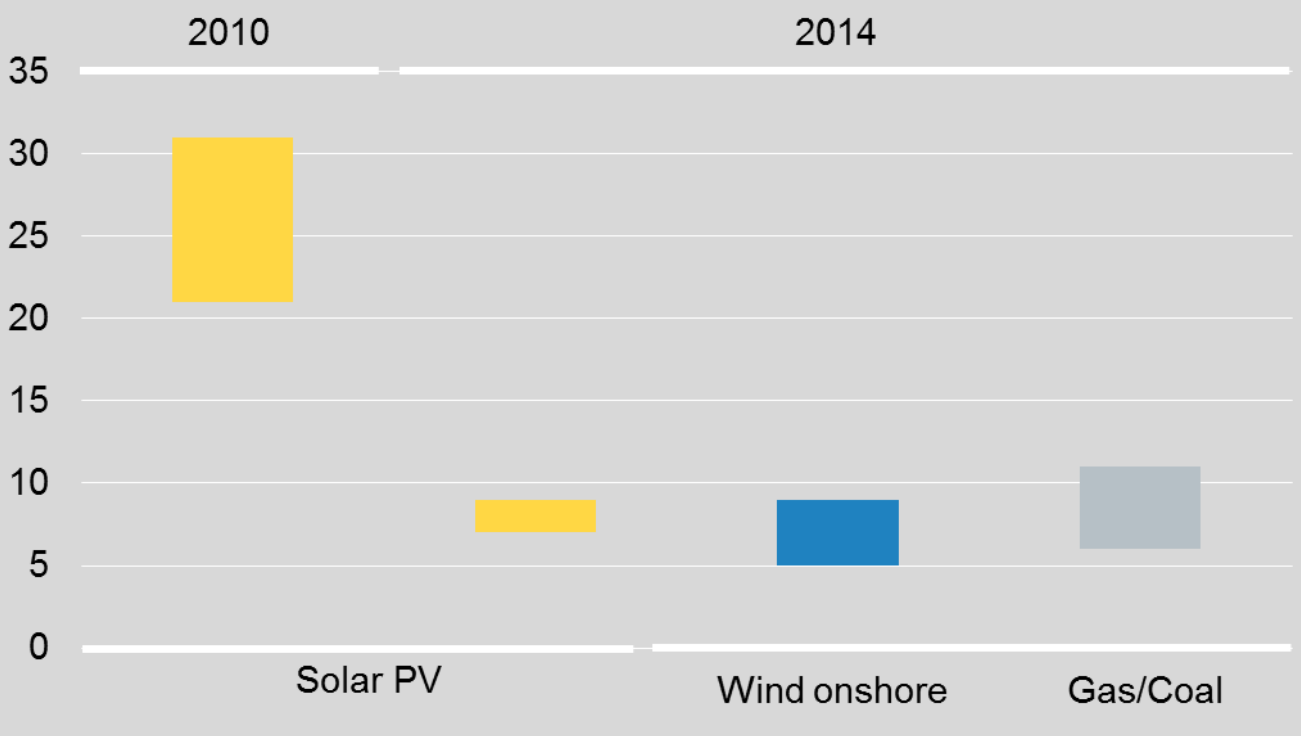
→Roughly 30% will be wind and solar PV

→This means a fundamental shift of the energy system: from dispatchable generation capacity to fluctuating power supply

→Integration of vRES comes at only little cost

Solar photovoltaics is today a low-cost technology (on same levels as new wind, gas and coal)

Cost of electricity of new ground-mounted PV power plants in Germany, ct/kWh



Own calculations

→ Cost of power produced by solar photovoltaic in Germany fell dramatically to below 9 ct/kWh

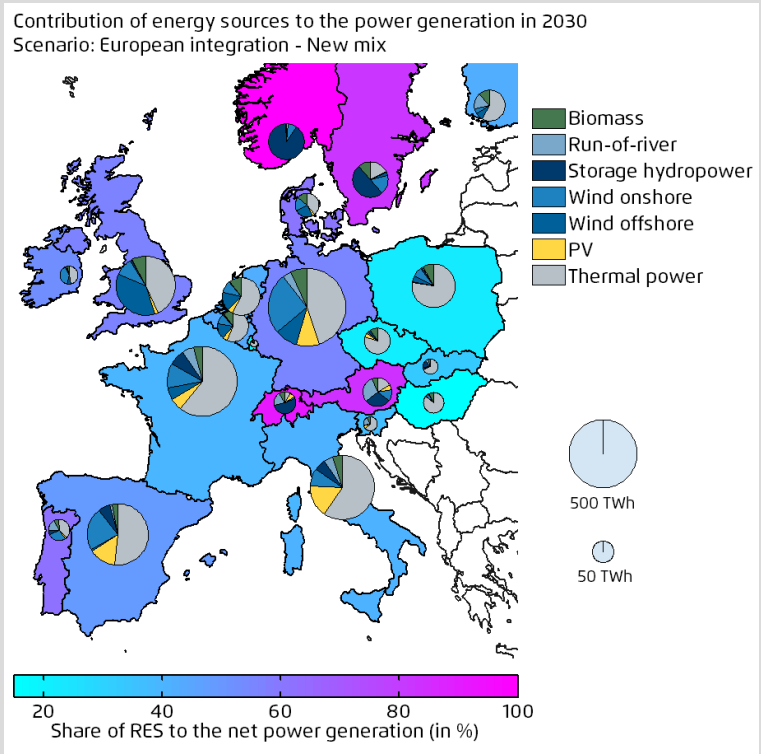
→ Today, photovoltaic is competitive with wind onshore and new fossil power plants for new investments

→ In Southern and Central Europe, the costs of PV range between 6.5 to 8.2 ct/kWh in 2015

→ In Dubai & Uruguay, costs of 5-7ct/kWh are reported

“It´s Wind and Solar” is not only a German story, but also a European one

Share of renewable energy sources in the “EU” generation mix 2030



Fraunhofer IWES (2015); Assumptions based on national energy strategies and ENTSO-E scenarios in line with EU 2030 targets

→ RES will cover almost 50% of the EU power mix in 2030 – according to the EU 2030 framework and national energy strategies. **Roughly 30% will be wind and solar PV.**

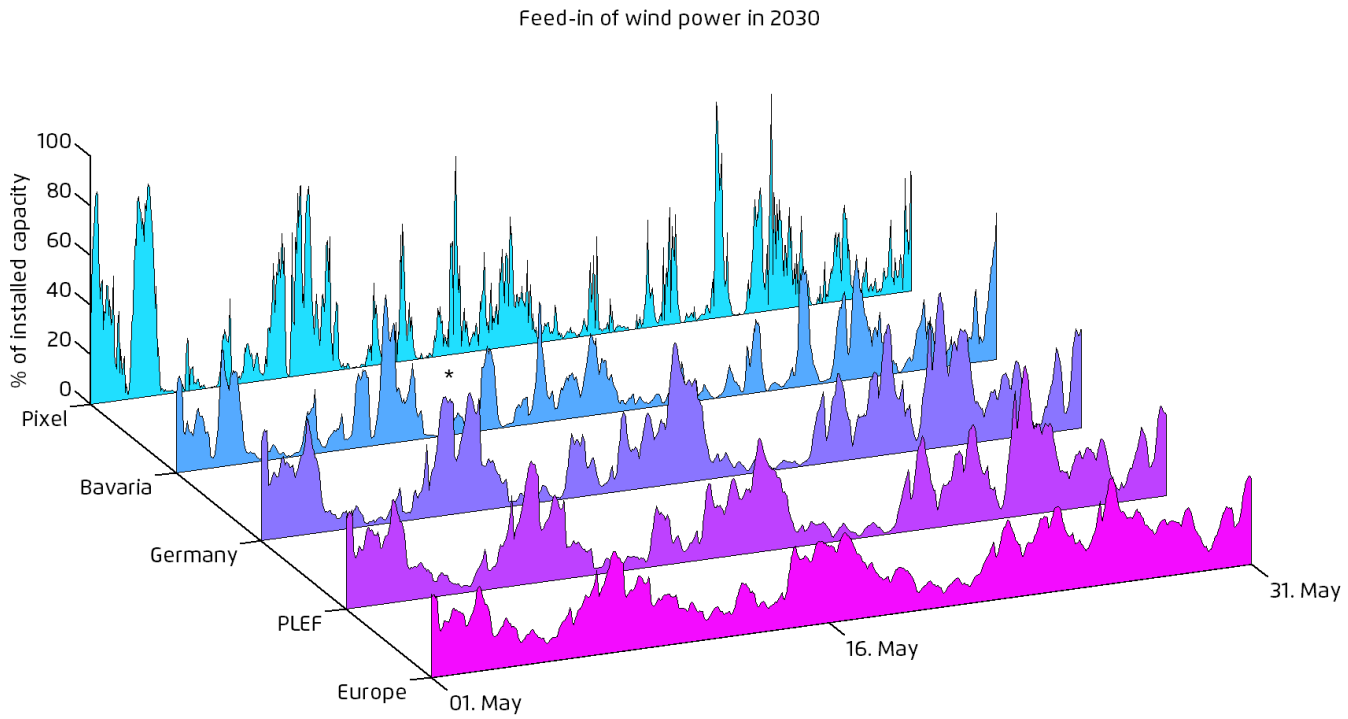
→ Most countries in Europe will therefore face a similar flexibility challenge than Germany

→ European and regional integration mitigates the flexibility needs from increasing wind and solar PV.

Distributed Wind Energy + Grids = Integration

Cross-border (and national) electricity flows enable geographical smoothing and mitigates flexibility needs

Wind onshore generation in May 2030 at different levels of aggregation



Fraunhofer IWES (2015)

* One pixel is equivalent to an area of 2.8 x 2.8 km

→ Instantaneous total wind power output is much less volatile at a high level of aggregation

→ EU-wide (hourly) wind ramps larger than +-5% of installed capacity occur during only 23hrs of the year

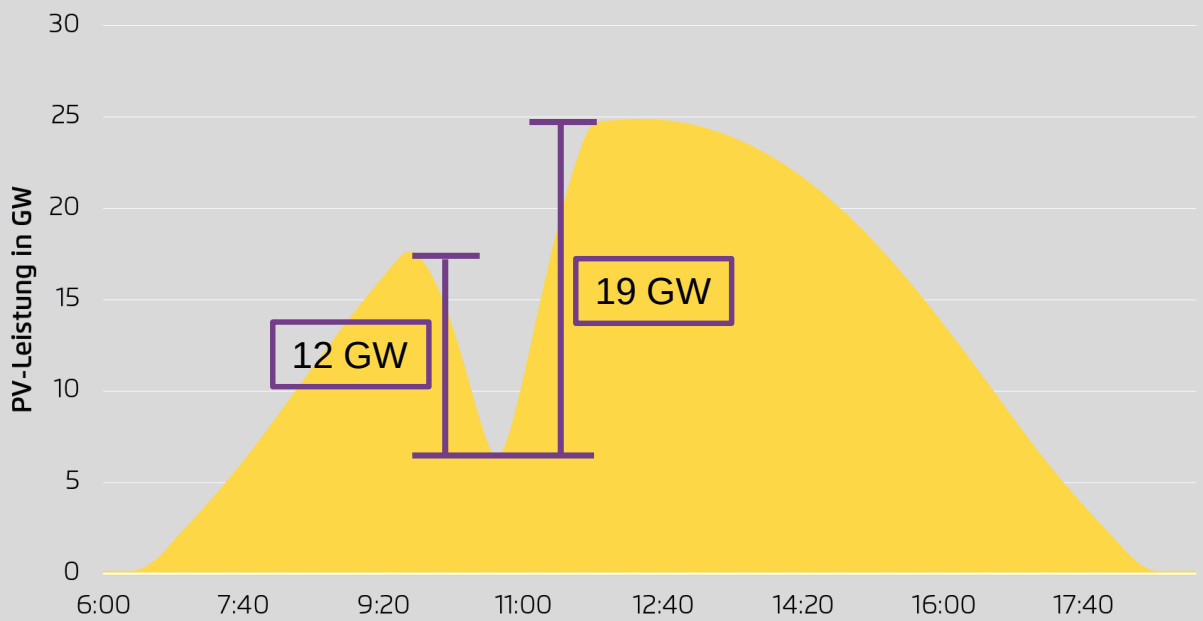
→ The largest EU-wide wind ramp is -10% of installed capacity (for comparison, largest wind ramp in France is +21%)

→ Wind output changes softer and slower and lacks extremely high and low values. This contributes to lower flexibility requirements

And there is plenty of flexibility

Solar Eclipse 2015: Huge solar ramps were covered by import/export and conventional plants

Electricity generation from solar PV in Germany on 20 March 2015



Own illustration; EEX data

→ During the solar eclipse on 20 March 2015: German solar PV ramped down 12 GW within 65 minutes, and up again roughly 19 GW within 75 minutes.

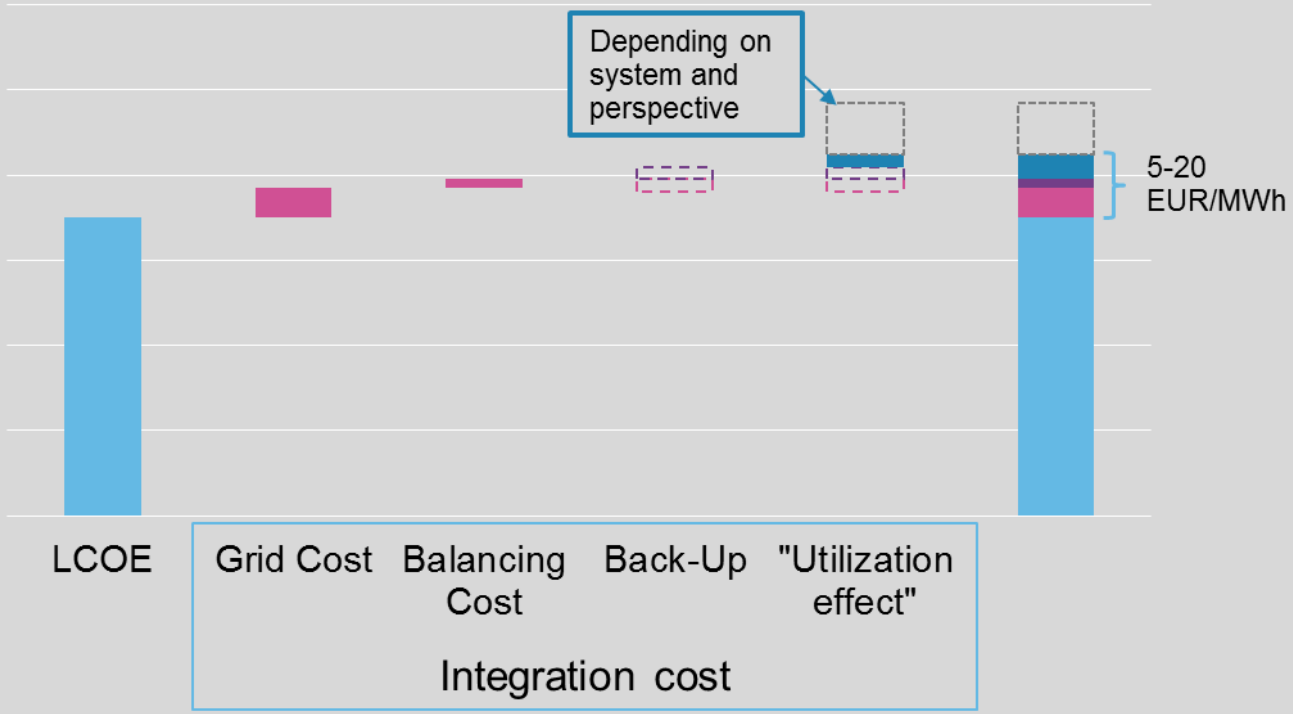
→ No shortages in the German power system occured. The system remained stable.

→ These ramps are unusual today, but are expected frequently in 2030 in Germany, when roughly 50% of electricity will be produced by Renewables (according to current law).

Flexibility/Integration comes at only little cost

It does not change the overall picture in a system in transformation

From Levelized cost of energy generation (LCOE) to total system costs



Agora (2015)

→ Agora launched a project to structure the discussion on the “integration costs”, aiming at capturing the economic impact of integrating vRES into power systems.

→ Integration costs for grids and balancing are rather well defined and small (+5 to +15 EUR/MWh)

→ Costs of interaction between vRES and the residual power plants are controversially quantified and attributed.

→ Comparing total system costs of different scenarios can be more appropriate to support the discussion

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Thank you for your attention!

Questions of Comments?
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