# Operation and repowering in the context of the energy transition: Challenges for the future electricity mix

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# Agenda

1. Role of wind power for the energy transition
2. Wind capacity leaving remuneration mechanisms
3. Recent developments on the electricity markets
   - 4.1. Price development
   - 4.2. Market design changes
   - 4.3. Reserve power markets considering wind
4. Conclusions

# Role of wind power for the energy transition

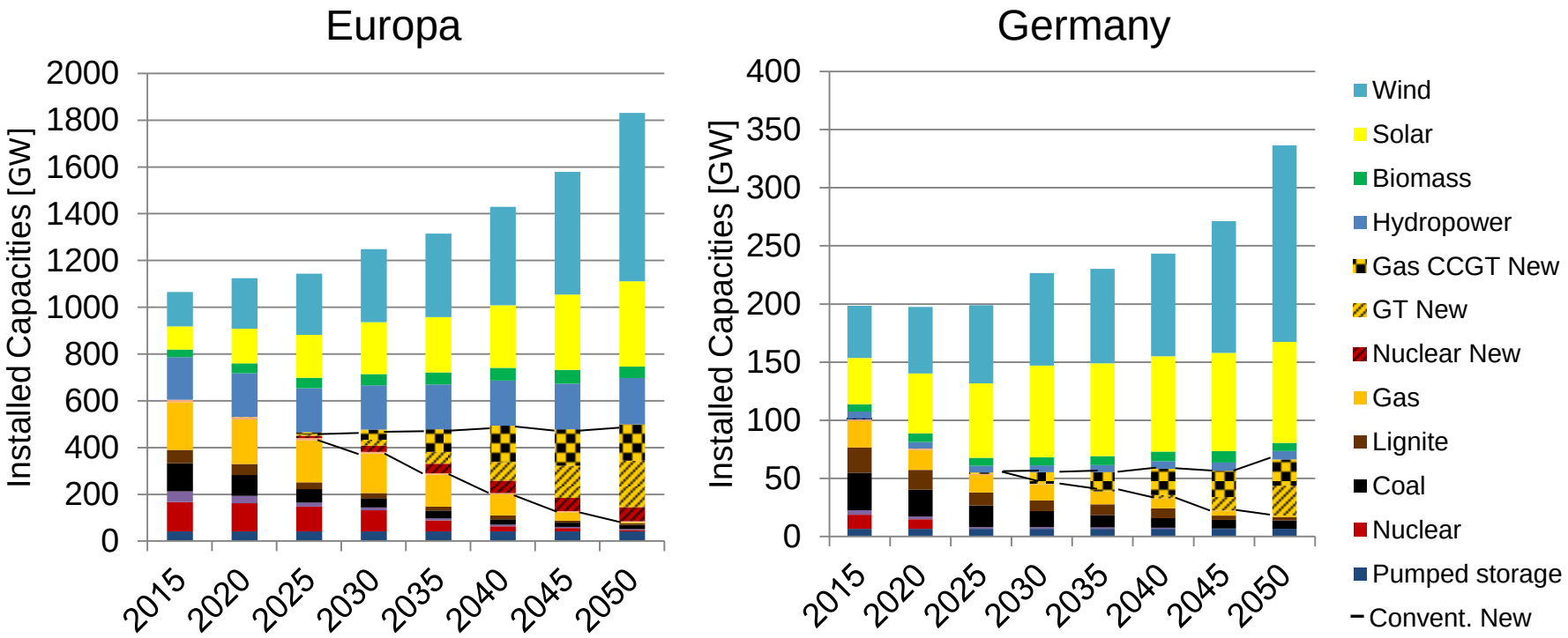
- Energy policy targets:
  - European Union aims to reduce greenhouse gas (GHG) emissions by 80% in 2050 compared to 1990 emissions
  - Germany and France have ambitious targets for GHG reduction and renewable exploitation

| Targets | France | Germany |
|---|---|---|
| GHG 2030 | -40% | -55% |
| GHG 2050 | -75% | -80% overall,<br>-90-95% (electricity) |
| Energy consumption | -50% (overall) | -80% (heat sector)<br>-40% (transport) |
| Renewable share<br>in 2030<br>In 2050 | 32% (final energy) | 50% (electricity mix)<br>80% |

- Renewable energies play a major role for GHG emissions reduction

# Role of wind power for the energy transition

## Cost optimal scenario achieving $CO_2$ targets

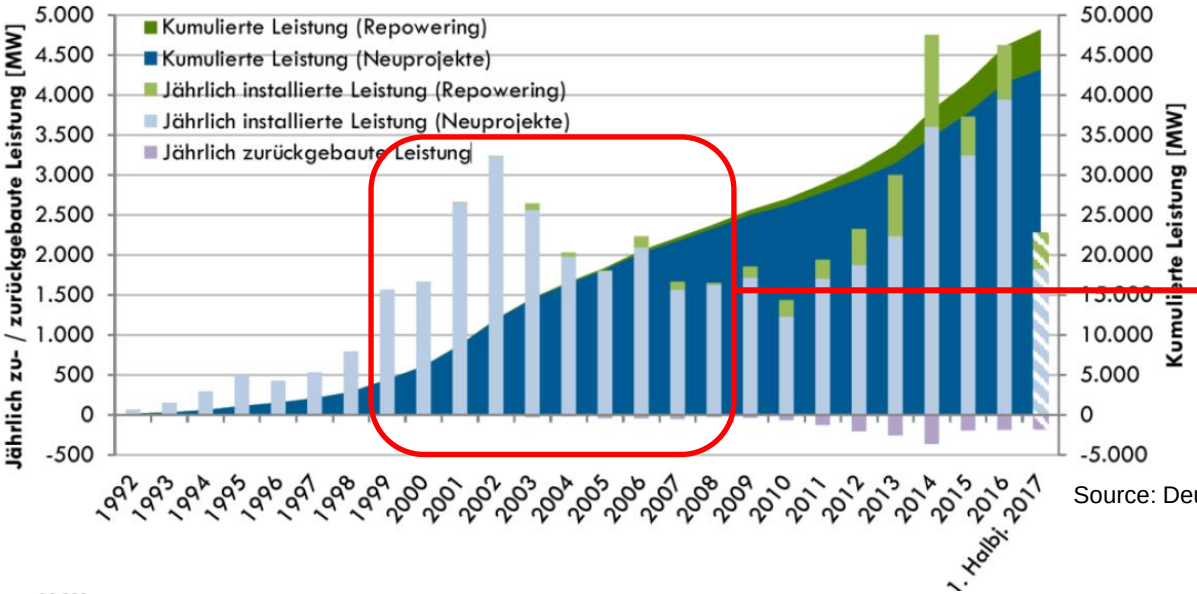



Source: DESK project, 2018

- Energy transition and achieving $CO_2$ reduction targets requires a high renewable share in Europe and Germany
- Wind power has the highest share among RES

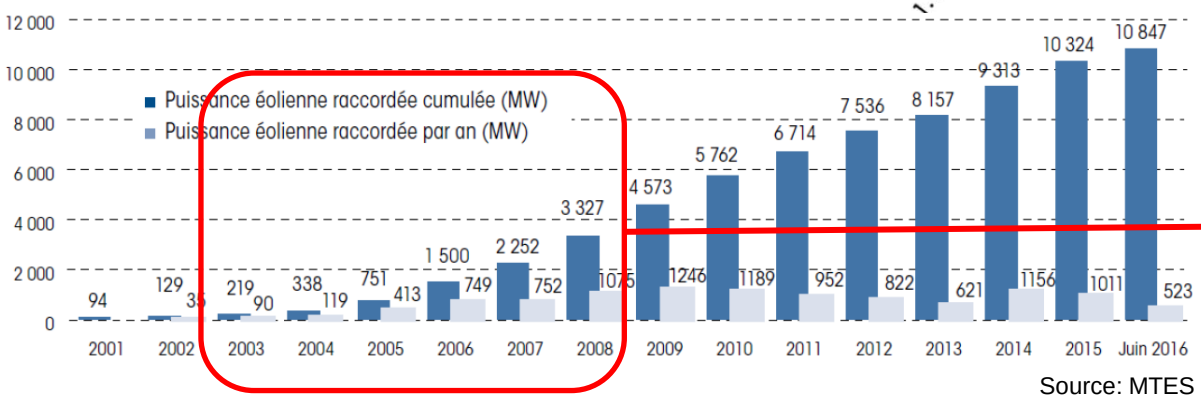
# Wind Capacity Leaving Remuneration

Development of installed and added wind capacity in Germany (top) and France (bottom)




Germany: More than 20 GW will be older than 15 years by 2023

Source: Deutsche WindGuard




France: Around 3 GW will be older than 15 years by 2023

Source: MTES

# Price development in CWE

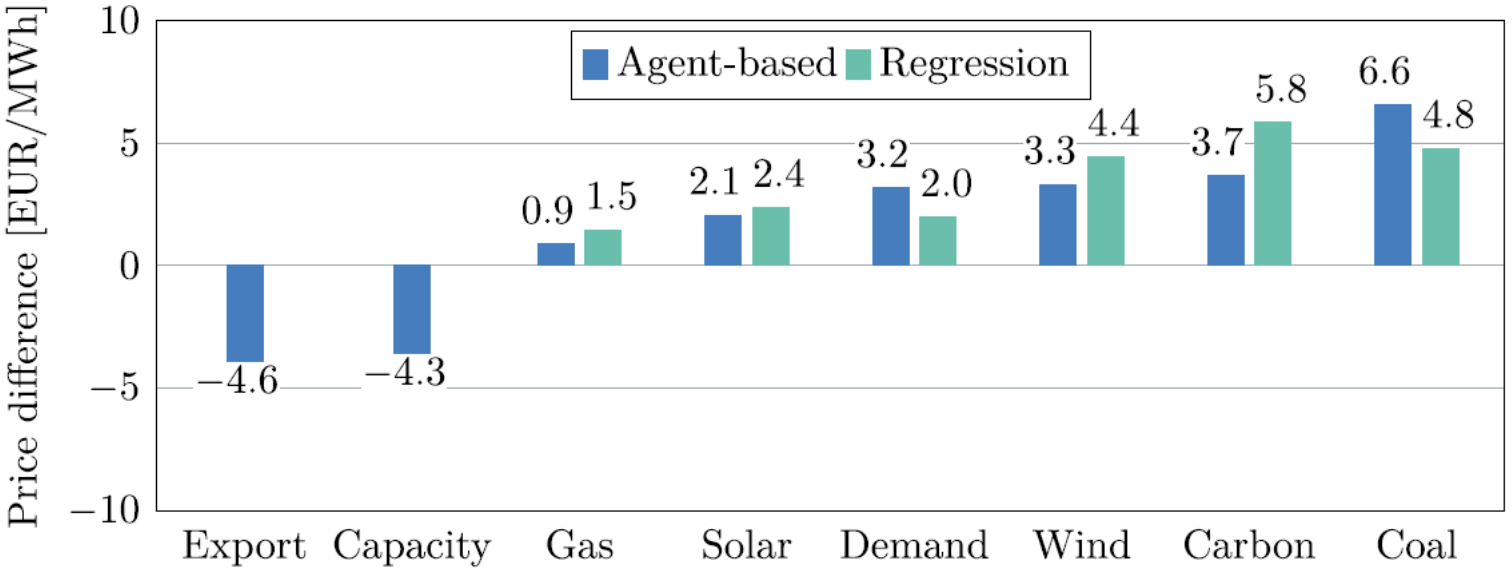
| [€/MWh] | CH | | DE | | FR | |
|---|---|---|---|---|---|---|
| year | Mean | Std | Mean | Std | Mean | Std |
| 2011 | 56.18 | 13.65 | 51.12 | 13.6 | 48.89 | 16.15 |
| 2012 | 49.52 | 21.19 | 42.6 | 18.69 | 46.94 | 37.29 |
| 2013 | 44.73 | 18.83 | 37.78 | 16.46 | 43.24 | 20.34 |
| 2014 | 36.79 | 12.82 | 32.76 | 12.78 | 34.63 | 13.91 |
| 2015 | 40.30 | 13.15 | 31.63 | 12.66 | 38.48 | 12.95 |
| 2016 | 37.88 | 16.78 | 28.98 | 12.48 | 36.75 | 24.44 |

Source: EPEX Spot data

- Strong decline not only of mean level,
  - → Profitability of power plants and energy storages got worse
  - → The market value of wind is even smaller due to the merit order effect, (wind power can rarely earn profits in peak price hours)

# Main drivers of price decline in Germany

- Price difference with c.p. analysis (one fundamental fixed to 2011) compared to 2015 price level

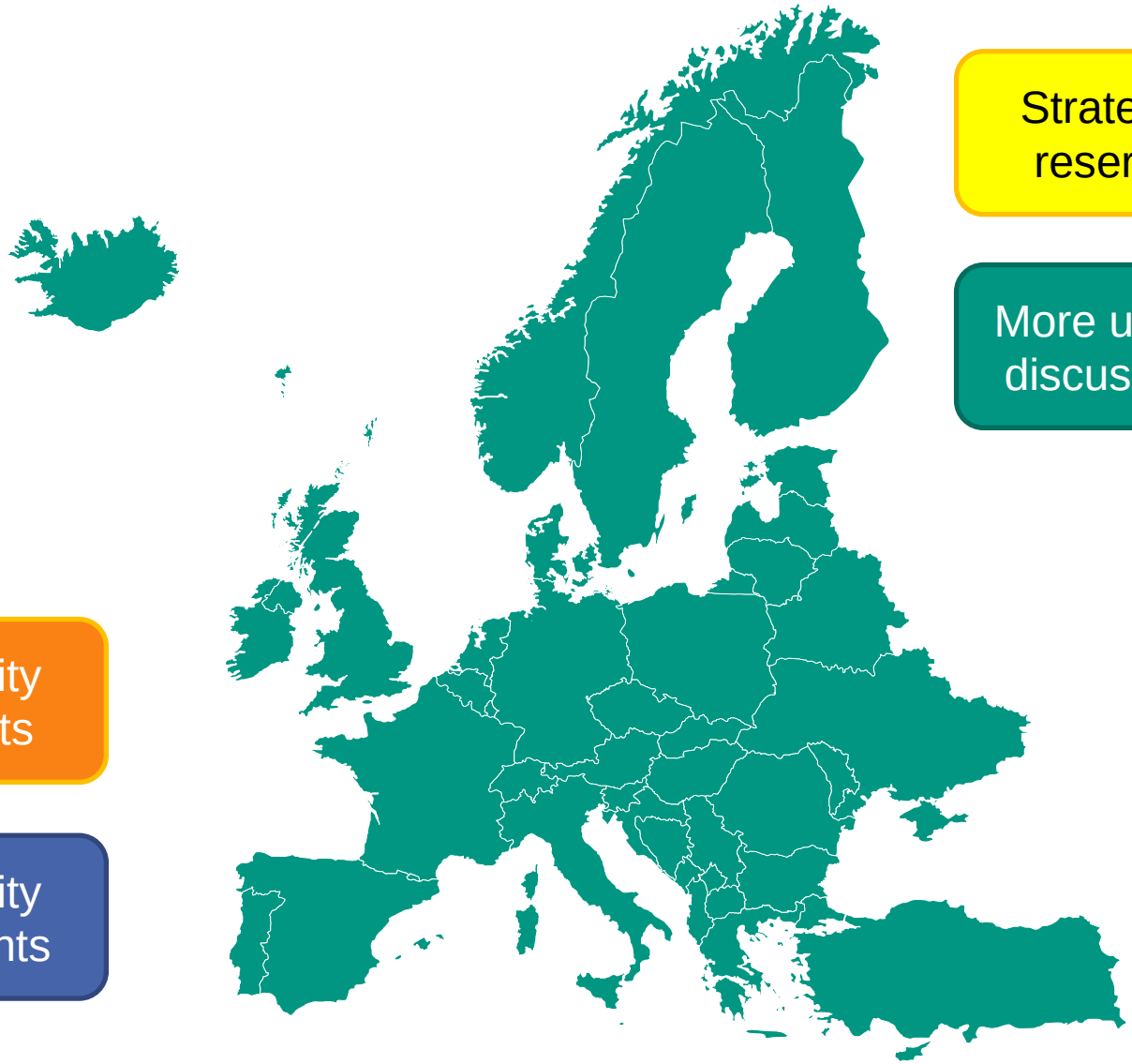



Source: Bublitz et al. (2017)

$CO_2$ and coal price decrease (-54% and -35% resp.) are major source of electricity price decline

→ Price recovery very likely if $CO_2$ and coal prices increase again

# Market design changes in Europe



Strategic reserve

More under discussion

Capacity markets

Capacity payments

Quelle: Eurelectric 2016

# Reserve Power Markets Considering Wind

- German Reserve Power tendering scheme will be changed in July 2018
- Major changes for secondary reserve (aFRR):
  - Gate closure: weak ahead to day ahead
  - Bid volume: reduction from 5 MW to 1 MW
  - Product duration: 4-h-time slices instead of HT and NT (Peak and Off-Peak)
  - → Enabling market access for smaller players and RES with limited predictability – particularly for wind power

- Future revenue potential difficult to estimate due to two-part auction and expected changes

| Weighted average capacity price per auction [€/MW*week] | 2016 | 2017 |
|---|---|---|
| Negative SR HT* | 21.86 | 15.59 |
| Negative SR NT** | 129.23 | 157.20 |
| Positive SR HT* | 263.36 | 151.68 |
| Positive SR NT** | 430.85 | 250.42 |

Focus of wind

Source: regelleistung.net, German TSOs

* HT: working days 8am-8pm;
** NT: working days 8pm-8am, weekend and holidays

# Conclusions

- High GHG and renewable energy targets requires a high share of wind entering and remaining in the energy system
- Around 20 GW in GER and more than 3 GW wind power in FR is expected to leave remuneration mechanisms in the next years
- Under current regulation, they need to be operated in the liberalized markets
  - Spot market prices dropped strongly, can recover if carbon prices recover
  - France: Additional revenues potential trough newly introduced capacity mechanism (see Kraft 2017)
  - Adjustment of reserve power markets with a shorter time period to gate-closure allows wind to bid in these markets (negative reserve power)
- Profitability of wind parks operating in the electricity market is questionable and needs case-by-case calculation

# References and further readings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