



EUROPEAN TECHNOLOGY & INNOVATION  
PLATFORM ON WIND ENERGY

**SIEMENS** Gamesa  
RENEWABLE ENERGY

# Making Europe's power system fit for climate neutrality – a wind OEM view

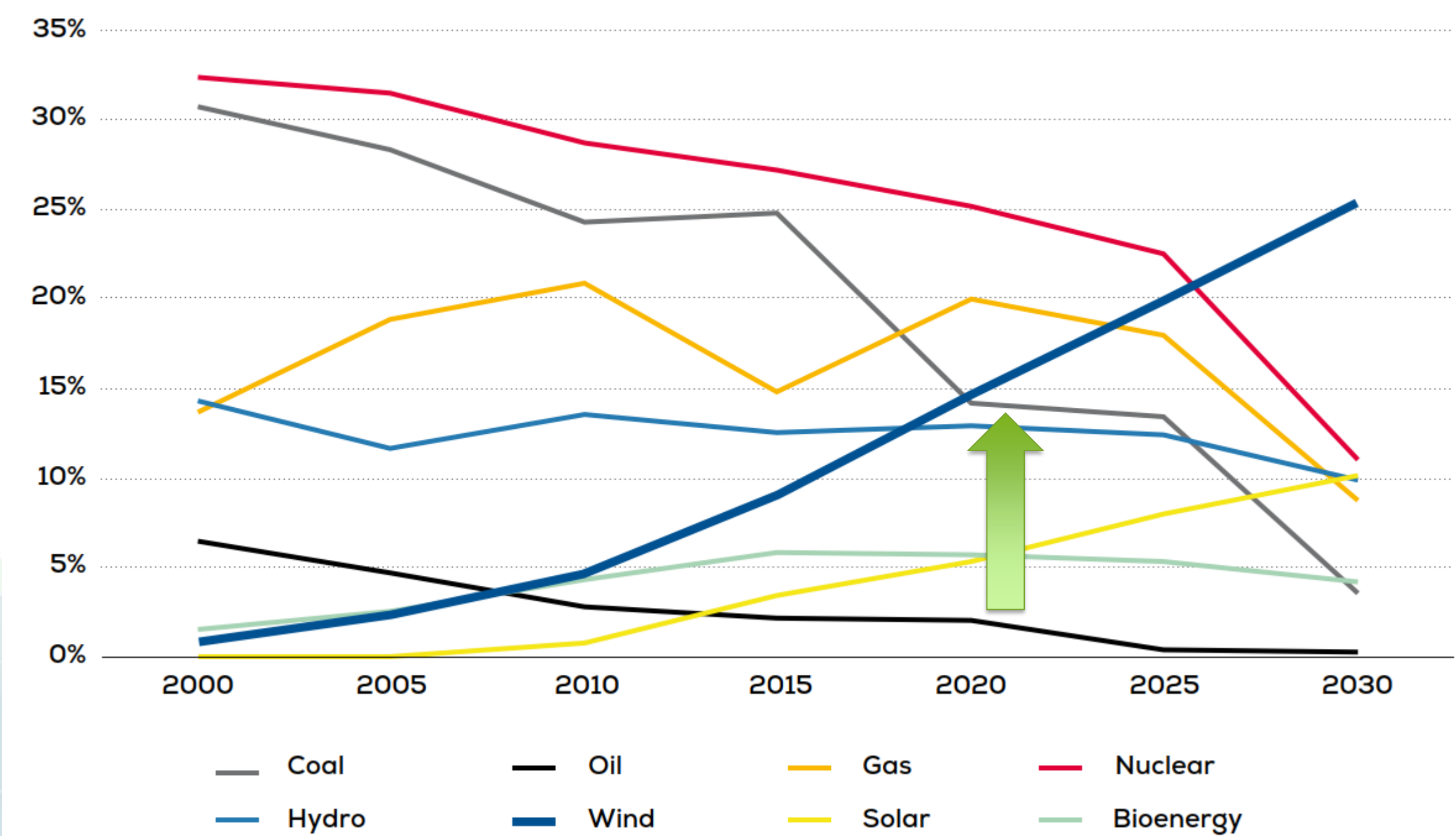
Frank Martin / Aidan Cronin  
Siemens Gamesa at the ETIPWind

# Disclaimer

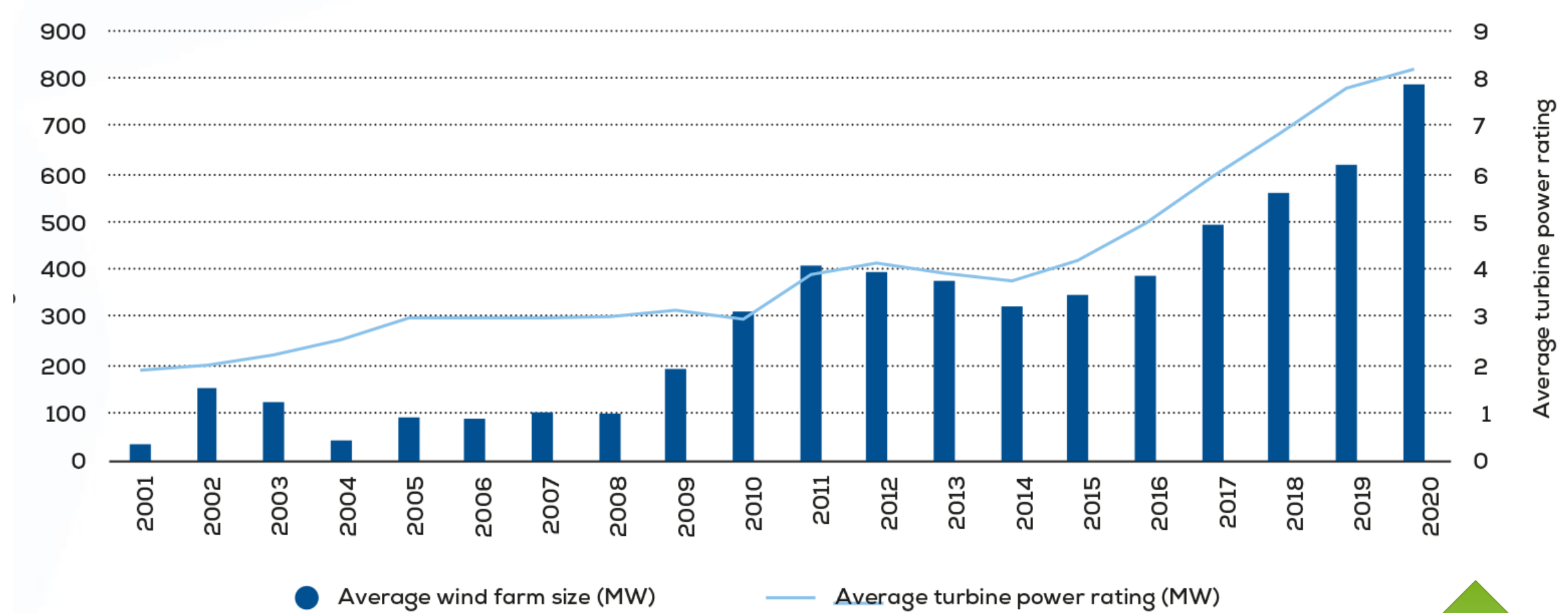
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# Where are we today

Electricity mix



Offshore wind farm and turbine size



# Current power system challenges

- Grid Code requirements – we still discuss definitions (e.g. unit, equipment) and requirements, applicable for years (e.g. simulation model validation, RoCoF)
- WPP size vs. connection point – grid connection is getting more and more challenging
- Power system is changing – impact to running WPP's will require more effort
- New control schemes getting deployed – many questions to be answered (requirements, capabilities, power system impact)
- Increased digitalization gives more flexibility but also more vulnerability (cyber security and impact to power system)
- Does the industry works sufficiently together – system operators, developers, OEM's?

# The future of power systems - 1

- Massive grid expansion needed with increased resilience and ability to withstand the increased stress of climate induced events
  - Demands on grid infrastructure will increase dramatically
    - EV charging, electrification of domestic heating and digitalization of everything
- Renewables to deliver backbone of power system
  - Much higher responsibility of Renewables for the power system
  - New and more extensive grid code requirements
    - New control schemes (e.g. grid forming) and much more extensive compliance studies / models / testing / new assessment methods
    - Grid Compliance not only at day 1, but over the lifetime of the WPP's
- Offshore to become bulk supplier of energy. Physical grid build can become expensive and impractical
  - New grid connection schemes getting deployed by TSO's / developers

# The future of power systems - 2

- Power to X will play a major role beside electricity production
  - Power to hydrogen as solution for large areas such as shipping and steel industry – onshore as well as offshore applications
  - Ammonia as shipping fuel and fertilizer feed stock
  - Battery ships / barges
  - How will grid requirements reflect this development (electricity + PtX on Energy Islands?)

