Danish Energy Agency

Danish Energy Policy

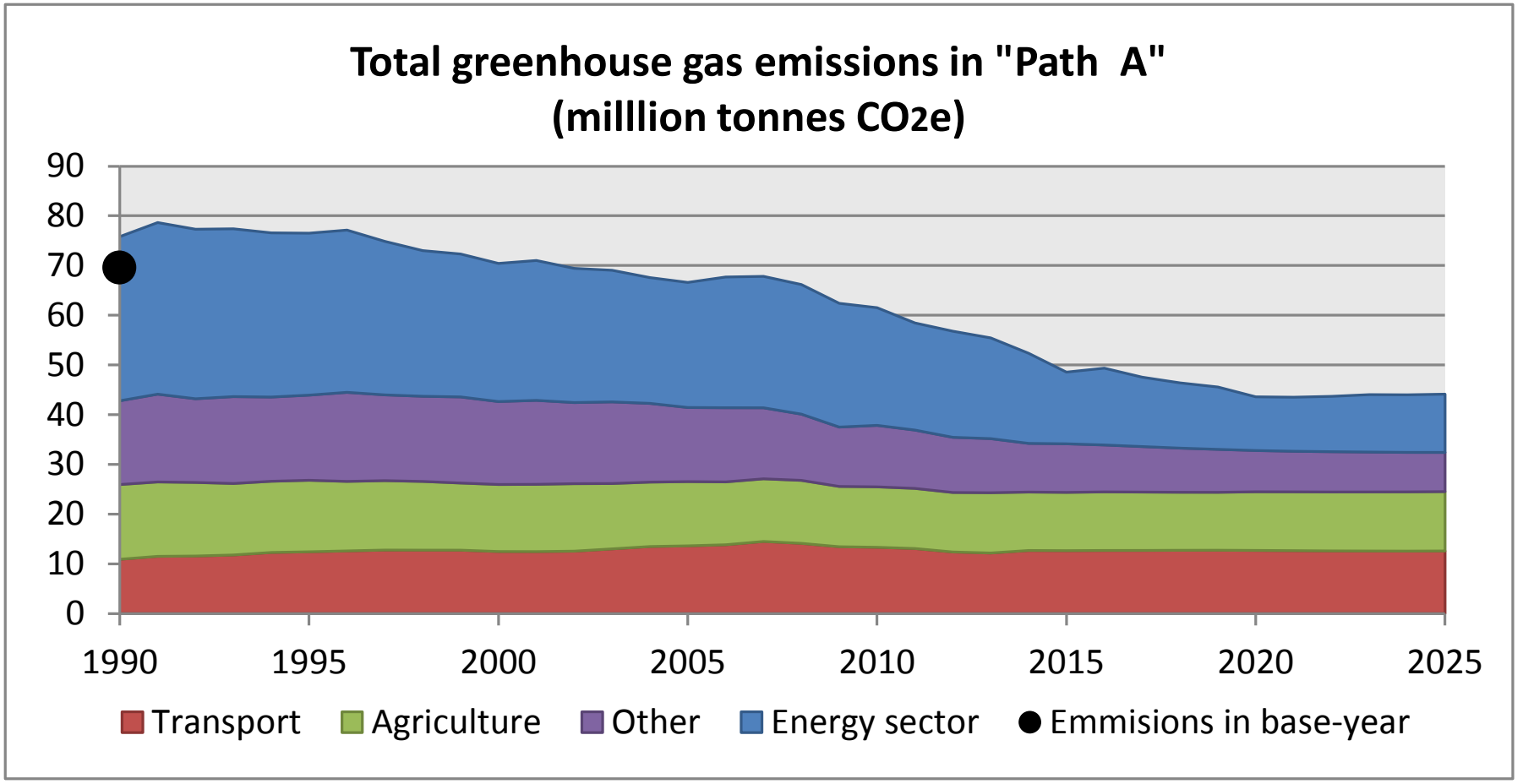
Low carbon energy sector –

integrating renewables through market principles

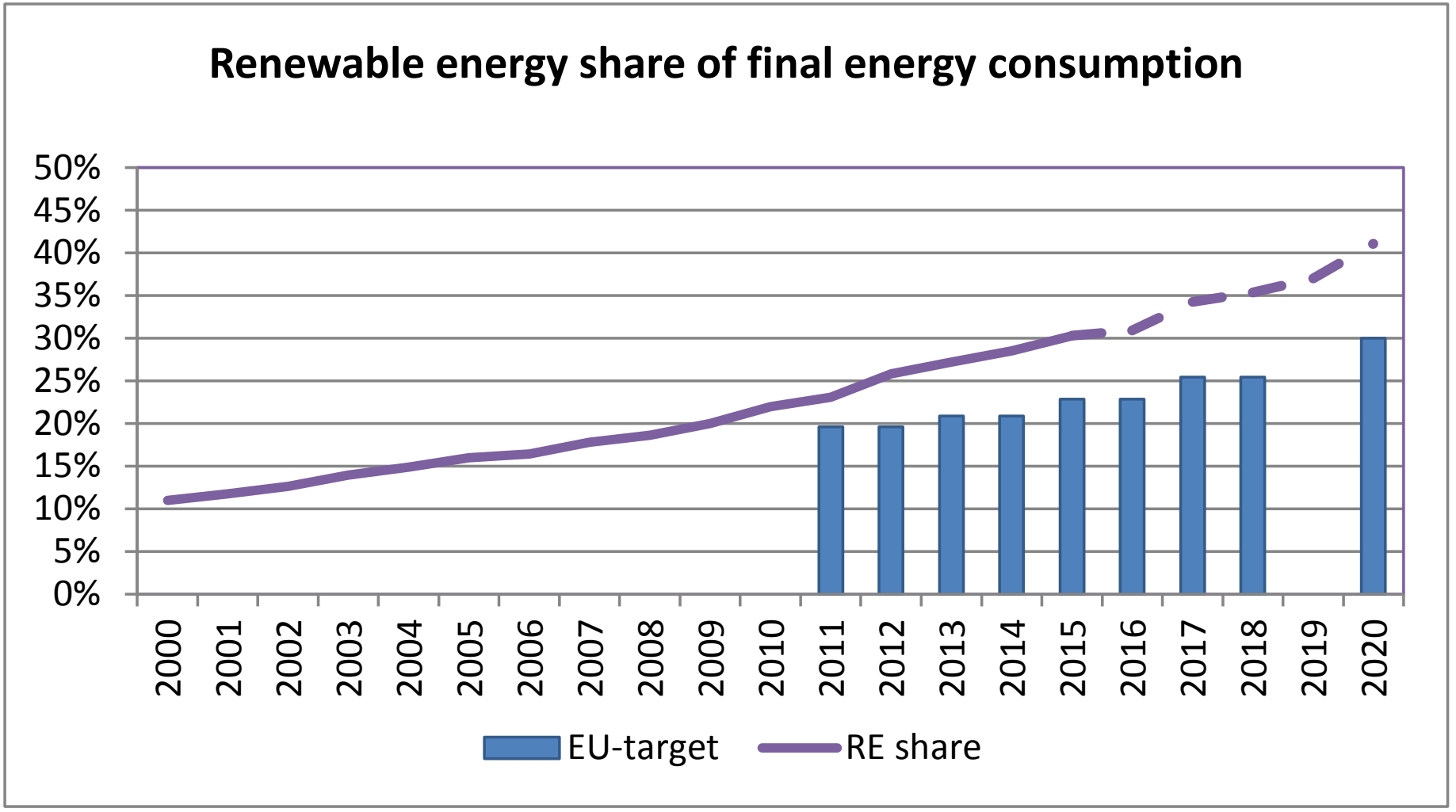
Danish Energy Agency

Decarbonising the power sector

Denmark has reduced GHG emissions significantly since 1990 – especially in the energy sector

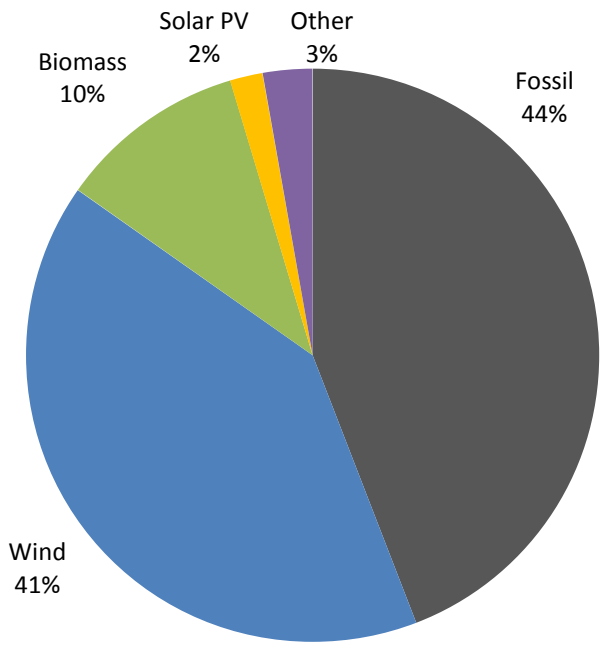


Denmark will exceed it's EU target for renewable energy in 2020 by 10 percentage points.

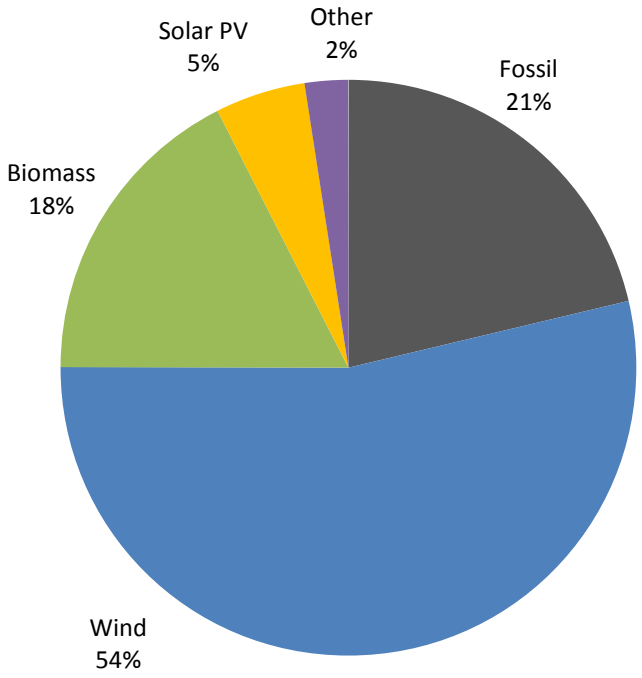


Major contributor to GHG reductions has been integration of RE into power system

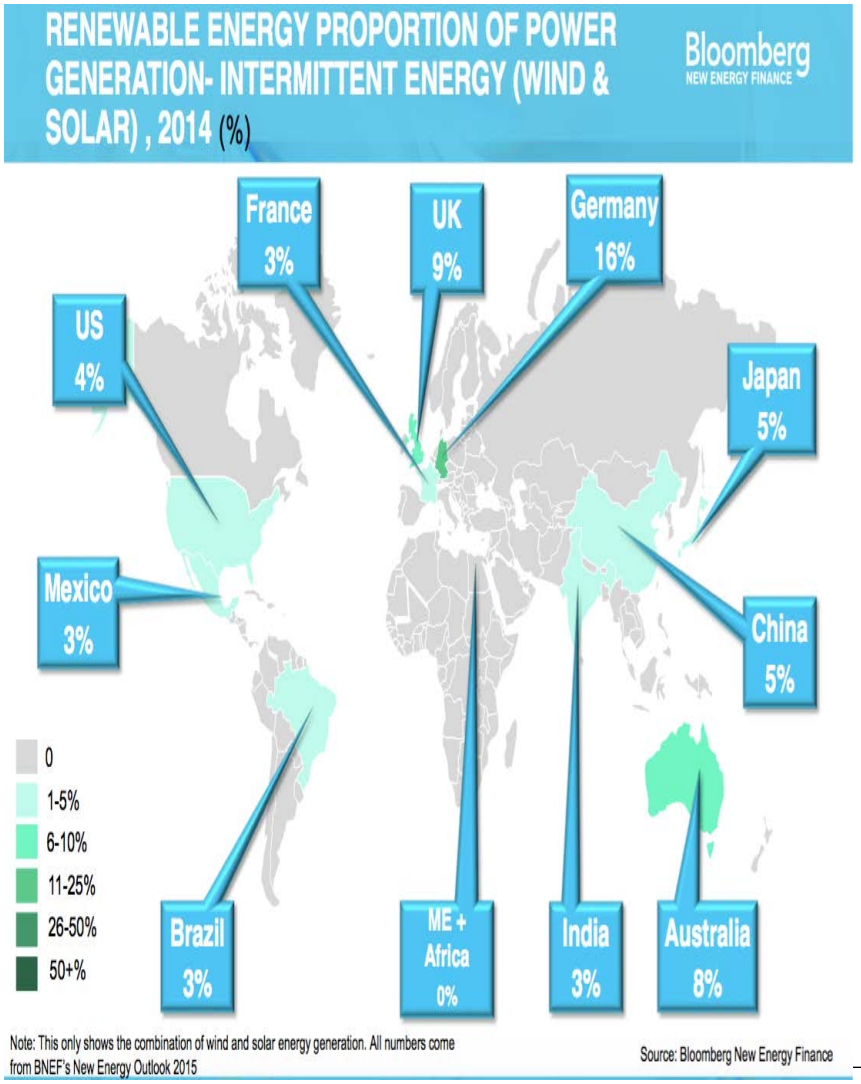
2014: 66 % RE

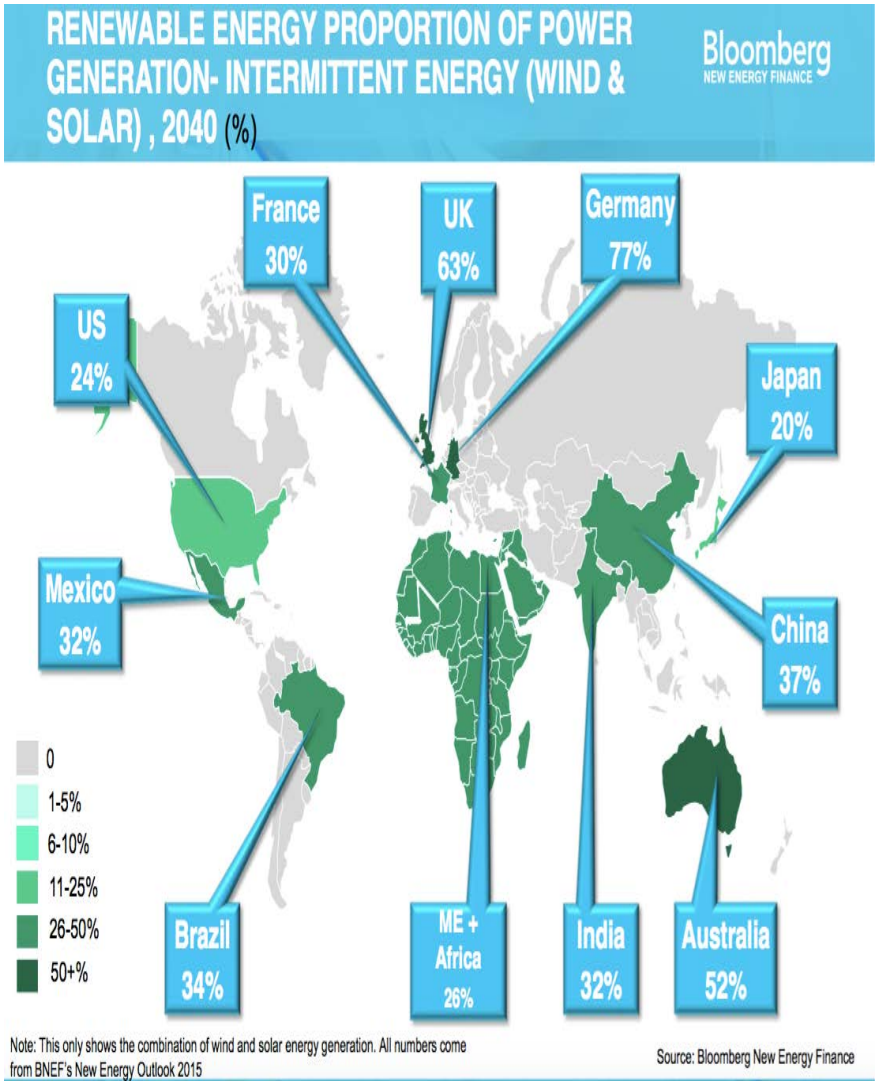


2020: 79 % RE



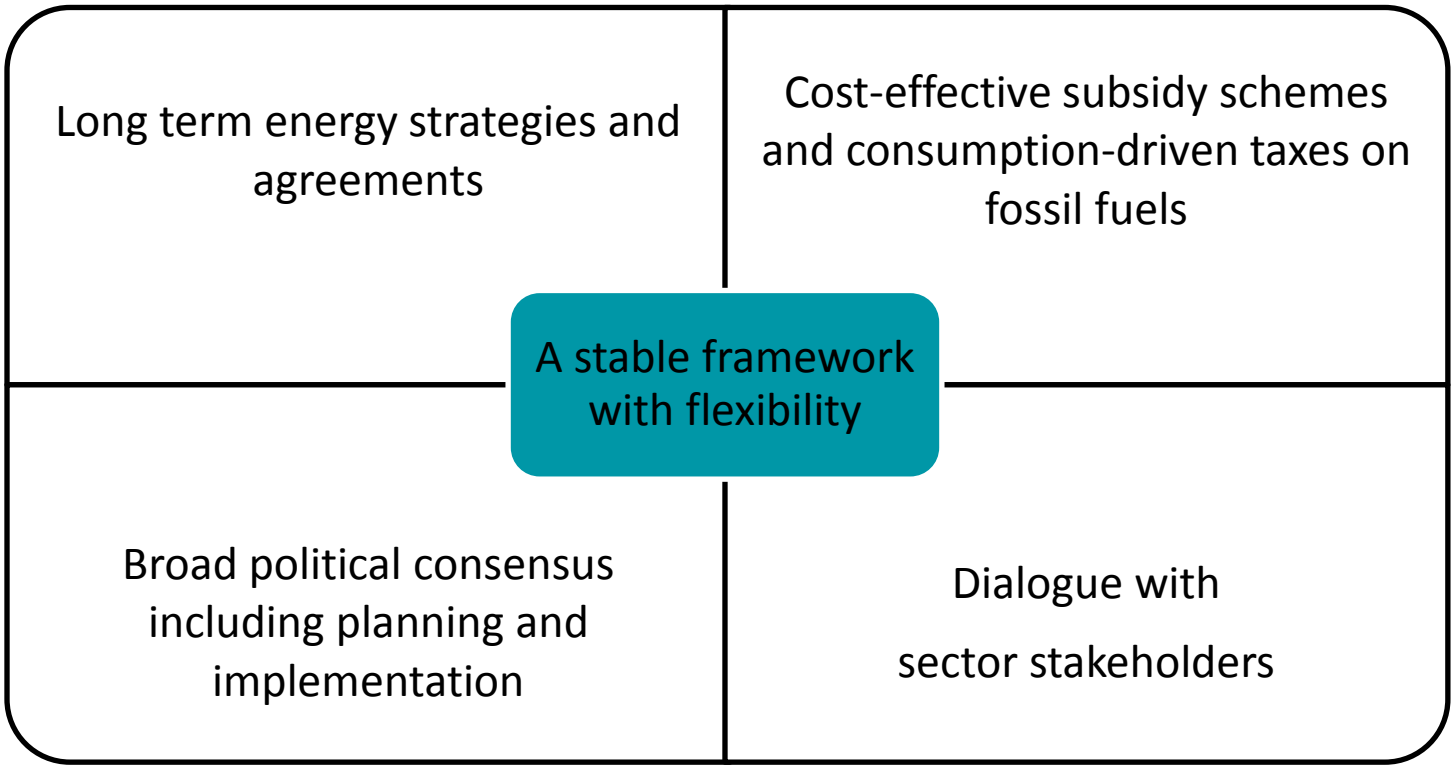
We are not the only ones – many countries are moving in the same direction...





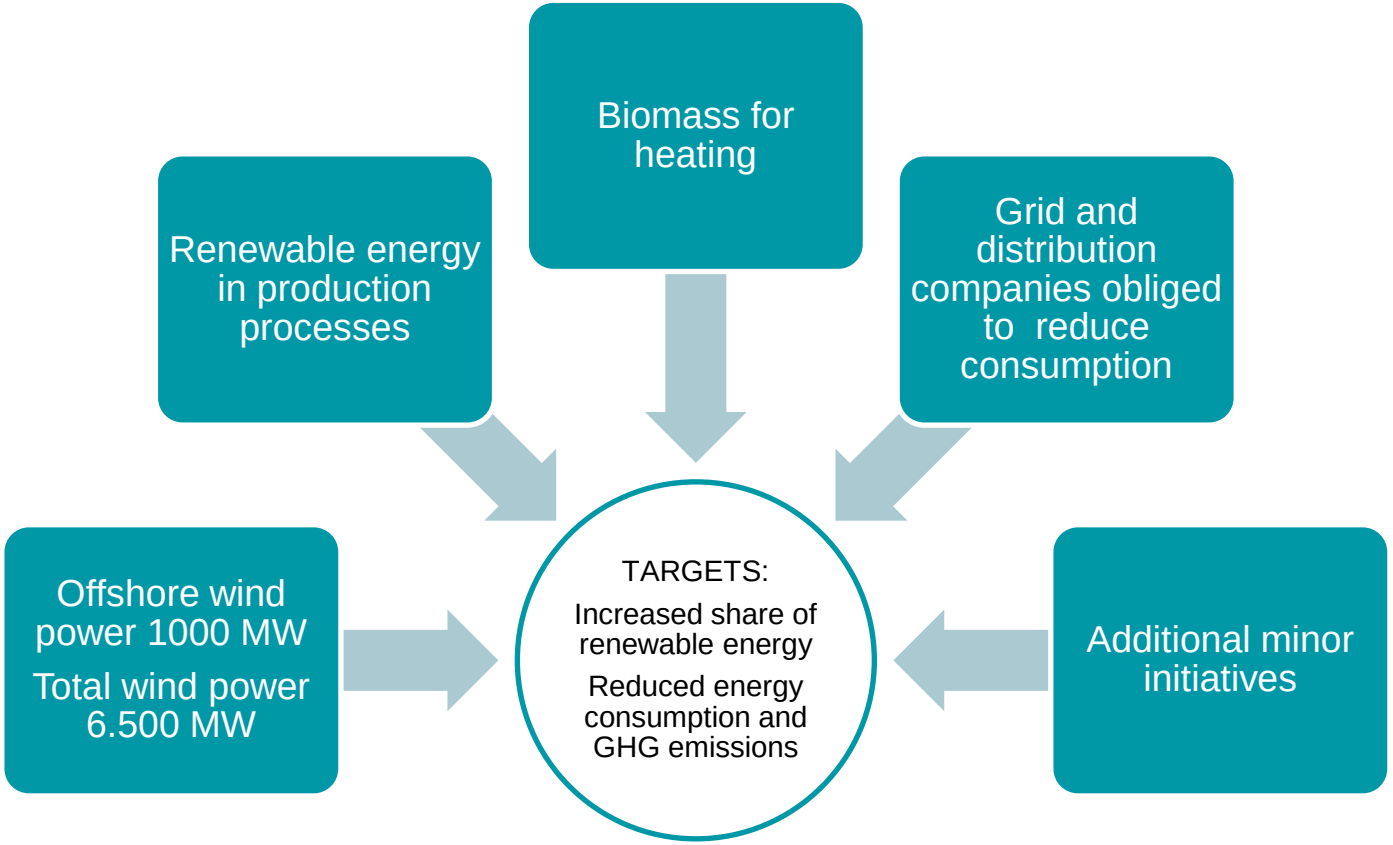

Danish Energy Policy

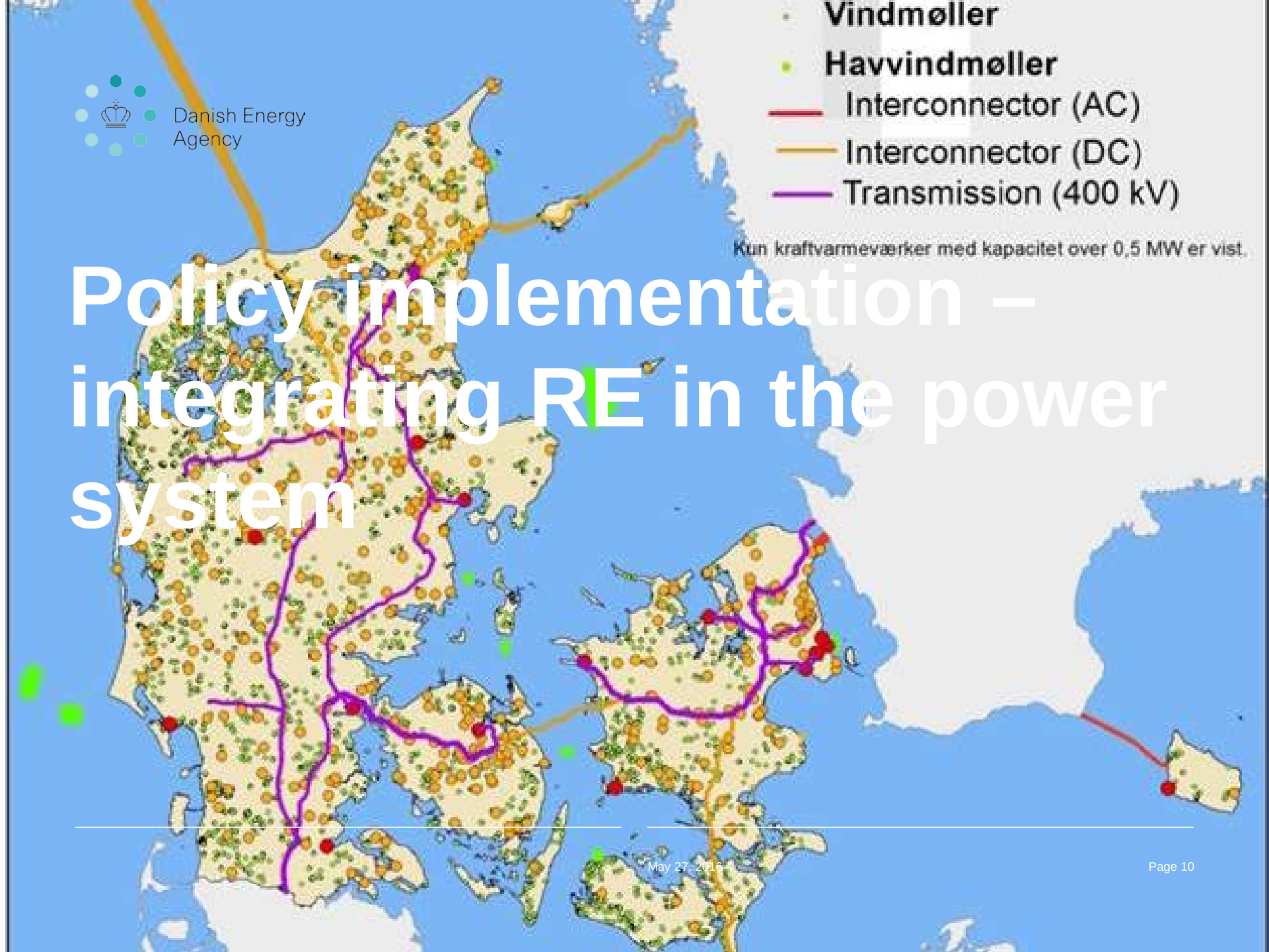
Key Elements of Danish Energy Policy over time



The current Energy Agreement

- 2020 targets and means





Danish Energy Agency

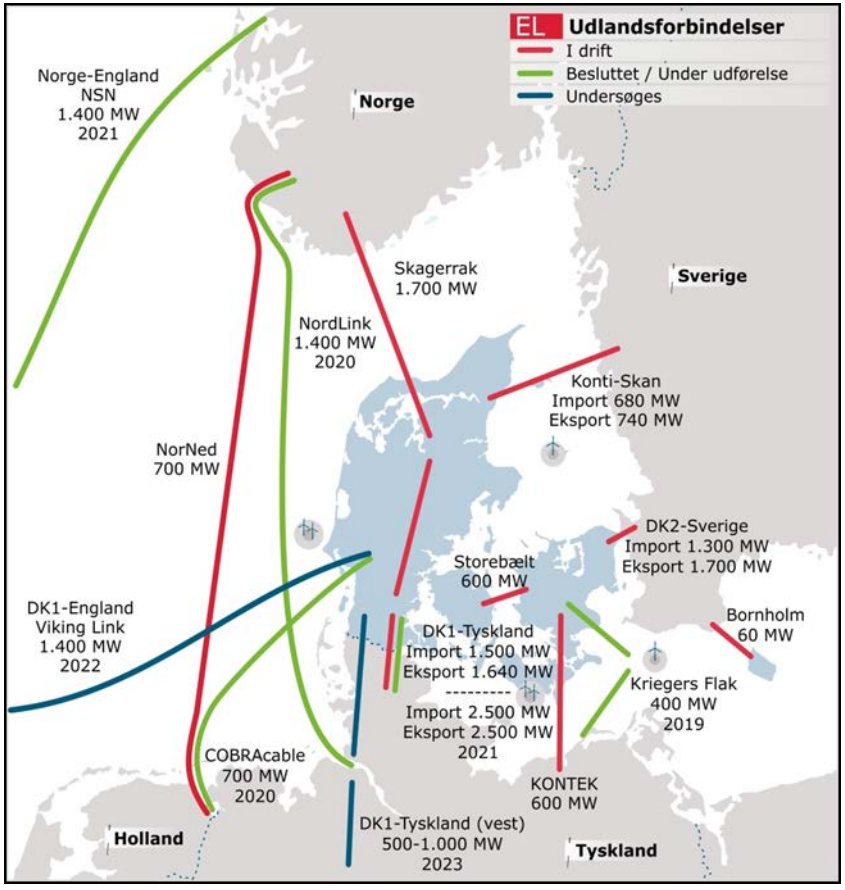
Policy implementation – integrating RE in the power system

The Danish energy system is in a transitional phase

- Small system sandwiched between two, large regional electricity systems
- Internationalisation of the energy system – increased focus on regional cooperation and market integration

Danish electricity system

- Denmark is a transit country for trade
- Increased system flexibility for integrating wind and solar power
- Success of Nordic market is integration of different technologies over a large geographical area resulting in more robust national power systems



Parallel developments

- towards renewable energy and open markets

From primary coal fired to local CHP and wind power

2000

From vertically integrated monopoly to competitive electricity market

Generation

Transmission

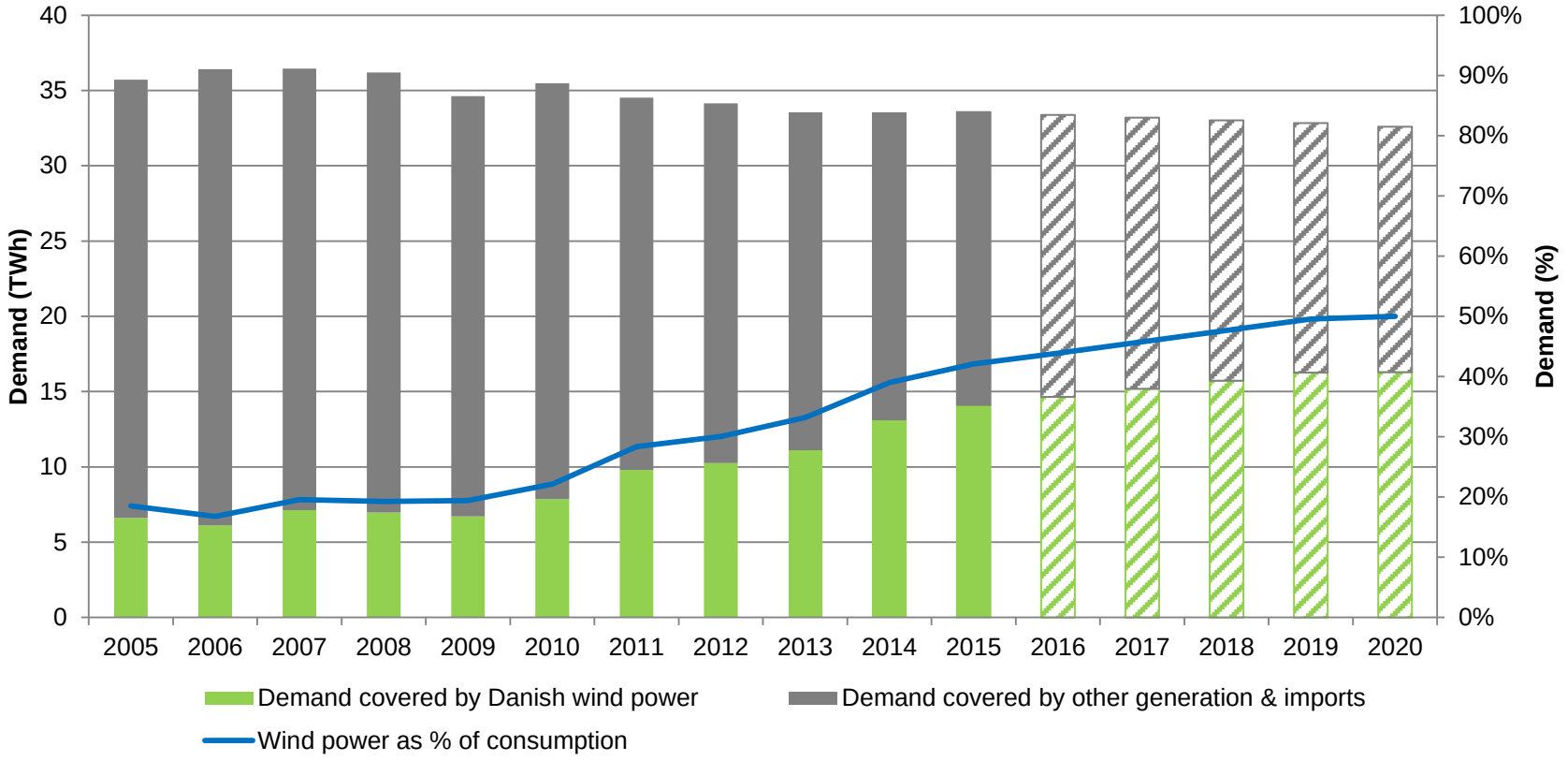
Distribution

Generation | Trade

Transmission System Operator

Distribution | Retail

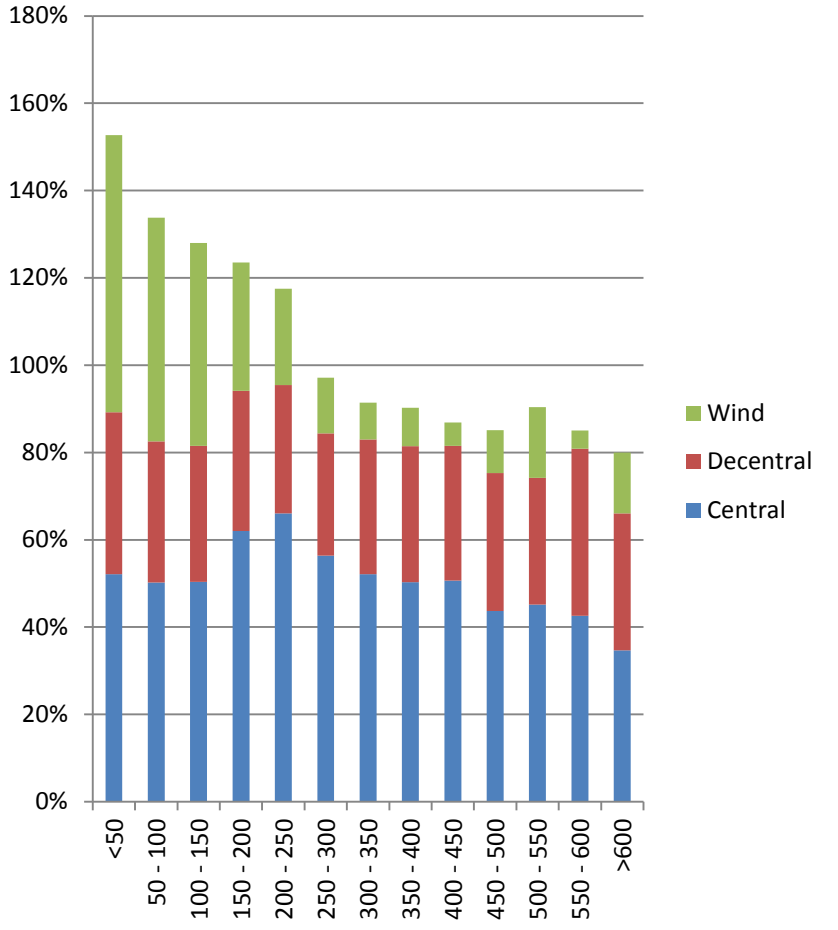
Danish electricity system will soon be dominated by variable RE

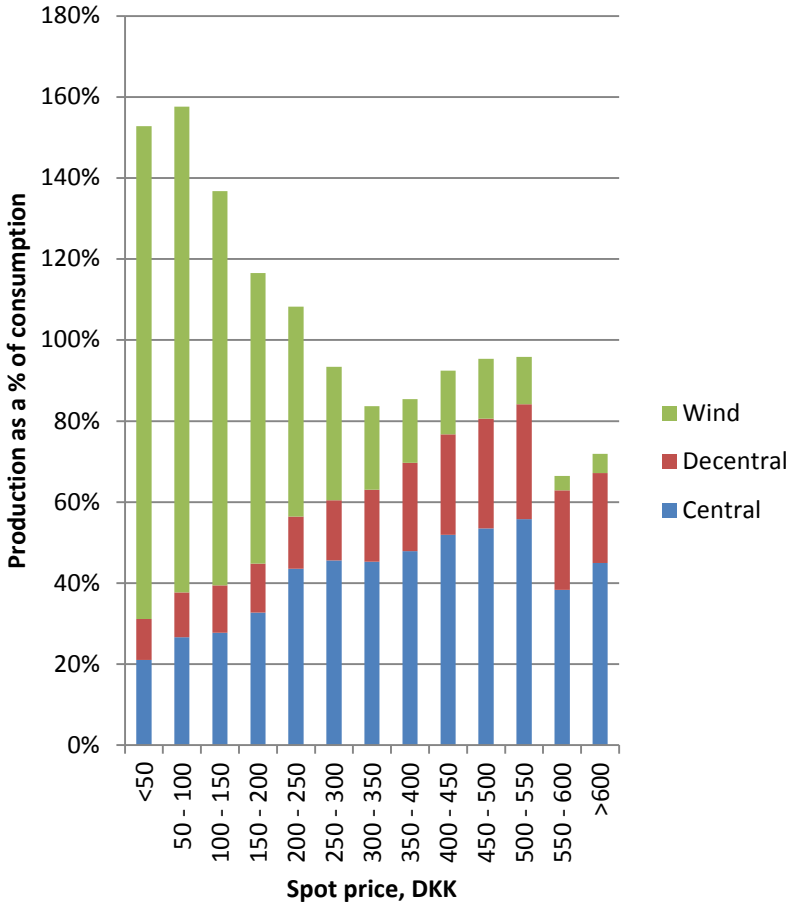


Danish Energy Agency

Flexibility – cost-efficient integration of RE through efficient markets

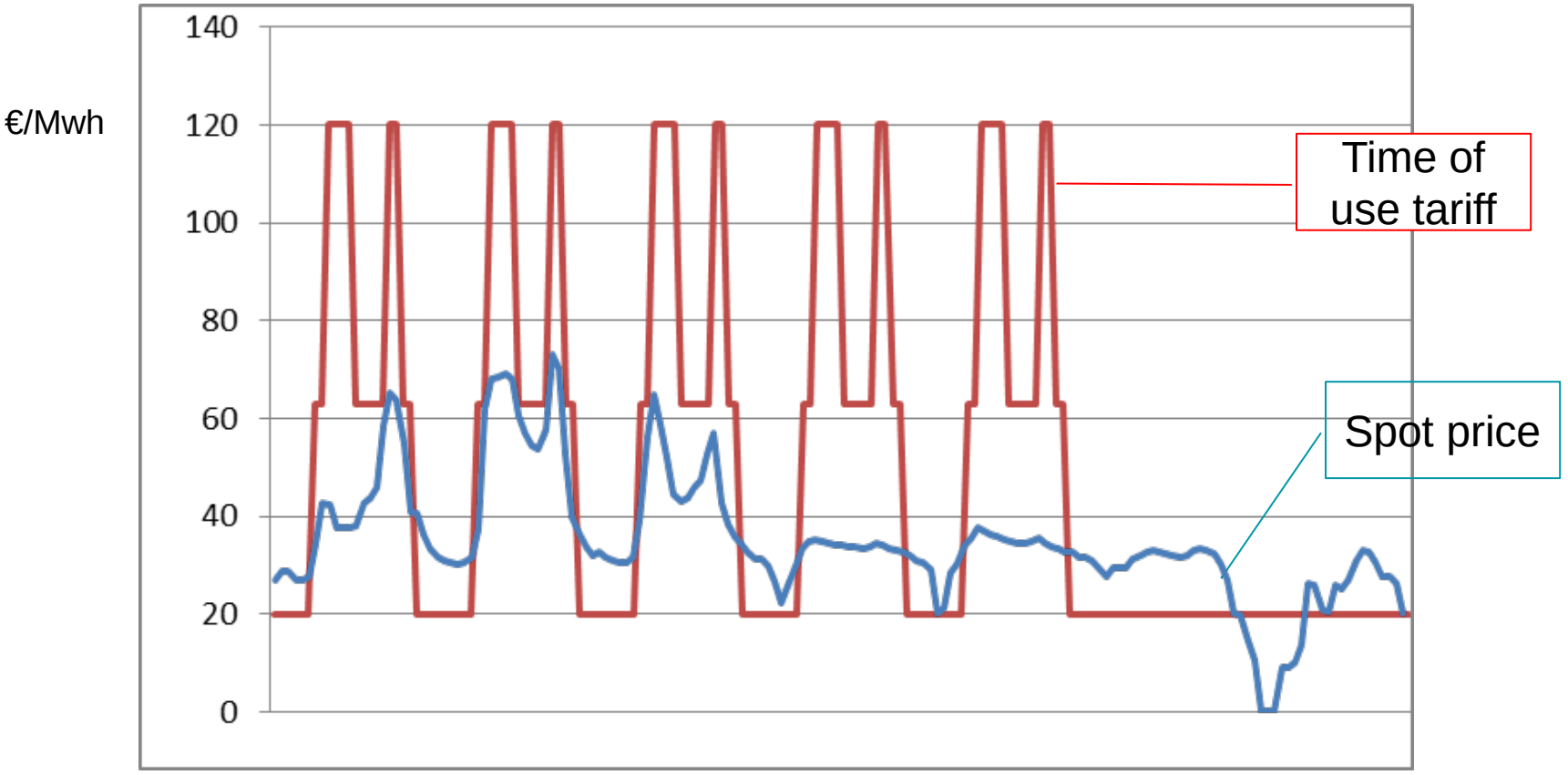
Increased flexibility in CHP plants, 2004 compared to 2014



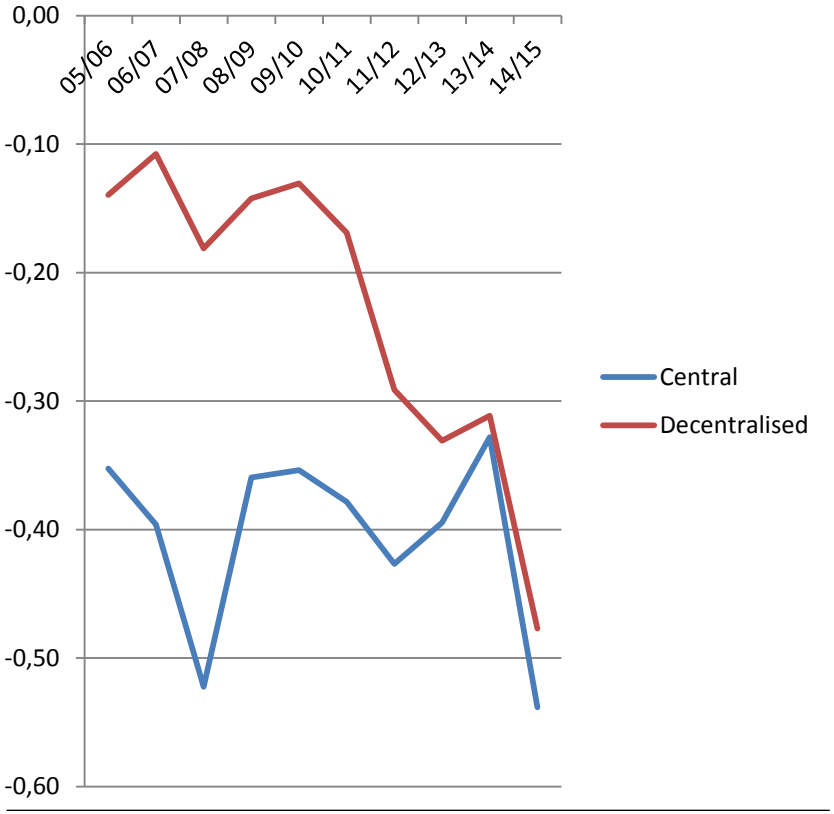


Flexibility delivered by economic incentives - plants

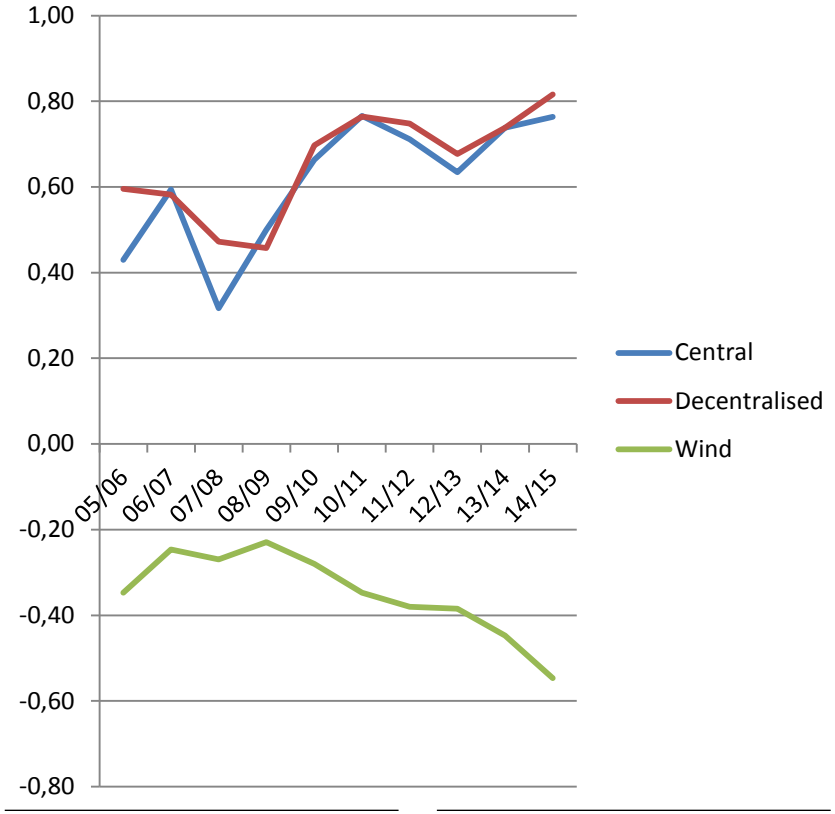
from tariffs to market prices - a week in January



Corelation wind power production and and CHP



Corelation – spot price and production by technology

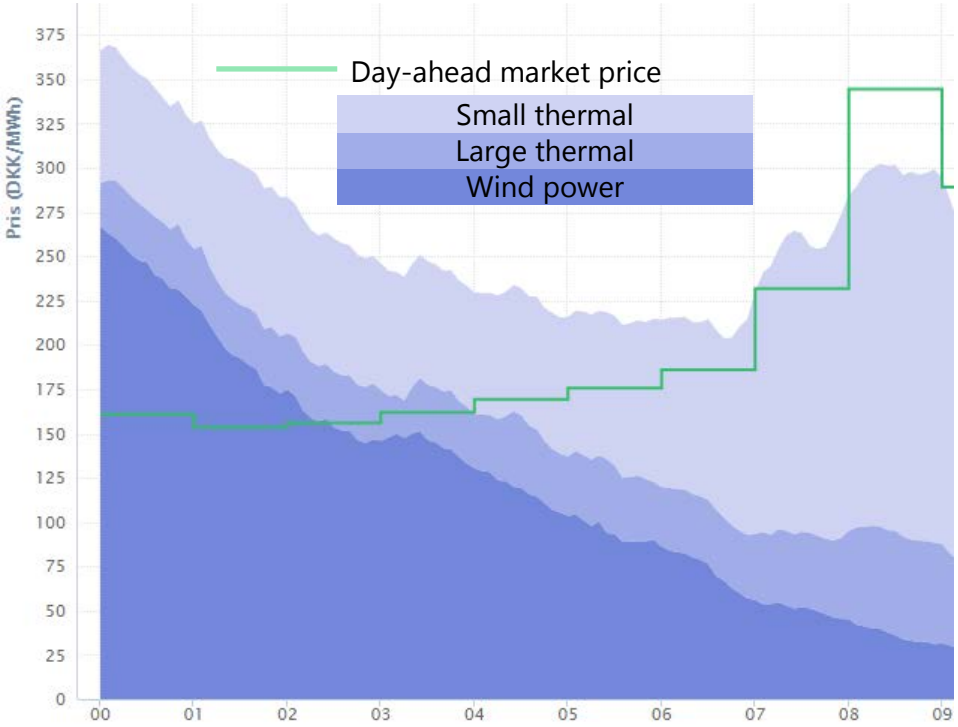


Danish experiences: Thermal power sector transition

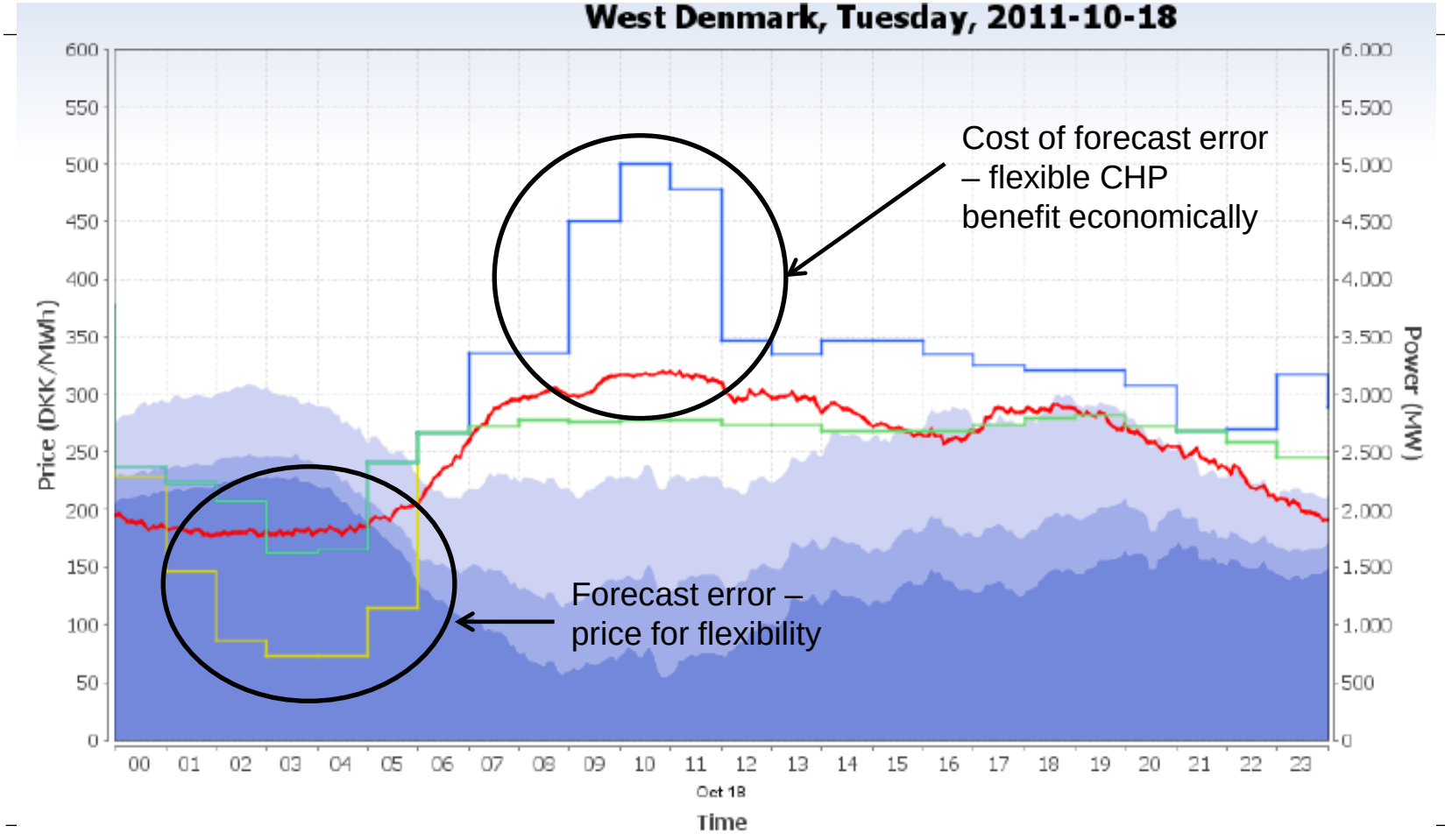
Thermal power plants in Denmark are very flexible

- Minimum load down to 15%
- Ramping speed of up to 4% pr. minute
- All large CHP plants in Denmark has Heat Accumulators

Power production in Denmark during 9 hours during the night and morning 22 April 2015

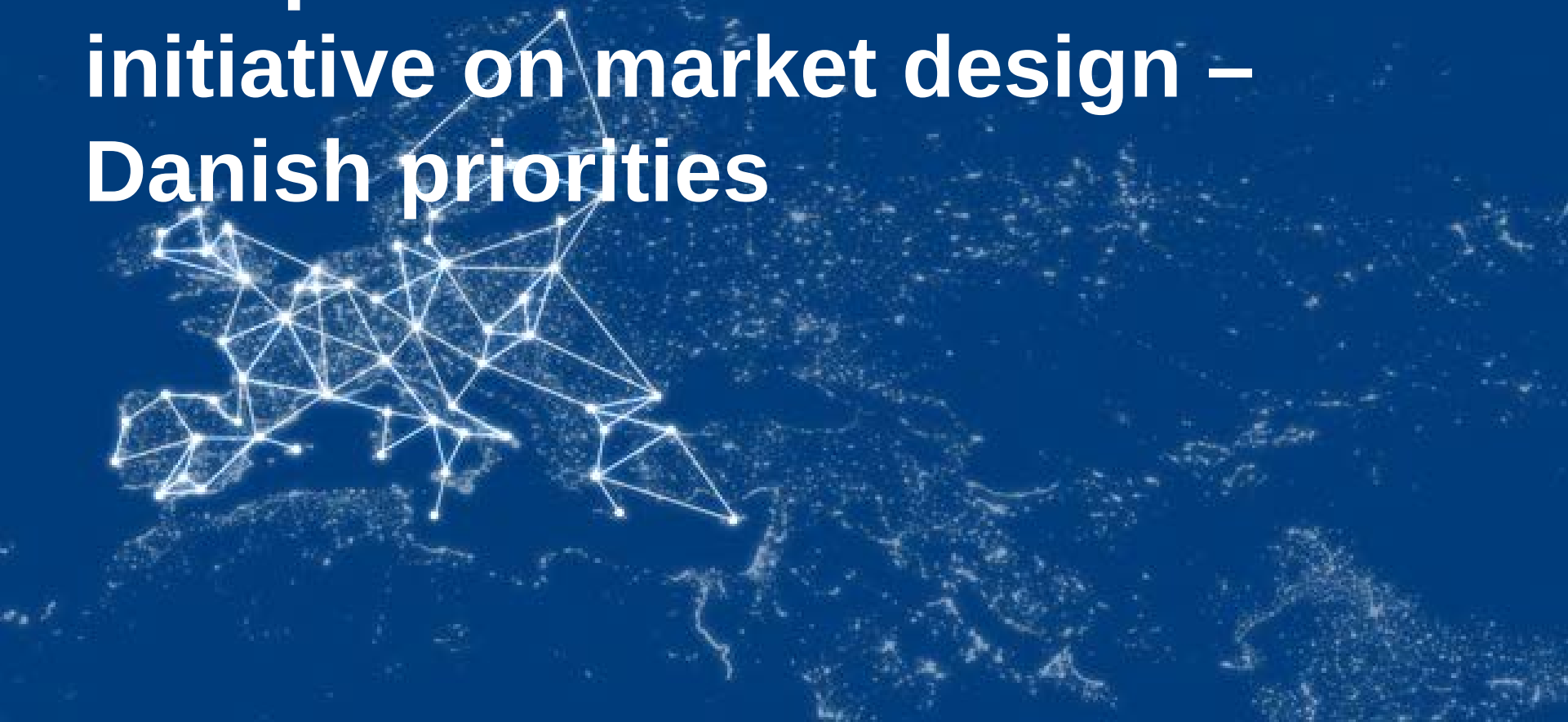


The market balances the power system by rewarding flexibility



#EnergyUnion

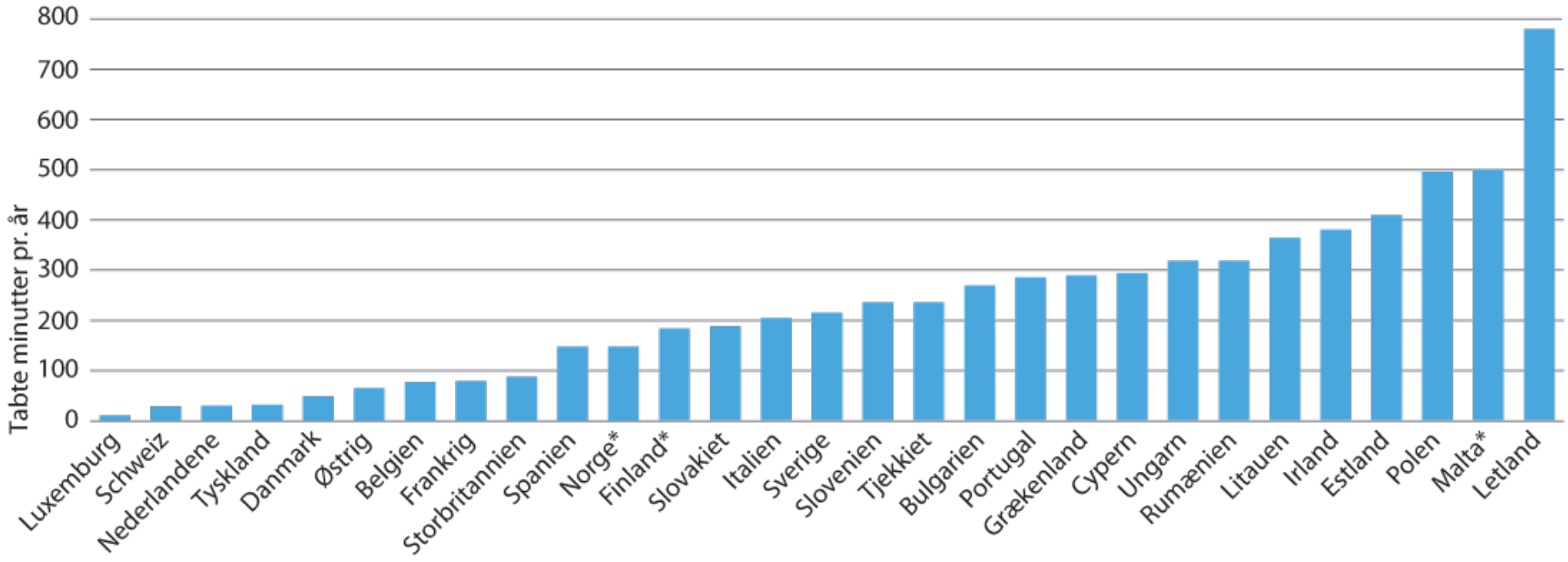
European Commissions initiative on market design – Danish priorities



Ensuring cost-efficient integration of renewables

- Strengthening day-ahead markets
- The intra-day market - provide an efficient hedge against the cost of imbalances
- Balancing market should have two roles
    i. purchasing regulating power
    ii. ensuring sufficient manual reserves
- Clear market rules for efficient and fair utilisation of international connections

Maintaining high level of security of supply



Thank you

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