

BARRIERS AND IMPLICATIONS OF ELECTRIFICATION FOR THE ELECTRIC INDUSTRY

IEA/EPRI workshop on decarbonisation

Ulrik Stridbæk

Head of Regulatory Affairs

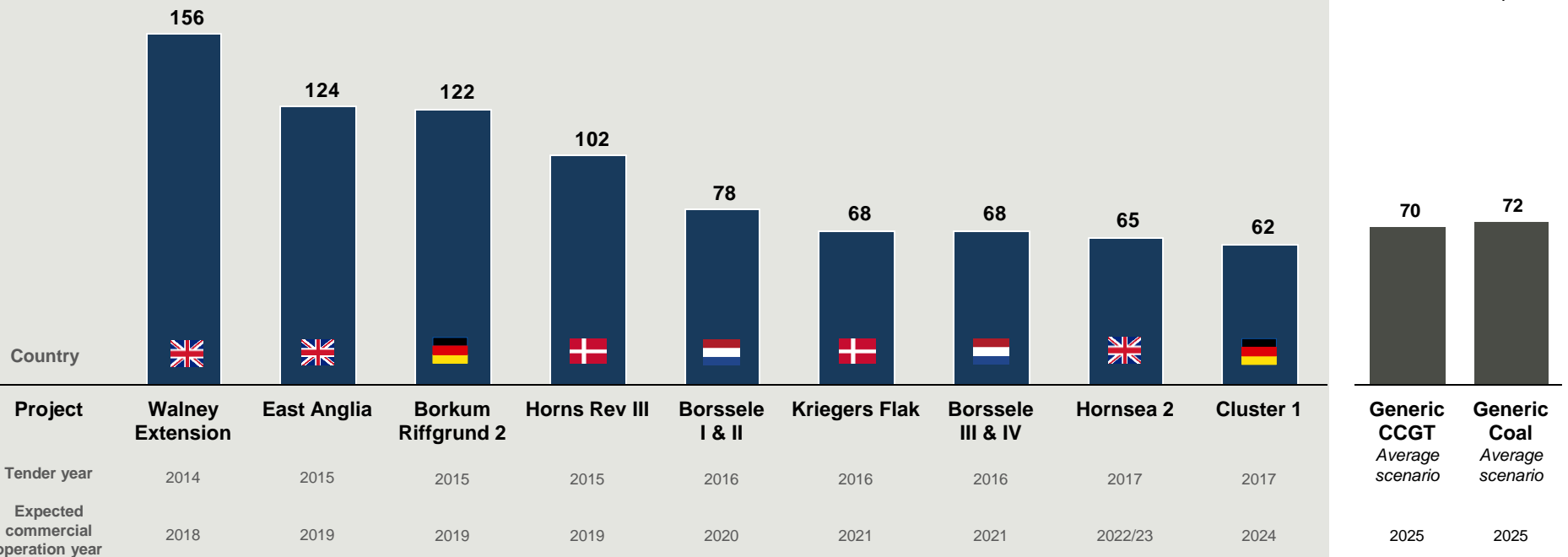


DONG Energy
is becoming
Ørsted

Offshore wind energy is becoming competitive with conventional technologies

Levelised costs for society of electricity, incl. transmission costs¹

New built capacity
EUR/MWh, 2016-prices

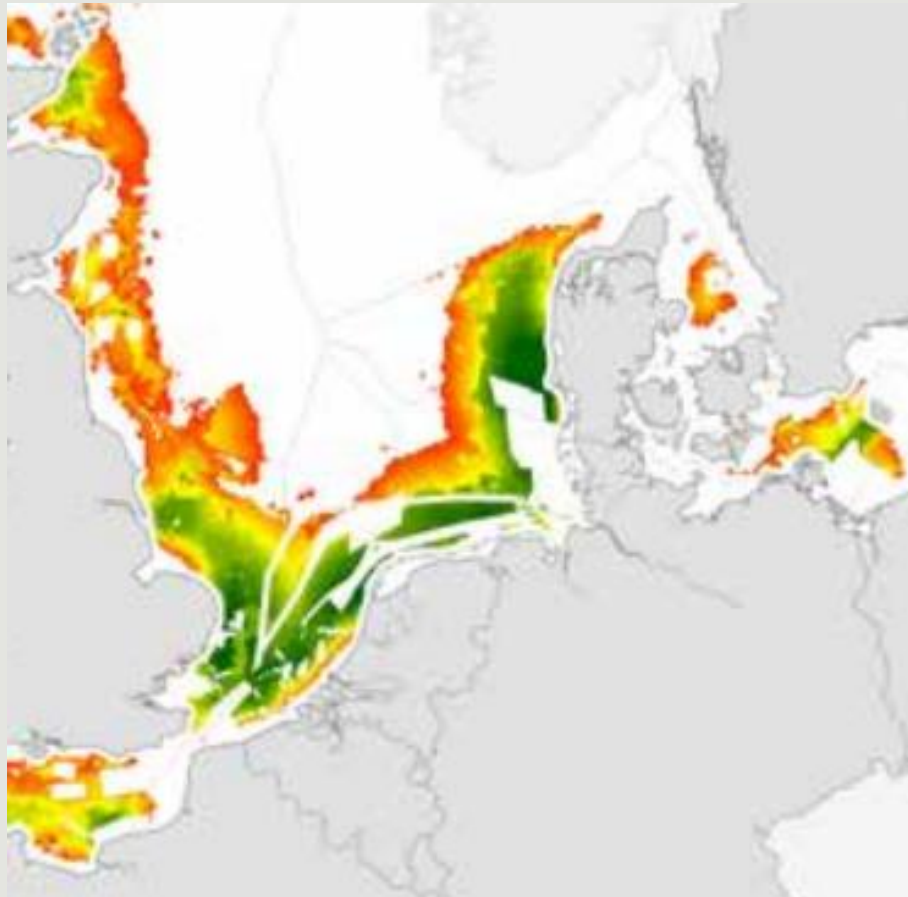


Conventional technologies
(Commercial Operation Date, 2025)
EUR/MWh, 2016-prices²

Sources: BNEF, BEIS; Danish Energy Agency; NEV (Dutch Energy Scenarios); Bundesnetzagentur

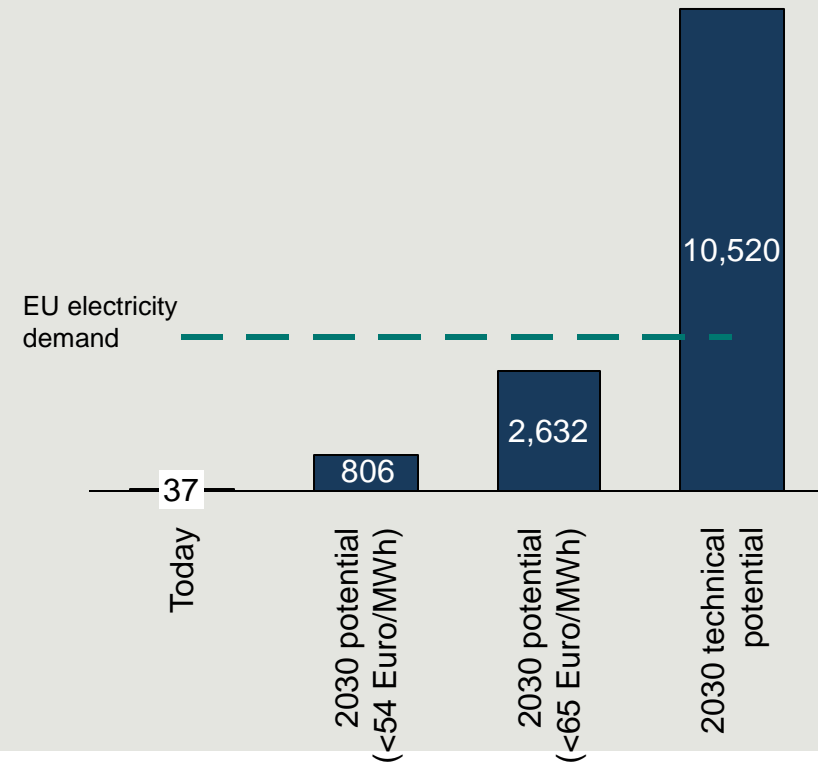
1. Levelised revenue (price) of electricity over lifetime of the project used as proxy for the levelised cost to society. Consists of subsidy and market price element for the first years and market income for remaining 25 yrs lifetime. Societal discount rate of 3.5%. Based on country specific public power price projections at the time of contracting where available, else an average of 5 analytics is used. For comparability across projects and because there is no transparency round the TSO costs of transmission a generic scope adjustment (incl. transmission and extra project development costs) have been applied. Due to specific DC transmission set up in Germany cost estimates from the 'Offshore Netzentwicklungsplan' 2017 have been applied.
2. LCOE data from BNEF, H1 2017. Average cost projection from Germany and the UK in average cost scenario with capacity factors of between 50 and 80% for gas, and 45 and 70% for coal. CO₂ price trend reaching 20 €/t in 2025 and 34 €/t in 2035.
3. Same approach as for offshore wind. Strike price is 92,5 £/MWh in real2012-prices hence indexed to inflation each year. Lifetime of 60 years and 91% capacity factor.

The North Sea is “made” for offshore wind energy



WindEurope og BVG-associates

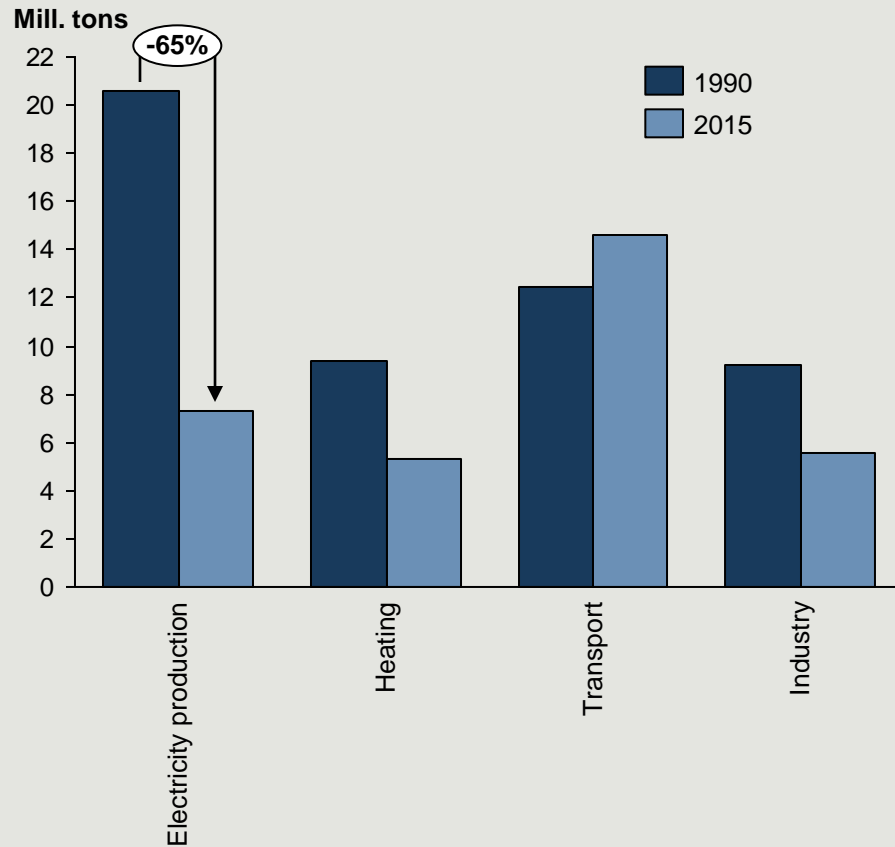
Accumulated economically attractive offshore wind production potential in Northern Seas (TWh)¹



1: BVG for WindEurope's report: Unleashing Europe's Offshore Wind Potential and WindEurope annual statistics 2016. Including transmission asset.

Example: Danish electricity sector on track to full decarbonisation, while transport and heating are lagging behind

Danish CO2 emissions, by sector, 1990-2015



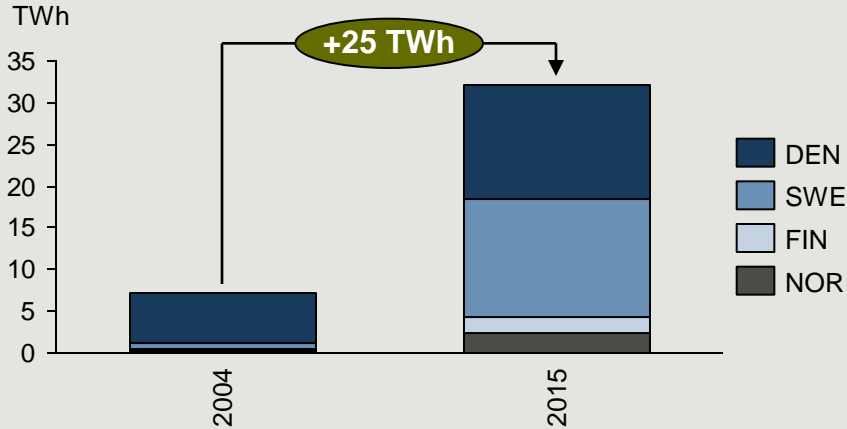
Decarbonizing through electrification

- 65% emission reductions in the **electricity** sector and decreasing
- **Transport** emissions continue to grow
- **Heating** has reduced emissions through fuel switching
 - Limited scope for further reduction through fuel switching
 - High share of district heating allows for fast scalability of new solutions
- Reduced emissions in **industry**
 - Efficiency measures 😊
 - Reduced activity ☹️

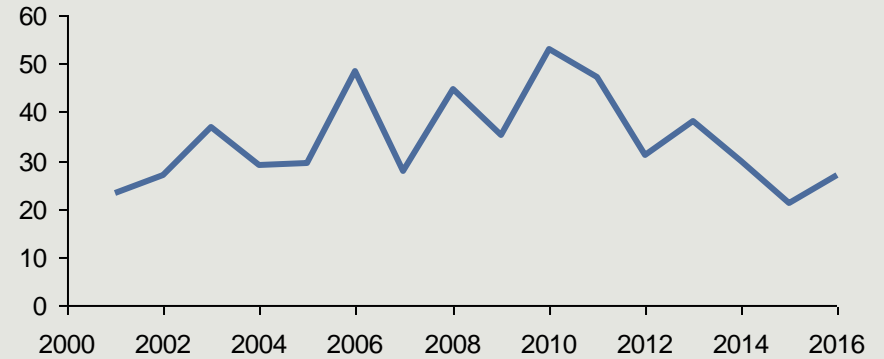
Source: Danish Energy Agency – 2015 energy statistics

RES expansion and stagnating electricity consumption has reduced the value of electricity

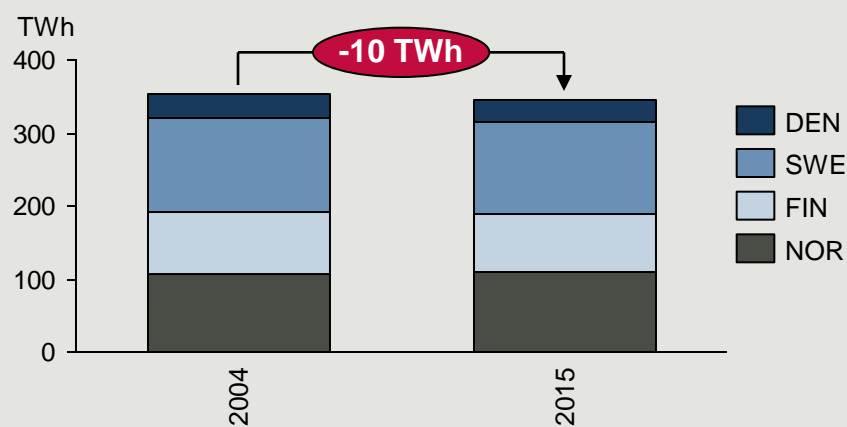
Wind and PV production, Nordic countries, 2004-2015



Nord Pool power prices, €/MWh, real



Final electricity consumption, Nordic countries, 2004-2015



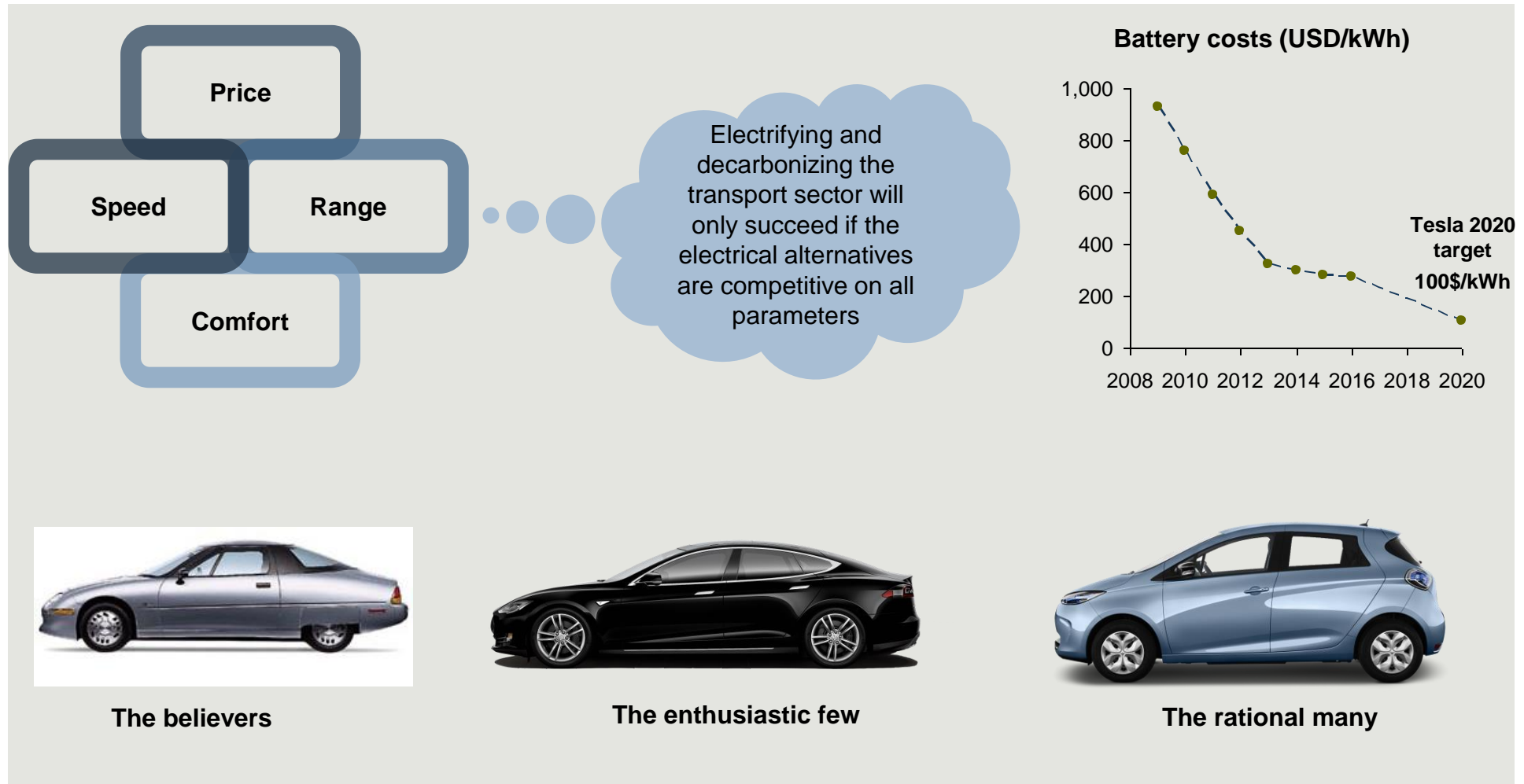
Value of electricity under pressure

- Electricity **generation** on track to decarbonize from reduced costs of RES
- Electricity **consumption** reduced from efficiency and reduced economic activity
- Value of electricity in the market **decrease** at a time when value of electricity as tool for efficient decarbonization **increase**

Source: Eurostat (consumption and production), Nordpoolspot (electricity prices and CO2-prices).

Consumer choice is key to electrification

Are utilities able to excite consumers?



Source: OECD/IEA – Global EV outlook 2017

Taxes, tariffs, and regulatory framework is key

Example: Danish district heating

