

Towards a low carbon future: putting it all together

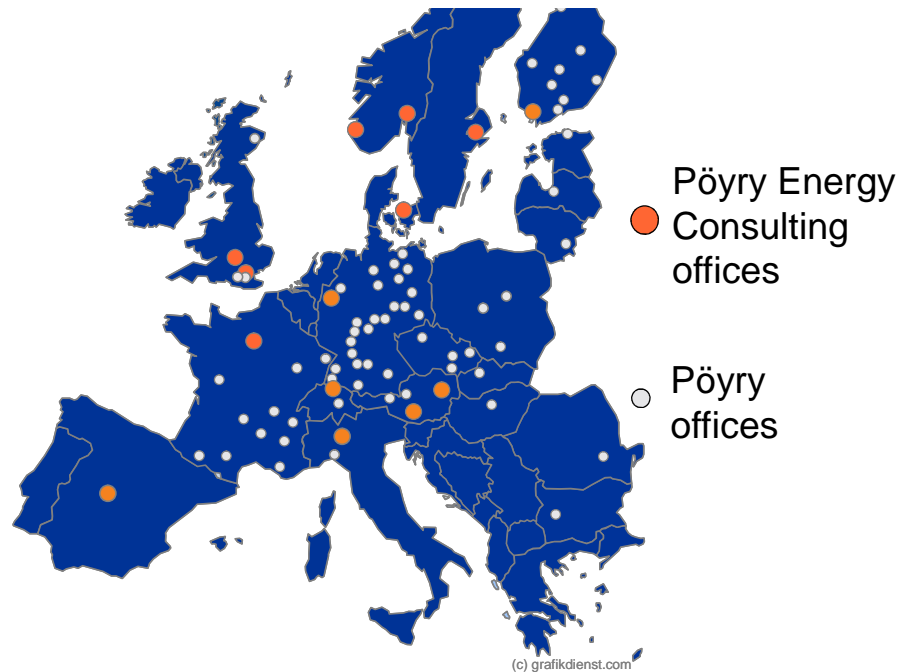
All Energy 2010

Stuart Murray

20th May 2010

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Strategy



Business Operation

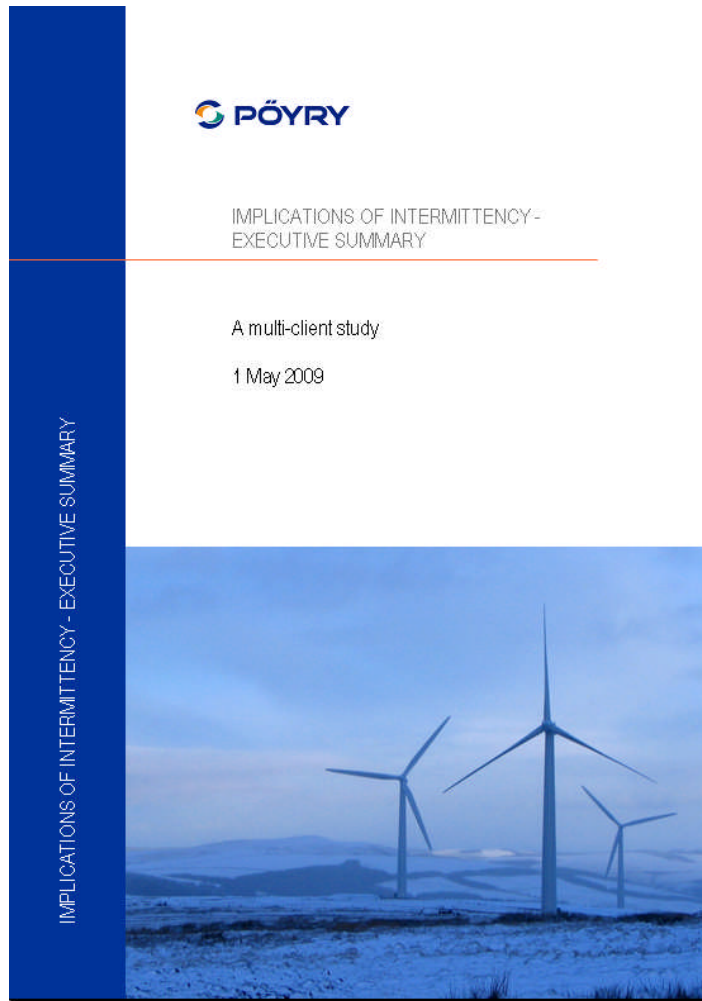


Valuation & Financing



Sustainability

Intermittency Multi-Client Study



- Market prices
- Plant running regimes
- Investment economics
- Wind uncertainty
- Value of interconnection
- Market arrangements

Study summary

The study had almost £1m budget, used powerful bespoke models, and generated unprecedented industry consensus

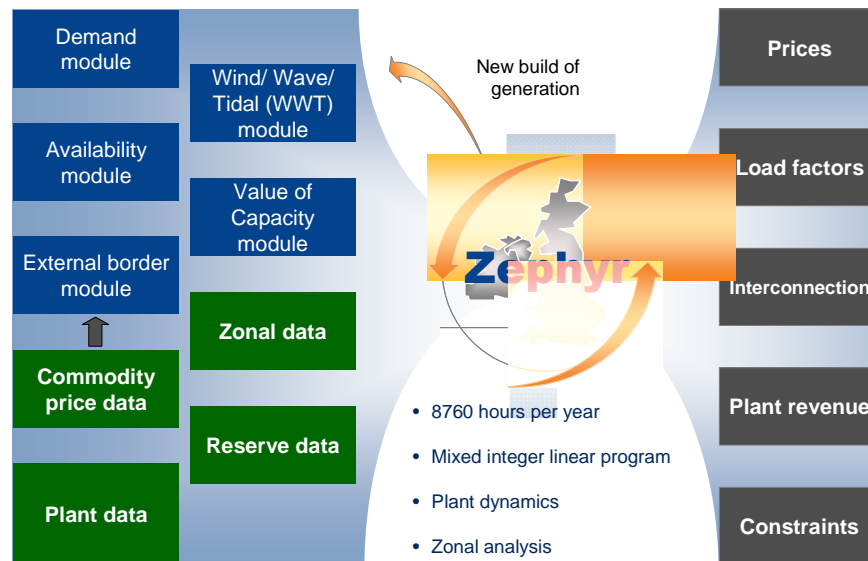
6 Founders

- Centrica
- DONG
- EirGrid
- ESB/I
- National Grid
- RES

13 Members

- Bord na Mona
- CCC
- DECC
- Bord Gais
- RWE
- Gaelectric
- EDF Energy
- Premier Power
- Scottish Power
- CER
- NIAUR
- Premier Power
- SWS Energy

Sophisticated computer modelling...

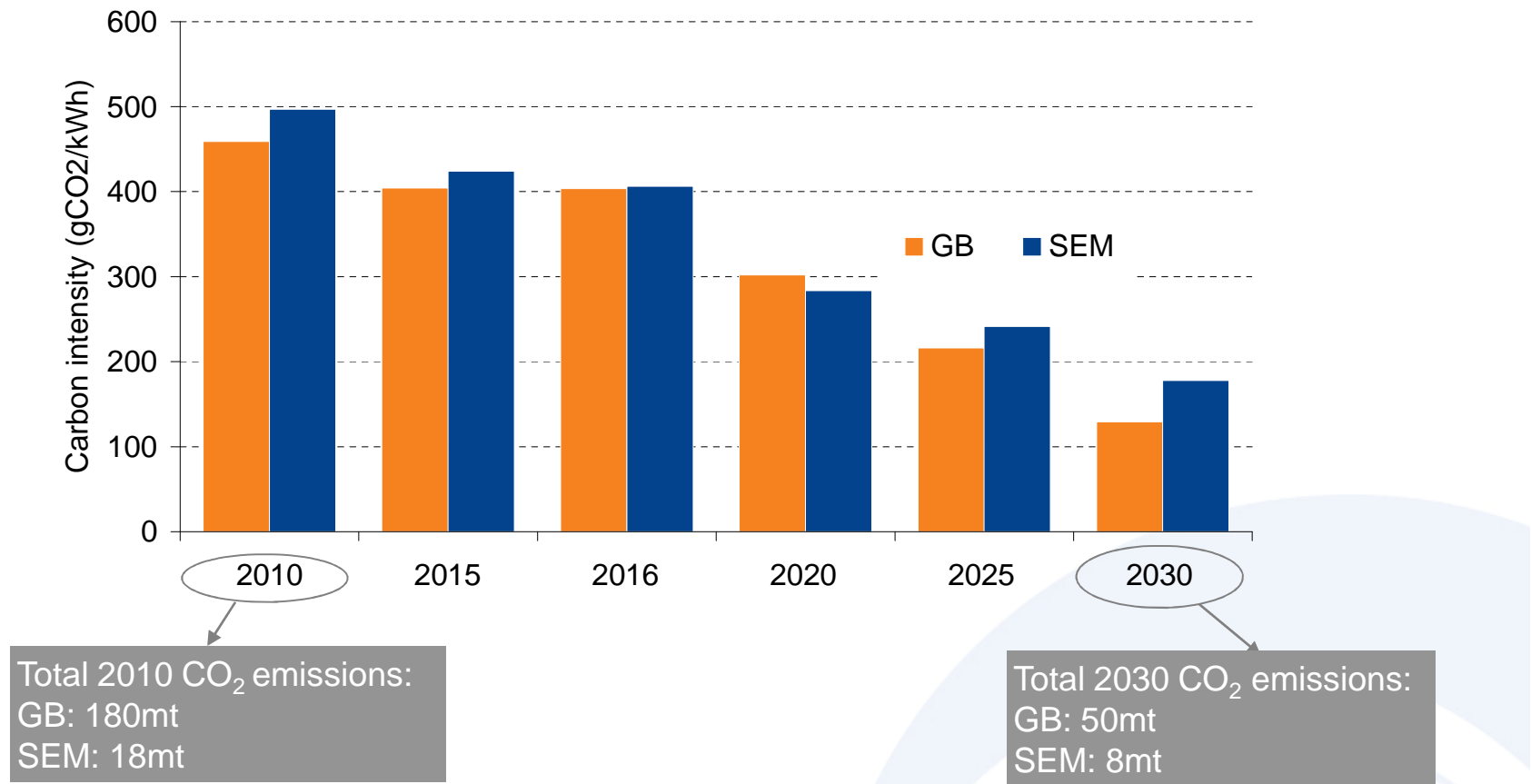


- 2.8 million wind records
- Each model run generates 50 million records, 840,000 prices and a 1.5GB database
- A total of 150GB of data generated from the study

CO₂ intensity

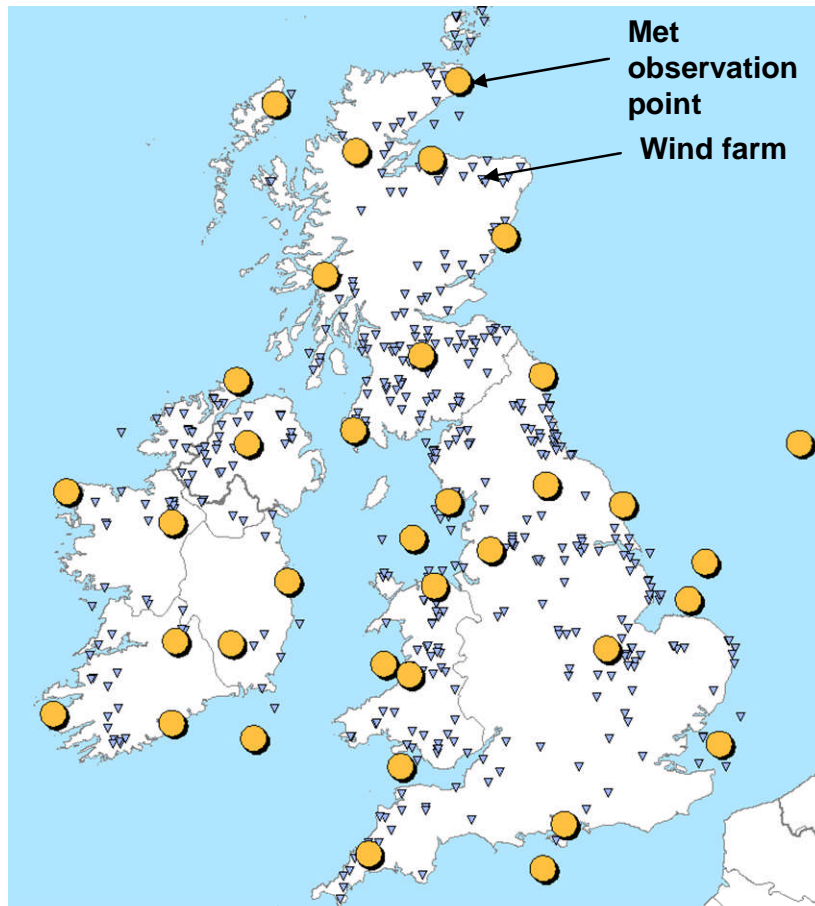
The CO₂ intensity decreases rapidly due to the emergence of nuclear, wind, marine and CCS.

Power Sector CO₂ emissions intensity in the Core scenario



Wind data

Location of observation points and operational wind farms

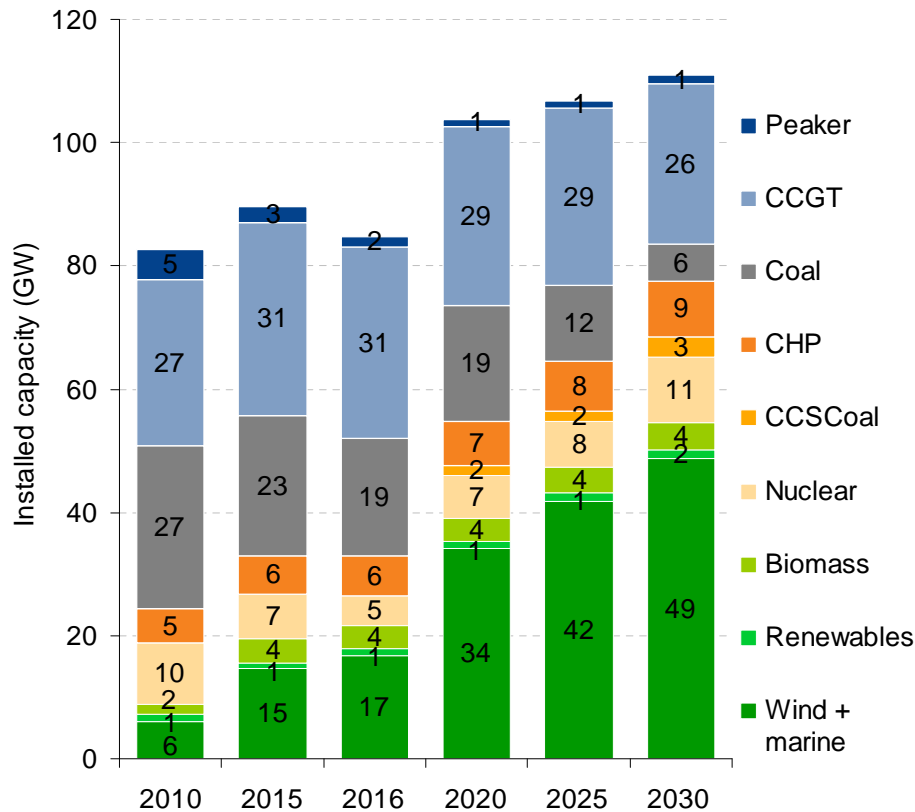


- 26 wind regions in the UK and 10 in RoI
- Data sources are Met Office (UK) and Met Éireann (RoI)
- Selection of regions in collaboration with Met Office with input from RES
- Sites were chosen to represent the location of current and future wind farms

Summary of 'Core scenario'

The study was focused around a Core scenario. Does not represent a 'base-case' but instead provides a 'stress-test' with a high percentage of generation from renewables.

Installed capacity assumptions in GB

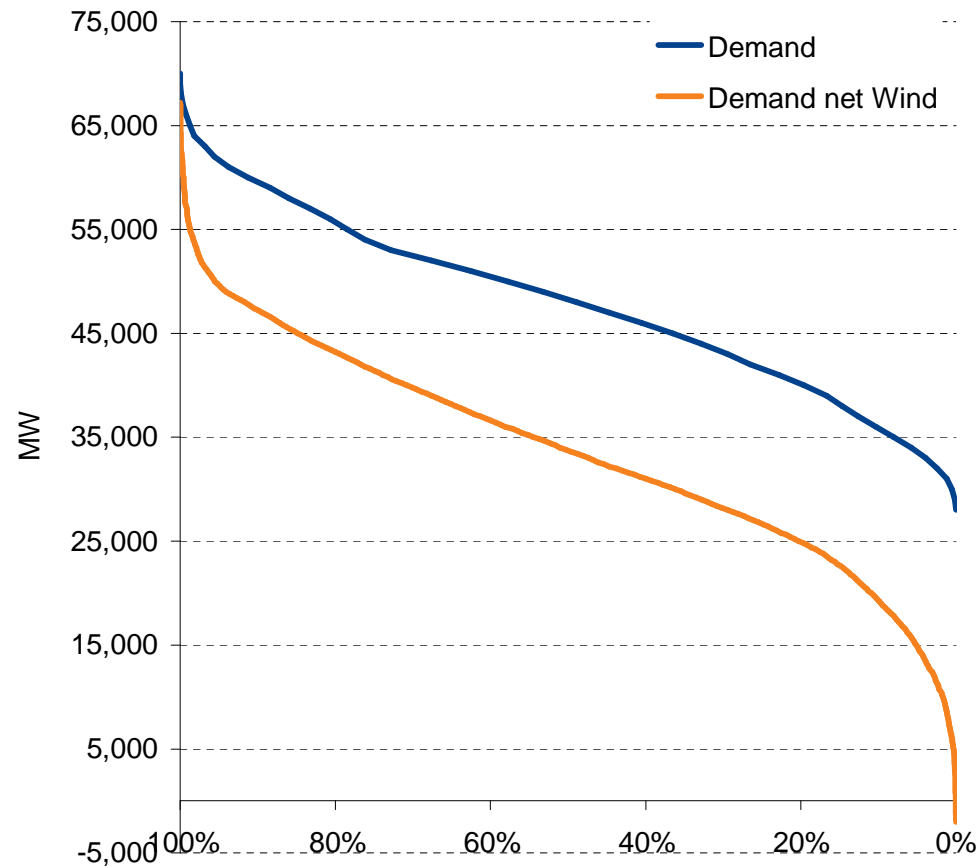


Fuel and demand assumptions

- Demand was assumed to grow at around 0.4% p.a.
- Oil price ~\$70/bbl
- Coal price ~\$70/tonne
- Carbon price ~€37/tCO₂
- New build of CCGT and coal is market determined
- New build of renewables, nuclear and coal CCS is 'non-market determined'

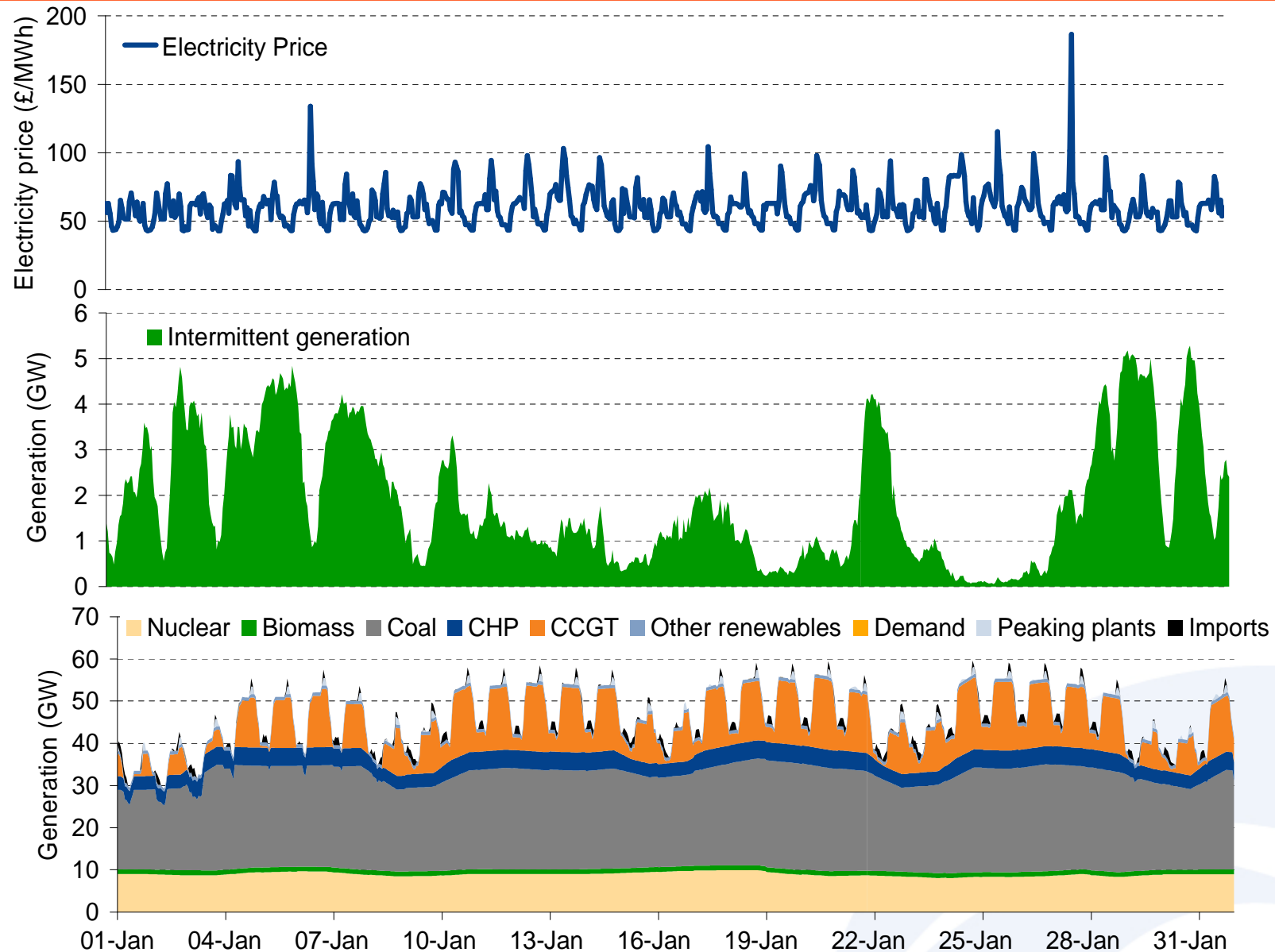
Note: The charted category 'Peaker' includes gas and oil steam as well as new and old GT plants.

Understanding the 'demand net wind' (GB market – 2030)

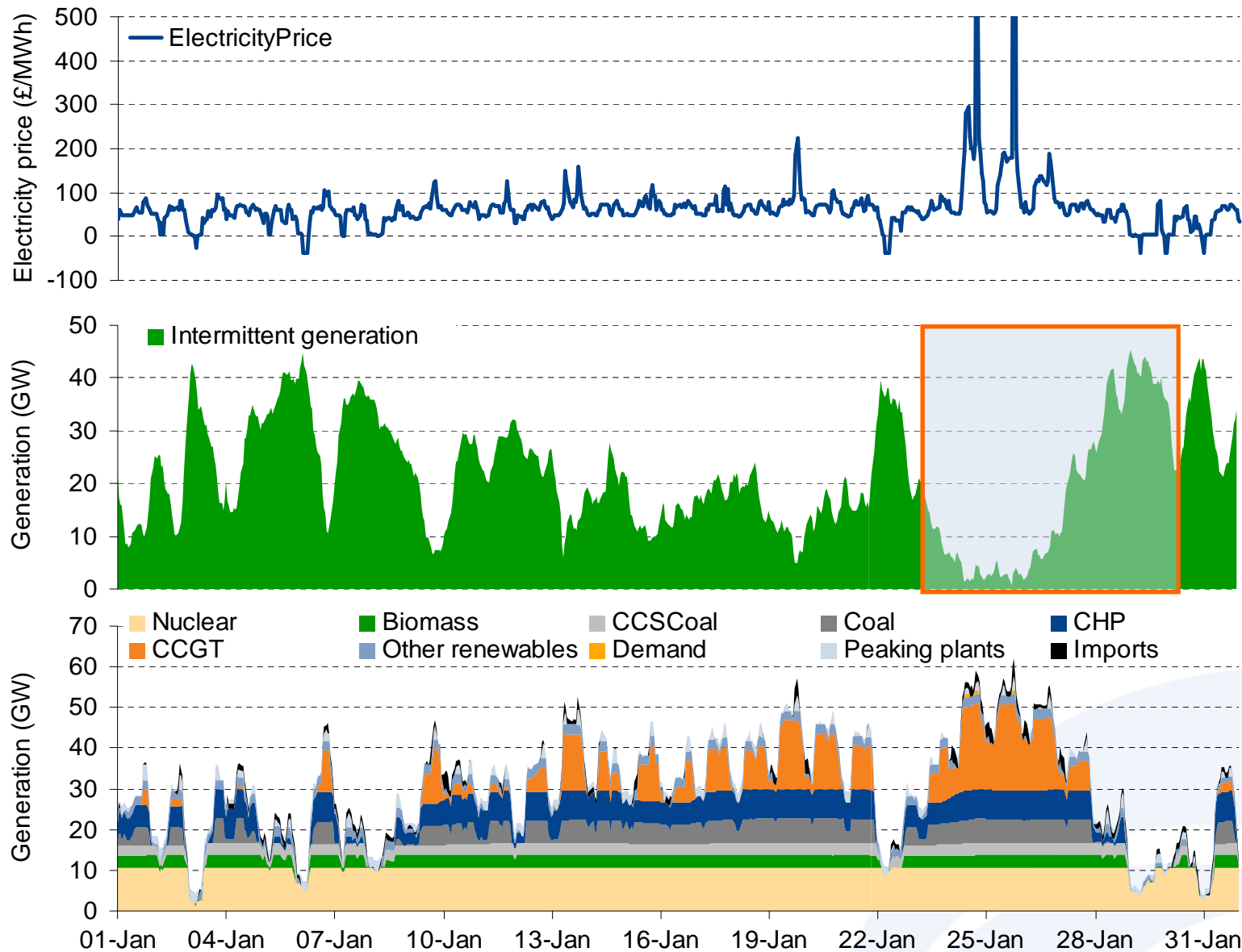


- At present, continuous baseload requirement of around 30GW
 - Zero for certain hours by 2030
- Demand net wind will be much more variable than demand alone
 - In the core scenario demand net wind varies between 0-65GW
- Less need for base load generation
 - All load factors likely to fall

GB – January 2010 (based on year 2000)



GB – January 2030 (based on year 2000)

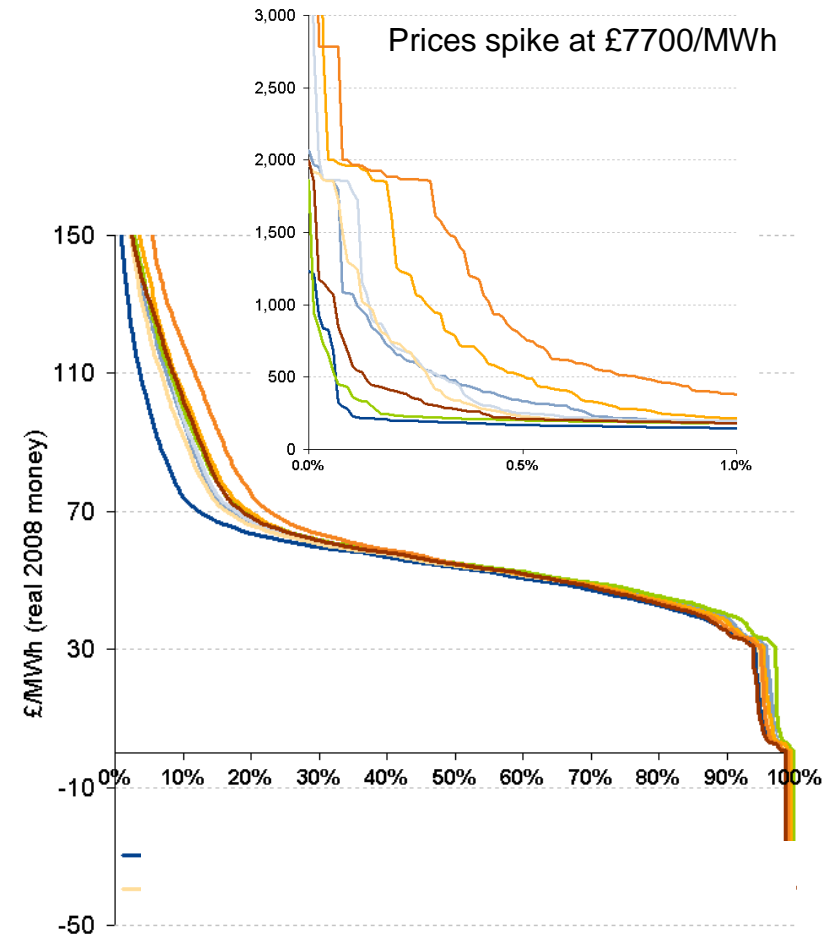
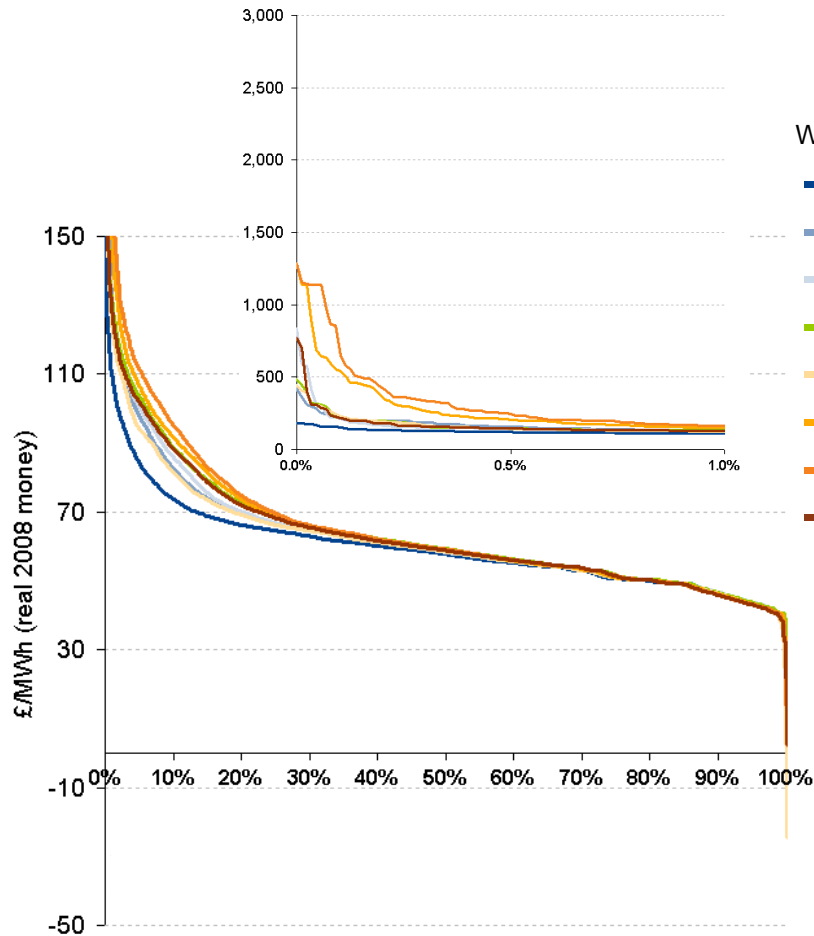


Market price volatility and stretch will greatly increase

Prices may spike regularly above £1000/MWh and fall to below zero

2020

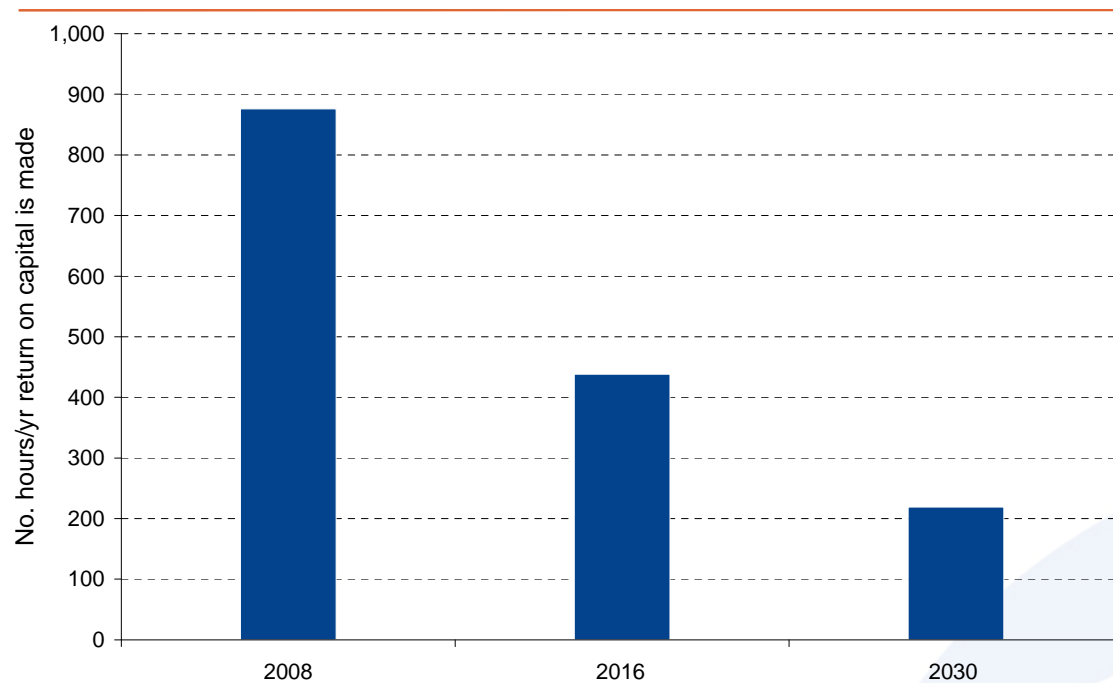
2030



GB faces an investment conundrum

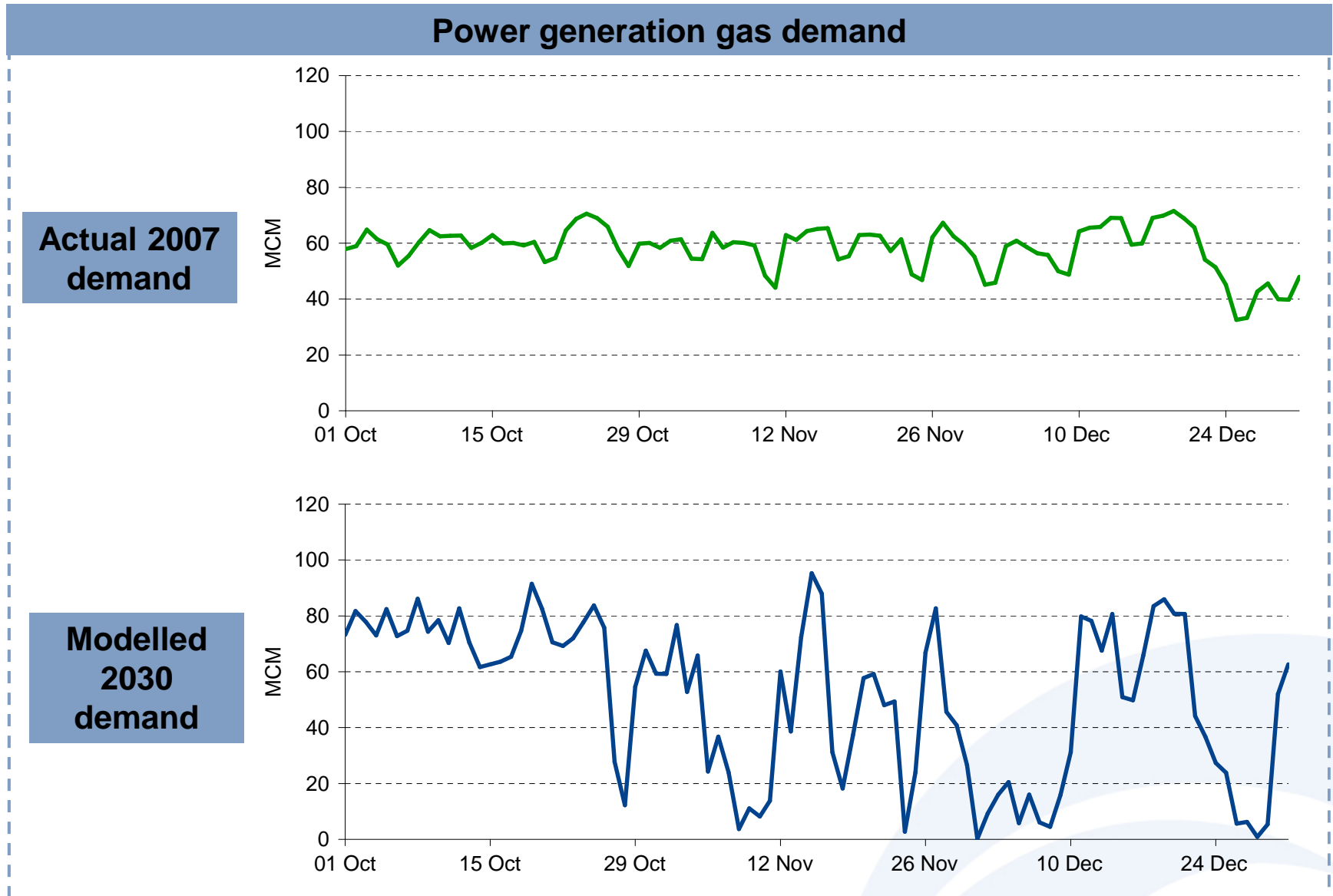
- Increasing installed capacity means fewer and fewer hours when system margin is tight and plants can recover fixed costs
- Number of hours plants earn a return on capital will therefore be squeezed
 - Creates high price spikes but also greater investment uncertainty

No. of hours per year plants earn return on capital



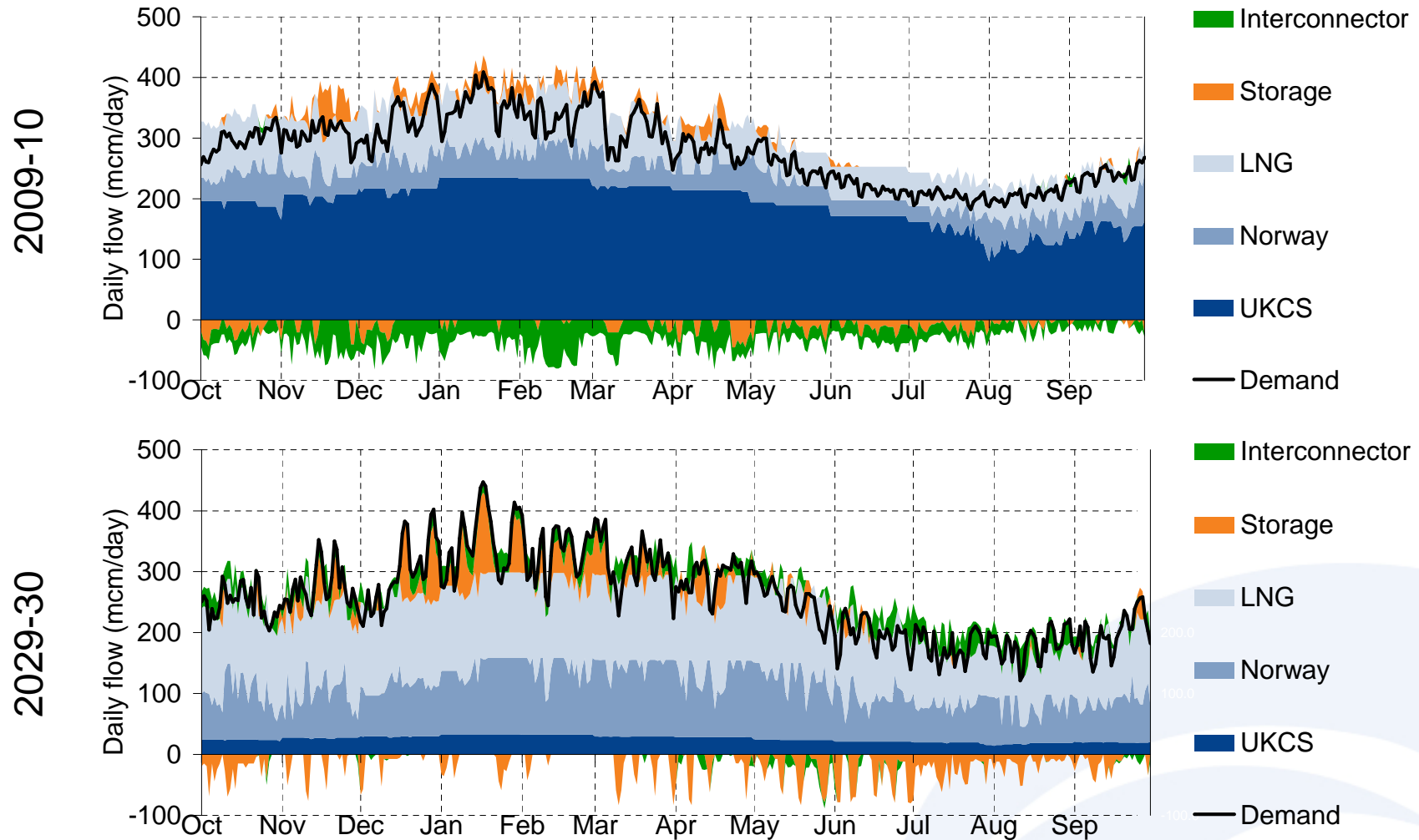
Will public/government accept this level of uncertainty?

The gas market will be transformed as well...



Gas supply mix

GB supply mix will shift significantly, with annual supplies and swing provided from a diverse mix of UKCS, LNG, Norway and interconnection



Conclusions – A high wind world will look very different to today

- The thermal system will flex in response to the wind
- Extremes will become more important and averages less so (for both electricity and gas markets)
 - Spiky prices
 - Uncertainty and risk
 - Changing operating patterns
- Investment conundrum for unsubsidised plant in GB
 - Will the rules need to change?
- Large increases in interconnection could change this picture somewhat
 - Not a ‘golden bullet’ in GB market but could mitigate risk somewhat
 - Issue will be examined more closely in the NWE intermittency study
 - Markets there are much more heavily interconnected

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