Flame 25TH ANNIVERSARY

GAS PRICING SUMMIT

LOOKING BEYOND 2020

Interactions between gas and power, market flexibility, long-term role of gas in a decarbonising world

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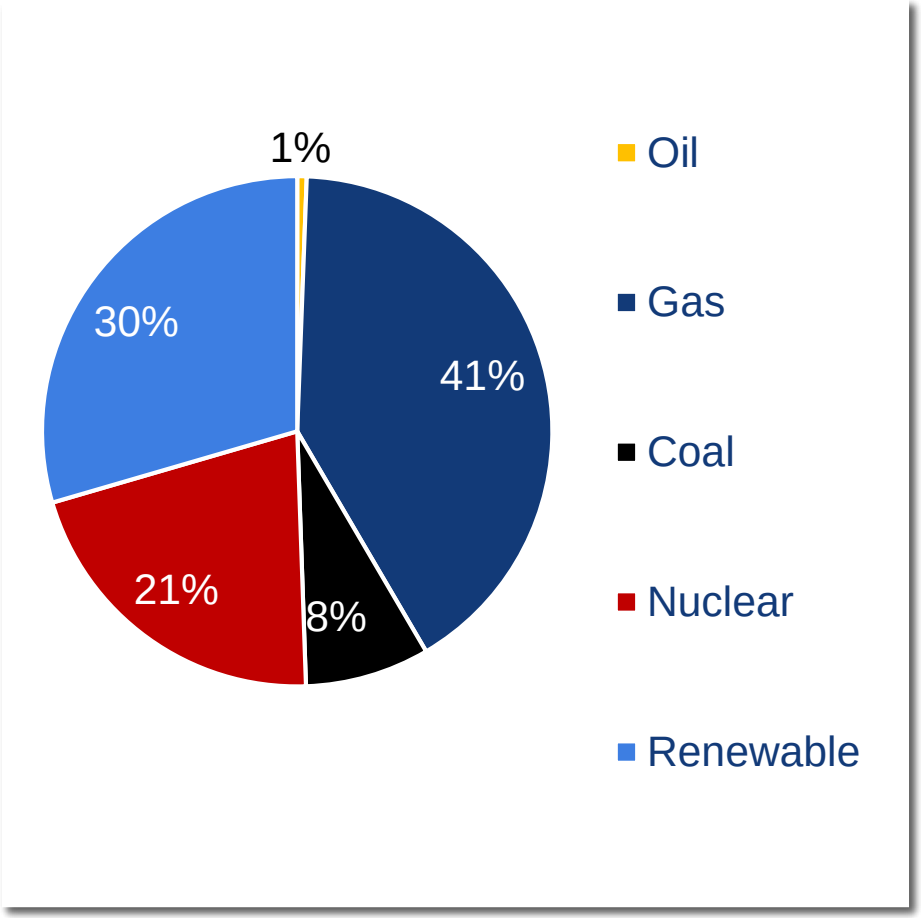
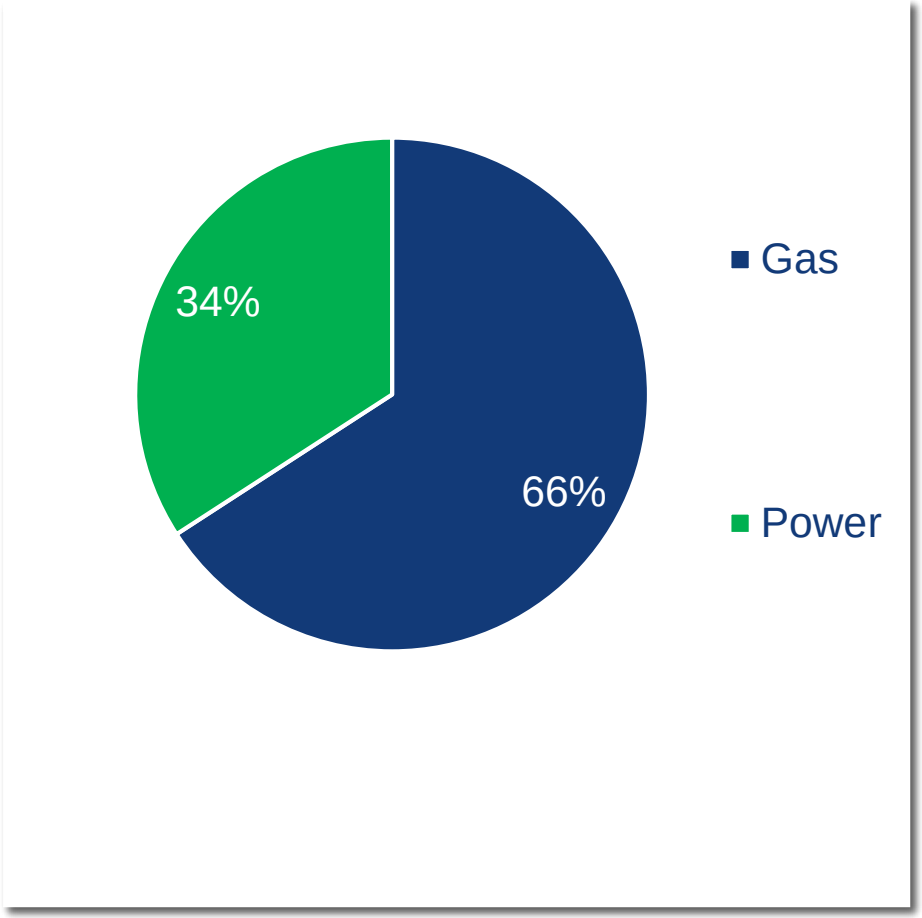
Gas is currently the bedrock of the UK energy system – makes up approx. 60% of primary energy in areas it competes with other fuels

UK fuel use in power generation (% avg since 2016)



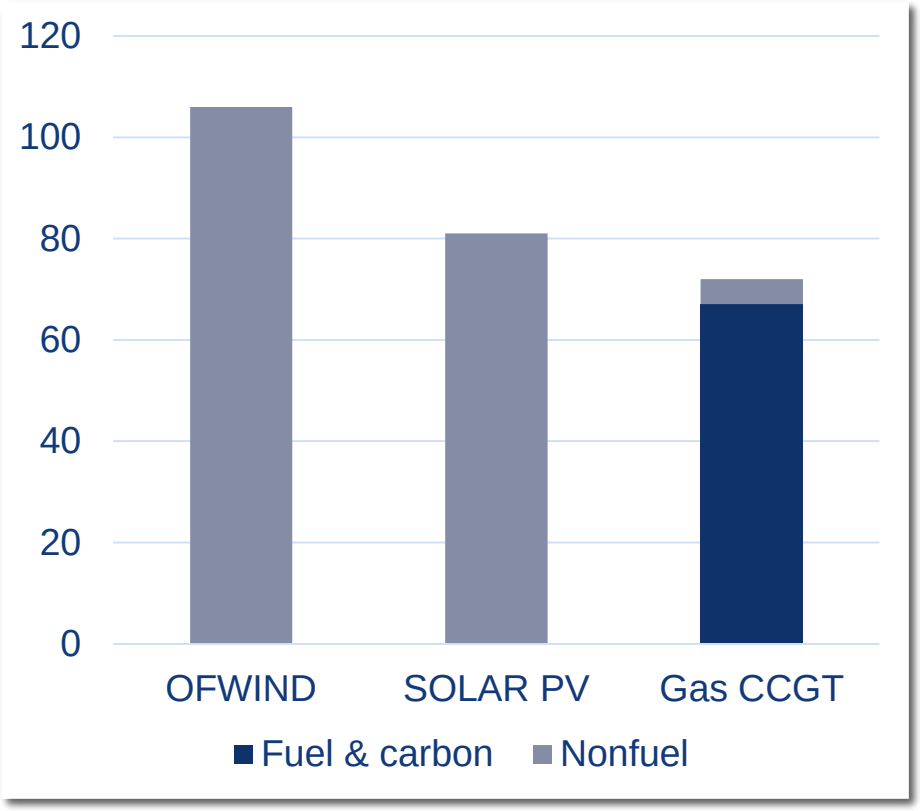
UK energy demand in residential, commercial, industry (% avg since 2016)



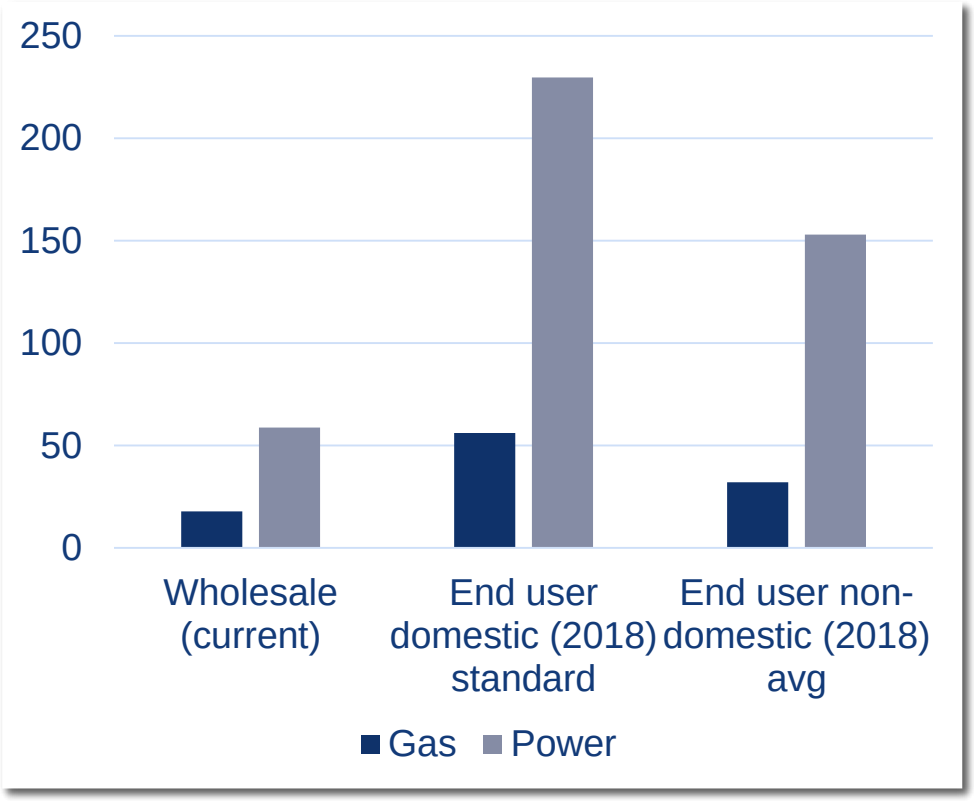
BP, N.Grid, Centrica, Author's calculations

Gas is also currently price competitive on an all-in cost basis and likely to remain so in the near term as the global market absorbs new supply

Power generation cost in the UK levelized $/MWh*



Wholesale and retail energy costs $/MWh*



*Estimated using market gas and carbon prices, average CAPEX costs from recent projects around the world, 7.5% ROI, 65% load factor for gas, 11% for Solar, 35% for offshore wind. Retail prices are from UK BEIS converted to USD using prevailing market rate at the time of writing in 2019

Plenty of margin in the market in the near term and gas makes a vital contribution to security of supply

Peak power demand to early 2020s @ < 60GW

- **More than 5GW of dependable margin estimated**
- **At nearly 30GW of dependable capacity, gas fired power provides the largest contribution**

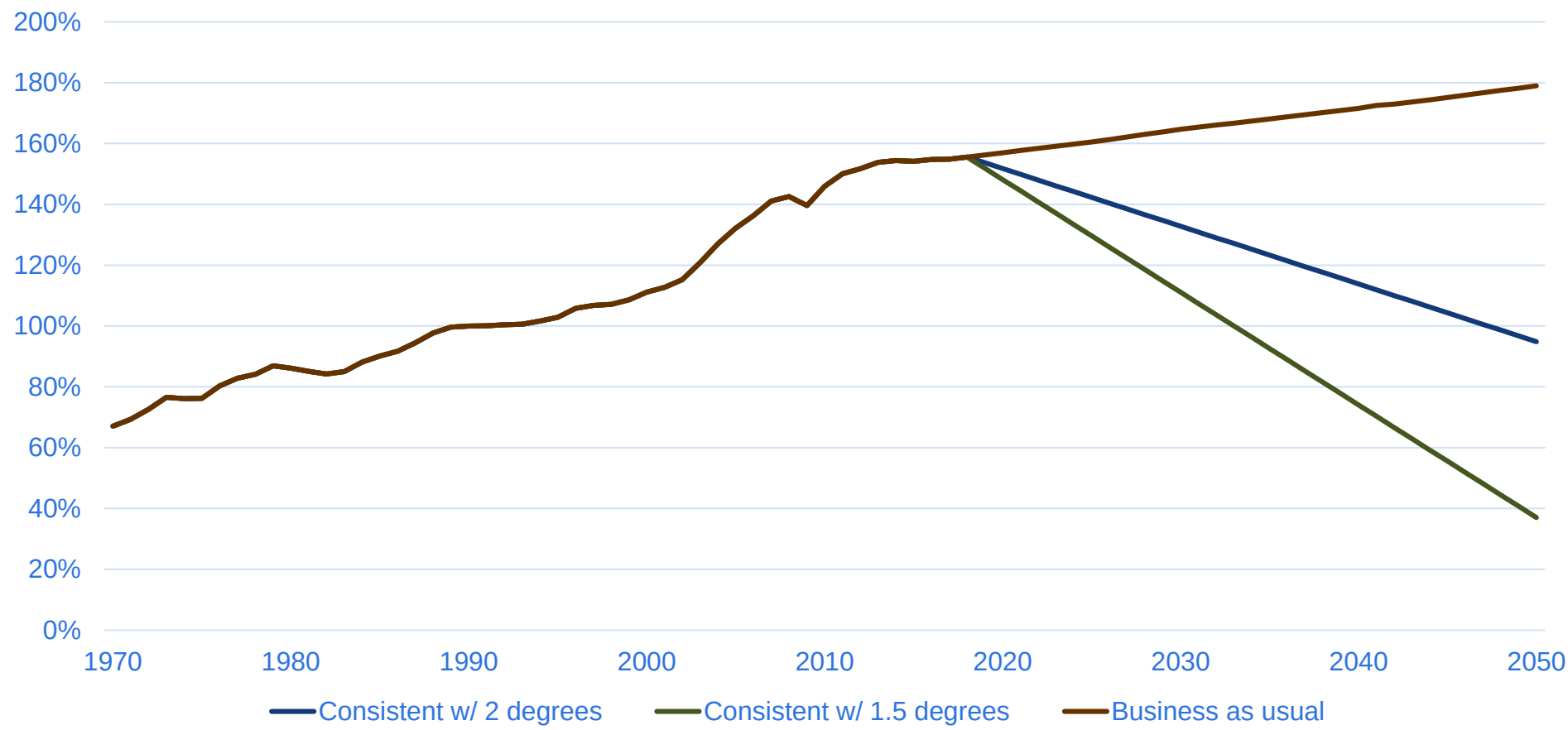
Gas system has 100mcmd capacity in an N-1 (1-20) peak situation

- **Sources are diverse, including pipeline, storage, LNG, domestic production**
- **Most forecasts show flat to falling demand, ignoring weather**

Source: National Grid, Author's calculations

In the longer term, decarbonisation is a dominant factor; Globally, major and rapid decarbonisation needed to come close to Paris targets. . .

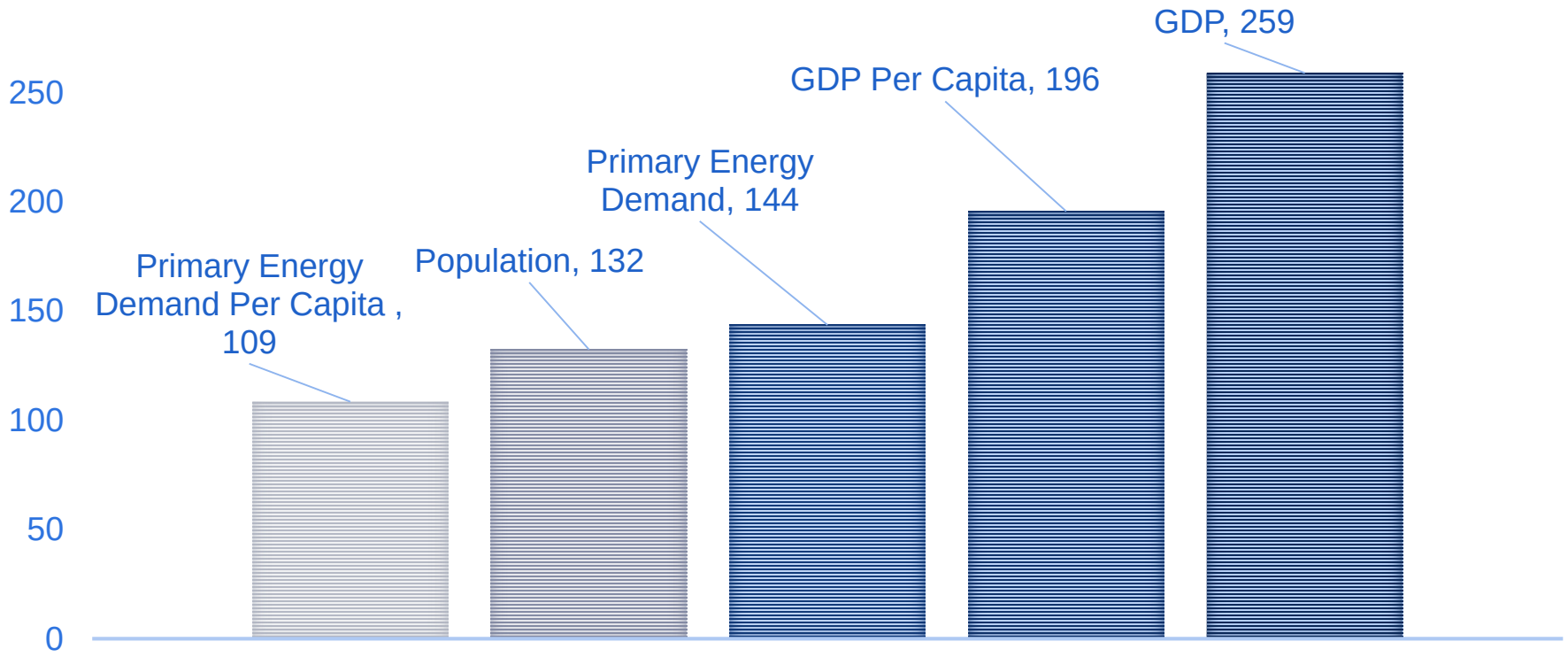
Global CO2 scenarios – indexed to 1990 CO2e



UNFCCC, UK CCC, BP, Centrica, Author's calculations

. . .and this needs to be done while energy demand is rising, as are population and economic activity

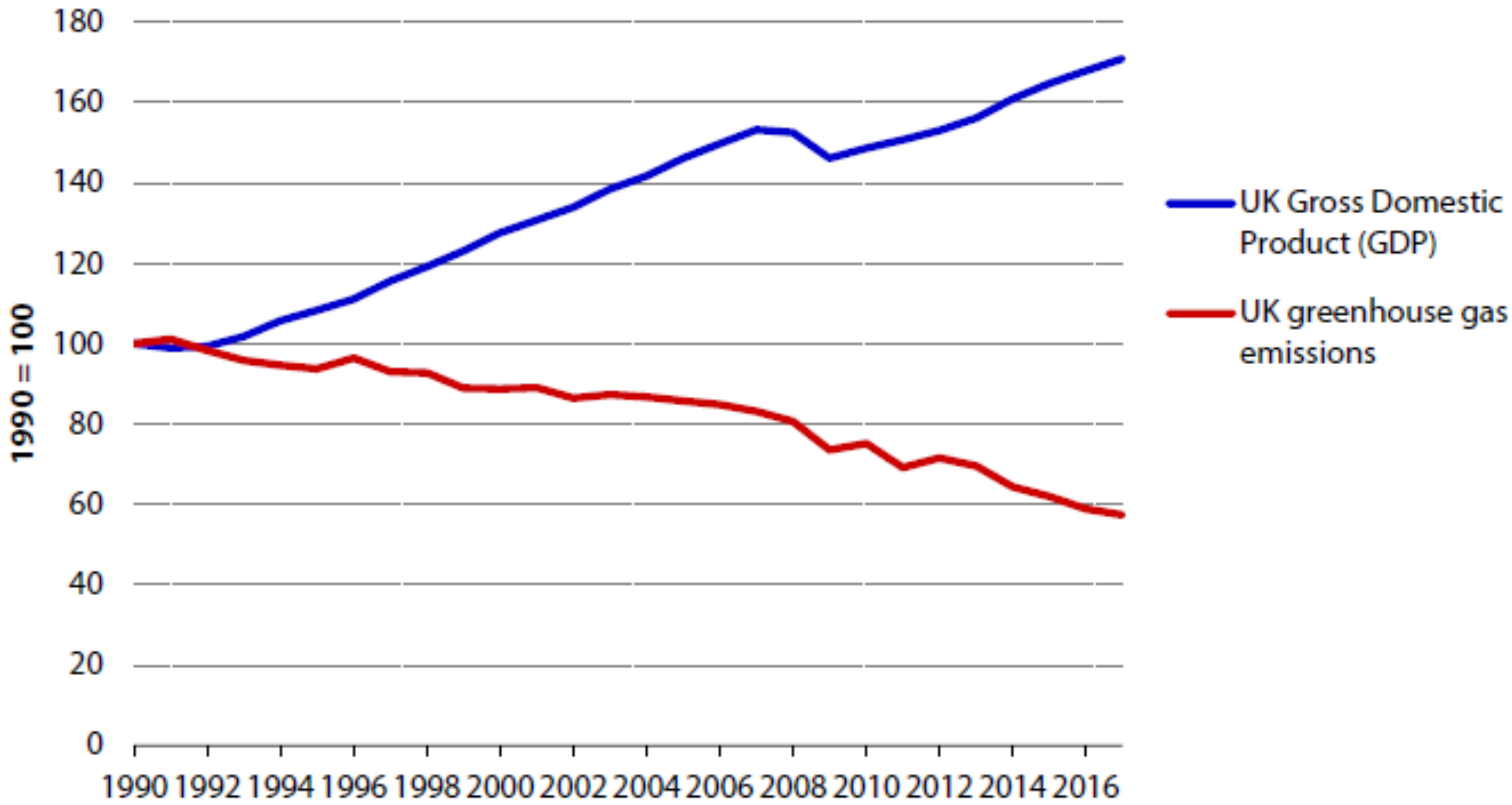
Global population, GDP, energy demand projection to 2040, 2010=100



Sources, UN, IEA, Centrica

In the UK the situation is slightly different as the country achieved substantial reduction in emissions and GhG and GDP growth de-coupled

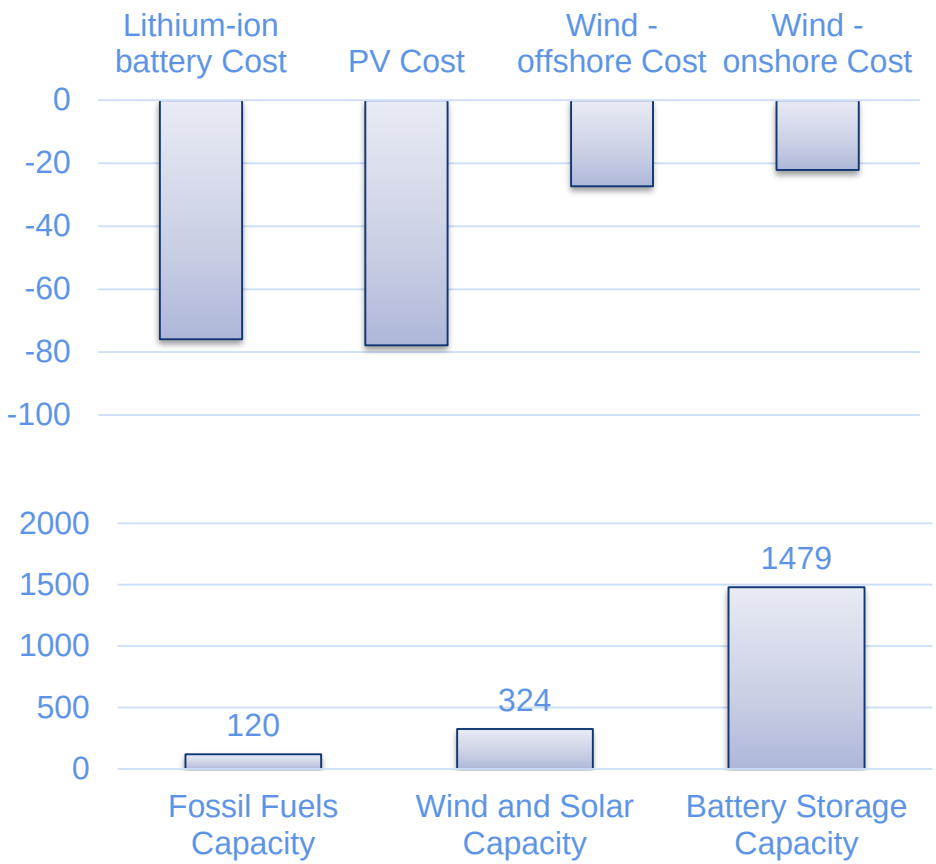
UK GhG Emissions (Mt)



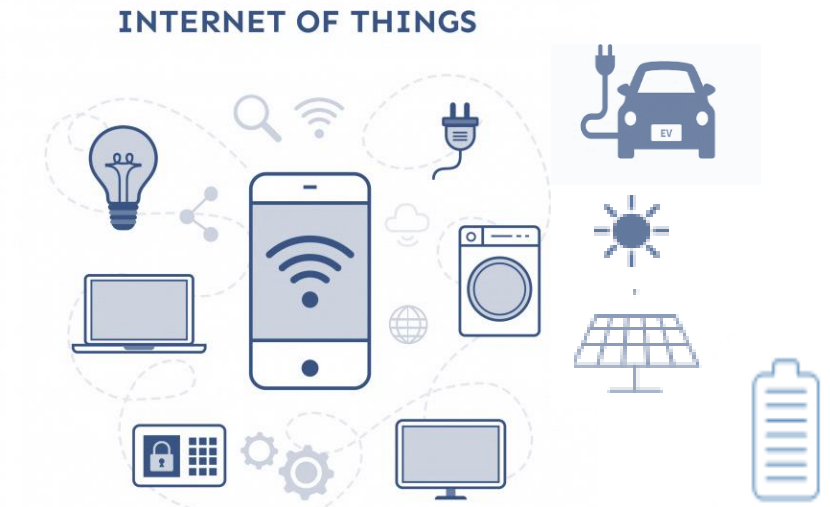
CCC, BEIS

Meanwhile, recent drop in cost of RES & storage alongside new tech provide new options to source manage our energy, driving transition to low carbon

Cost of renewable generation and Li-ion batteries falling and capacities are growing globally (2010=100) . . .



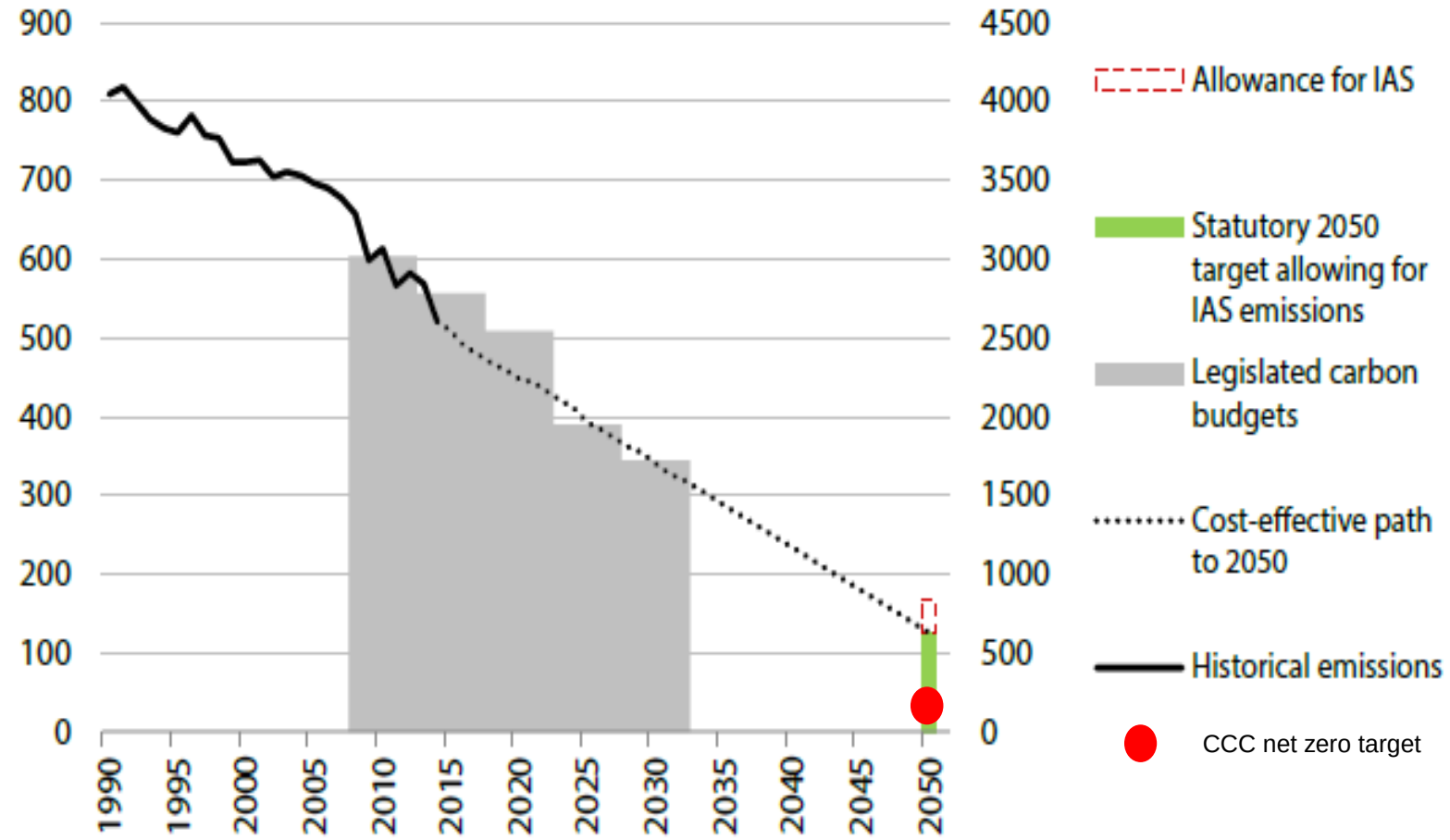
. . . while a huge number of new choices are emerging for energy customers



Source: BNEF, Various public reports, Centrica

Looking ahead: the UK legislated for deep decarbonisation and CCC have just recommended a ‘net zero’ by 2050. . .

UK GhG Emissions (Mt)



These targets are seriously challenging. . . Regardless low carbon gas offers compelling solutions both in the mid and long term

Challenges. . .

- Increasing renewable capacity will drive the need for storage and backup
- New power demand (estimated 60-90WTh and 3-30GW @peak) from 30-40million EVs will have to be met
- Heat demand is nearly twice power demand, can be 5-6x at peak. No technically or commercially viable form of storage exists to deal with seasonal storage needs, yet
- Electric solutions to heating may not work as well for customers – difficult retrofitting, low performance
- What fuel to use in aviation and shipping?
- AFFORDABILITY is a BIG issue

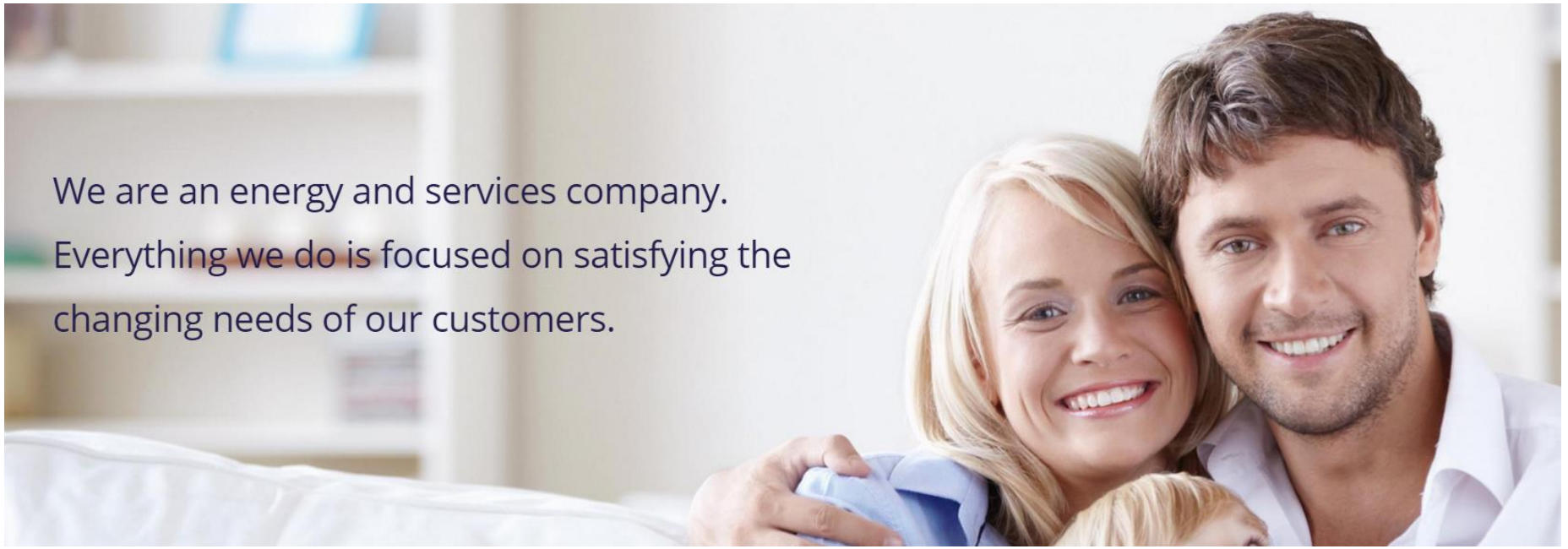
'Gas-based' solutions could go a long way

- Gas peakers are capable, flexible and affordable
- Gas CHP + renewable combinations can provide attractive solutions to lower carbon and reduce costs in the 2020s
- Biogas, Biogas+CHP make sense when feedstock is available
- Hybrid boilers that use gas when needed could provide performance similar to what customers are used to and avoid major retrofitting
- Hydrogen can play a complementary role or a major role, especially beyond 2020s. Cost of production is currently 2-4x current gas price but there is time to test and improve. Making maximum use of the existing infrastructure makes economic sense

Irrespective of the pathway, need stable policy that supports flexibility, puts customers first, and provides long-term low carbon incentives

- Is the current market set up for a high renewable, intermittent, and distributed power system? Do we need local markets and pricing? How will we optimise EV charging?
- Energy customers are an active part of the energy system enabled by digitalisation and other new and incoming technologies - EVs, appliance optimisation. How to enable the shift from energy as commodity to energy as a diversified service and in a market where customers are ‘prosumers’
- Putting customers first in our approach to decarbonising domestic heat, considering cost and practicality
- Long-term carbon pricing policy
- International coordination / compatibility of our energy system with neighbours and rest of the world so we can import/export/trade energy

Thank you!



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