Net Zero power by 2035: could the UK accelerate decarbonisation of its power system?

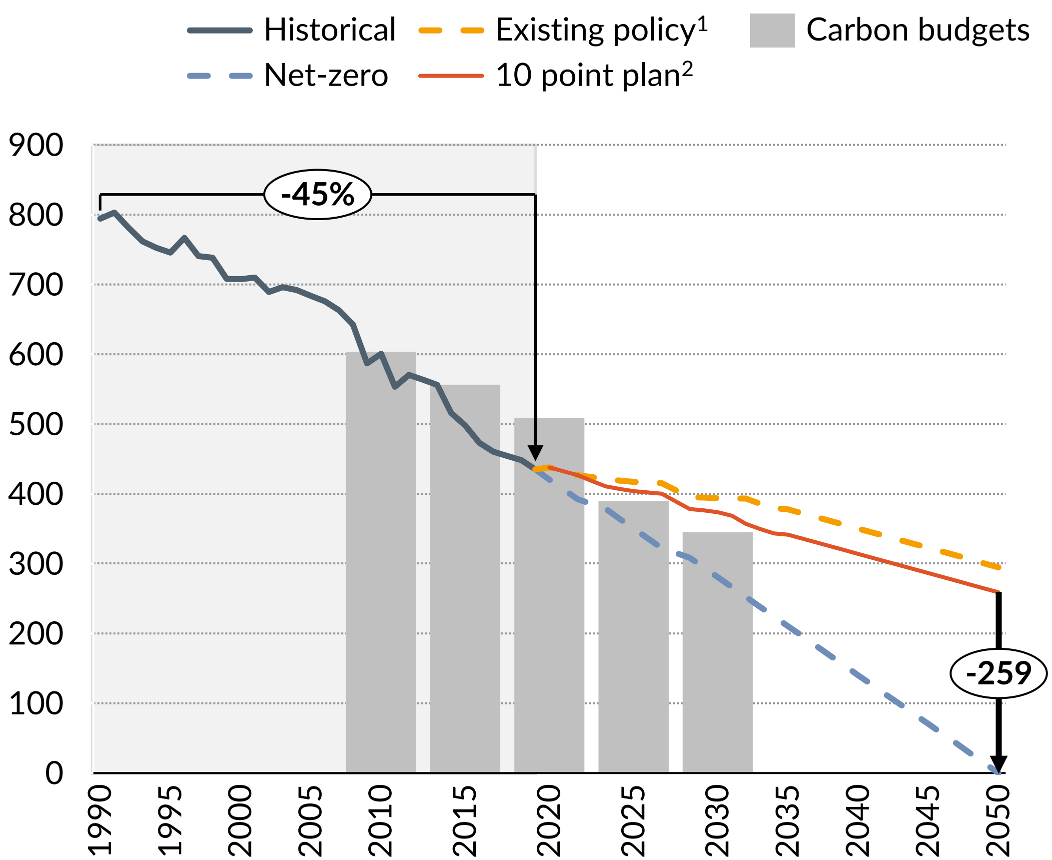
30 November 2020

GB is set to miss its 2050 Net Zero target, and also its 4th & 5th Carbon Budgets despite Boris' ambitious 10-point plan

Total Greenhouse Gas Emissions

Excluding aviation and shipping

$MtCO_2e$



- The UK has seen a 45% decline in emissions since 1990 and beaten all of its carbon budgets to date.
- Current progress has been driven by a switch from coal to gas in power generation and uptake of renewables.
- Under existing policy, the CCC expects the UK to miss its upcoming decarbonisation targets as further abatement efforts become increasingly challenging.
- The new Ten Point Plan seeks to improve this outlook but still falls short of the 4th and 5th carbon budgets.
- In addition to existing policy, the 10 point plan still sees the UK missing its Net Zero target by 259 $MtCO_2e$ per year[2].
- A number of prominent energy companies have called for the UK Government to match President-elect Biden's pledge for a Net Zero power system by 2035

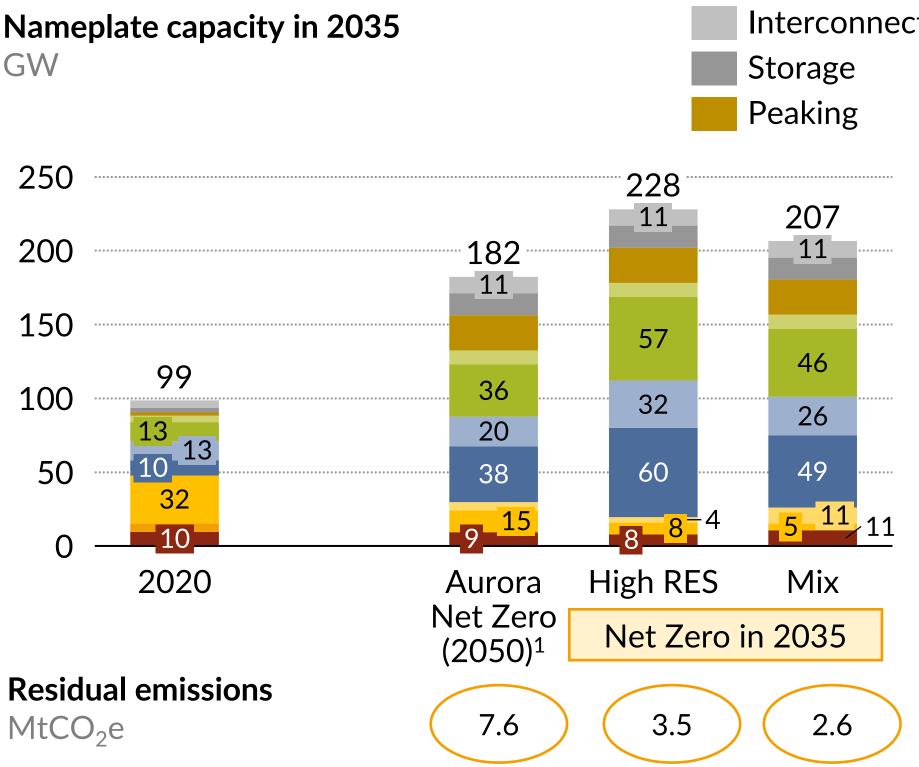
1: Extrapolated from BEIS projections which end in 2035, using estimated net carbon account as published in CCC's 2020 Progress Report; not accounting for announcements in Ten Point Plan.
2: Estimated based on existing policy coupled with 10 point plan emissions savings.

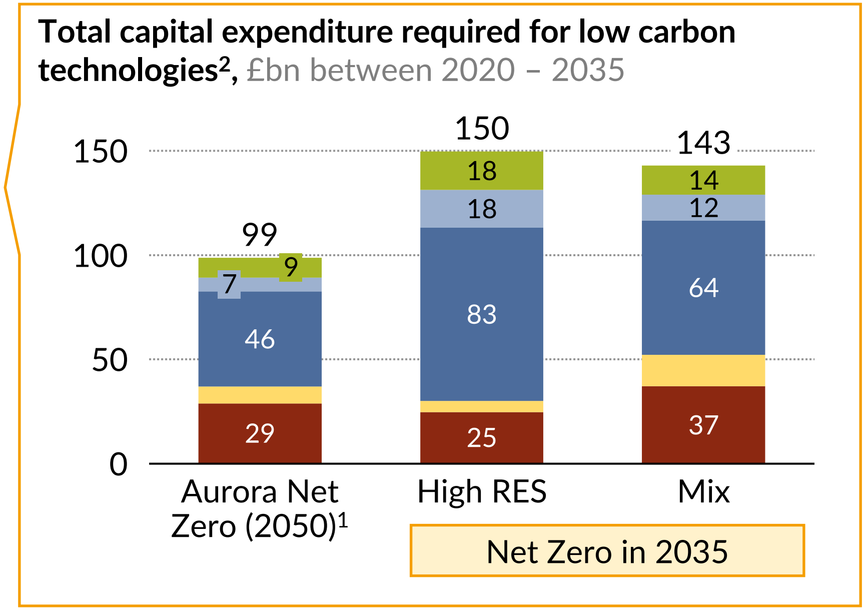
Sources: Aurora Energy Research, BEIS, CCC

In Power, meeting Net Zero by 2035 requires £150bn of additional CAPEX to deliver 120 GW of low carbon assets

AURORA ENERGY RESEARCH

Nameplate capacity in 2035
GW





- We consider two possible scenarios to achieve net zero in Power by 2035 - (i) High RES which focuses on the buildout of renewables and; (ii) Mix which considers a mix of renewables alongside Gas CCS and nuclear
- Nuclear can realistically provide a maximum of 10-11GW in 2035, due to long times to construct new plant, combined with closures of all but one of the existing fleet. Offshore wind provides a large share of low carbon power.
- Meeting net zero by 2035 will require an ambitious buildout of up to 120 GW of low carbon assets from today, at a total capital expenditure cost of £150 billion

1) Capacity mix in 2035 based on Aurora's Net Zero scenario with hydrogen which reaches Net Zero by 2050. 2) CAPEX shown for new builds required net of retired capacities in the period to 2035.

Source: Aurora Energy Research

Getting to Net Zero power by 2035 involves overcoming a number of significant challenges

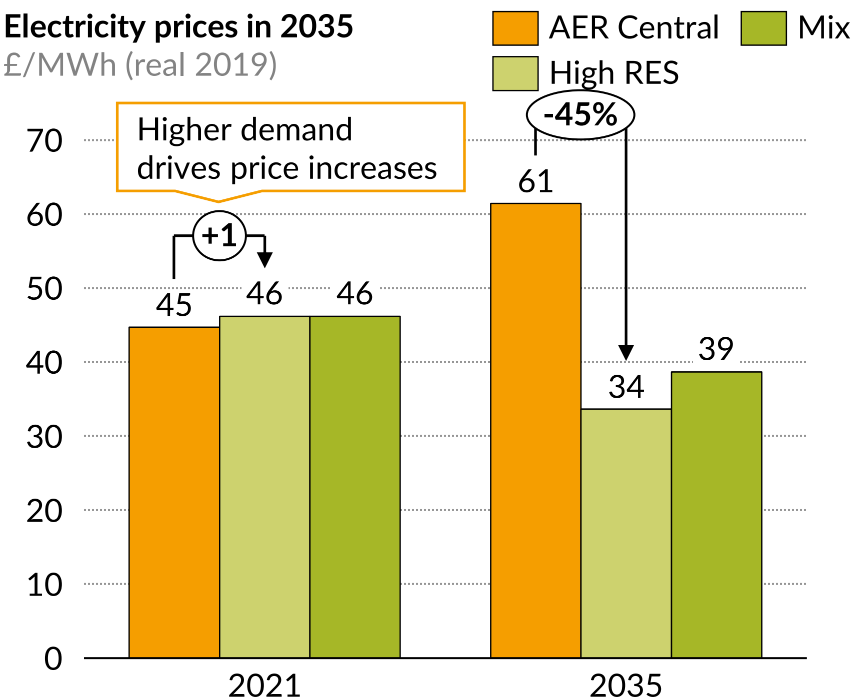
Key challenges	Key considerations
A Investor sentiment	▪ Sudden and rapid decarbonisation could undermine the economics of existing thermal and renewable assets and affect investor sentiment and risk appetite. ▪ Meeting net zero targets by 2035 could precipitate the closure of up to 5 GW of existing CCGTs ahead of their technical lifetime of 30 years.
B Government support required	▪ A large buildout of renewables by 2035 will dampen wholesale powers prices. Relative to a pathway to meeting Net Zero in 2050, wholesale power price could be 30% lower if Net Zero was to be met in 2035. ▪ A low price environment will necessitate significant Government support for deploying low carbon technologies, some of which are in their nascent stage of development.
C System stability	▪ To manage the large-scale buildout of intermittent renewables, the system operator will have to ensure sufficient capacities to provide system balancing and ensure grid stability. ▪ These services are mainly provided by thermal technologies today (such as CCGTs and gas peakers), which could hinder the Net Zero agenda. ▪ Grid scale and EV batteries and pumped storage are well suited to providing short term balancing, but cannot address a longer 'wind drought' over several days ▪ Hydrogen could play a role, with electrolysers soaking up excess power production, and hydrogen then stored and used in hydrogen CCGTs to provide power at peak times, but the technology is at an early stage of development.
D Supply chain	▪ Building out capacity in a short space of time could exert a strain on supply chains. ▪ Getting to 60GW offshore wind involves building 4GW per annum from 2025 – compared to a build rate of just 0.9GW per annum in the 2010s. ▪ The lead times for nuclear and CCS are relatively long, setting a cap on the volume of these technologies which could realistically be delivered by 2035

Source: Aurora Energy Research

Meeting 2035 Net Zero could lower power prices by up to 45%, and reduce system inertia below NGESO's required bands

1 Power prices will fall by almost 40% compared to Aurora Central

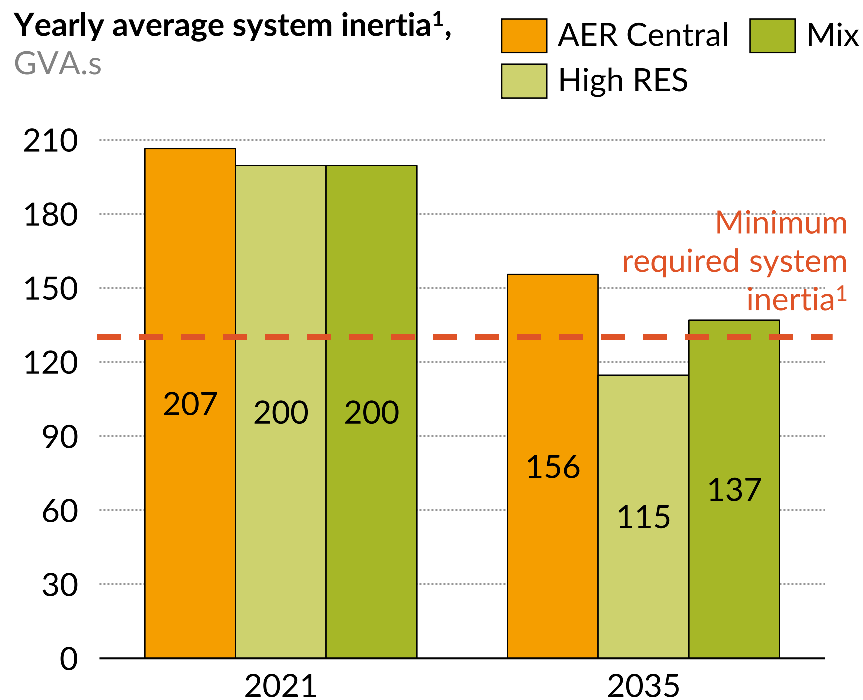
Electricity prices in 2035
£/MWh (real 2019)



- Meeting Net Zero by 2035 decreases average baseload prices by up to £45% in 2035 as ow marginal cost renewables start setting the price more frequently.

2 System inertia will fall below the minimum

Yearly average system inertia[1],
GVA.s



- Meeting Net Zero by 2035 could decrease system inertia below minimum required levels due to thermal assets coming off the system. Nuclear and Gas CCS plants could however also provide the service.

1) Systems with high inertia experience a lower rate of change of frequency (RoCoF) following a sudden drop in generation, and so are more stable. Minimum required inertia of 130 GVA.s as reported by NGESO

Sources: Aurora Energy Research, NGESO

Report details and disclaimer

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