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Lifting the lid on Net Zero

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Where do we stand?





CO₂ Concentration – 12 months







CO₂ Concentration – 1700 to Present







CO₂ Concentration – 800,000 years



Global warming



CO₂ Concentration – 800,000 years





What do we do about this?



















Alternatives to fossil fuels – Renewable Power Generation Costs



Source: International Renewable Energy Agency (2019) Renewable Power Generation Costs in 2018



Reducing emissions in the UK









Surface Transport: Emissions in 2050





Source: CCC analysis



How UK net-zero scenarios can be delivered

	2020s	2030s	2040s	
Electricity	Largely decarbonise electricity: renewables, flexibility, coal phase-out	Expand electricity system, de generation (e.g. using hydroger	ecarbonise mid-merit/peak n), deploy bioenergy with CCS	
Hydrogen	Start large-scale hydrogen production with CCS	Widespread deployment in industry, under the widespread deployment in industry, under heavier vehicles (e.g. HGVs, trains) and p	use in back-up electricity generation, potentially heating on the coldest days	
Buildings	Efficiency, heat networks, heat pumps (new-build, off-gas, hybrids)	Widespread electrification gas grids potentially	, expand heat networks, switch to hydrogen	
Road Transport	Ramp up EV market, decisions on HGVs	Turn over fleets to zero-emission v	ehicles: cars & vans before HGVs	
Industry	Initial CCS clusters, energy & resource efficiency	Further CCS, wid hydrogen, some	espread use of electrification	
Land Use	Afforestation, peatland restoration			
Agriculture	Healthier diets, reduced food waste, tree growing and low-carbon farming practices			



How UK net-zero scenarios can be delivered

	2020s	2030s	2040s		
Aviation	Operational measures, new plane efficiency, constrained demand growth, limited sustainable biofuels				
Shipping	Operational measures, new ship fuel efficiency, use of ammonia				
Waste	Reduce waste, increase recycling rates, landfill ban for biodegradable waste	Limit emissions from co wastes (e.g. deploy measures to rec	ombustion of non-bio duce emissions from waste water)		
F-Gases	Move almost completely away from F-gases				
Removals	Develop options & policy framework	Deployment of BECCS in vario air capture of CO ₂ , other remo	us forms, demonstrate direct ovals depending on progress		
Infra- structure	Industrial CCS clusters, decisions on gas grid & HGV infrastructure, expand vehicle charging & electricity grids	Hydrogen supply for industry & potentially buildings, roll-out of infrastructure for hydrogen/electric HGVs, more CCS infrastructure, electricity network expansion			
Co-benefits	Health benefits due to improved air quality, healthier diets and more walking & cycling Clean growth and industrial opportunities				



Central estimates for annual resource cost of meeting a net-zero GHG target (2050)





Five months on – some observations



Observation one: We don't have all the answers

Remaining emissions in the Further Ambition scenario



Source: CCC analysis



Total CO2 captured and stored due to Further Ambition options in 2050







Use and production of Hydrogen in 2050



Costs of example low-carbon technologies compared to past projections Offshore wind (left) Battery packs (right)



Source: Offshore wind costs, CCC analysis based on DECC (2012) Electricity generation costs and LCCC (2019) CfD register. Battery forecasts, CCC (2015) Sectoral scenarios for the 5th Carbon Budget, outturn costs from BNEF (2018) Electric cars to reach price parity by 2022





Economy cost of Electric Vehicle switchover

Source: CCC analysis



Role of societal and behavioural changes in the Further Ambition scenario



- Low-carbon technologies or fuels not societal / behavioural changes
- Measures with a combination of low-carbon technologies and societal / behavioural changes
- Largely societal or behavioural changes



Observation five: Other approaches are available

Indicative emissions trajectory





Observation five: Other approaches are available

Indicative emissions trajectory



Source: CCC analysis



Thank you