Climate
Change
Committee

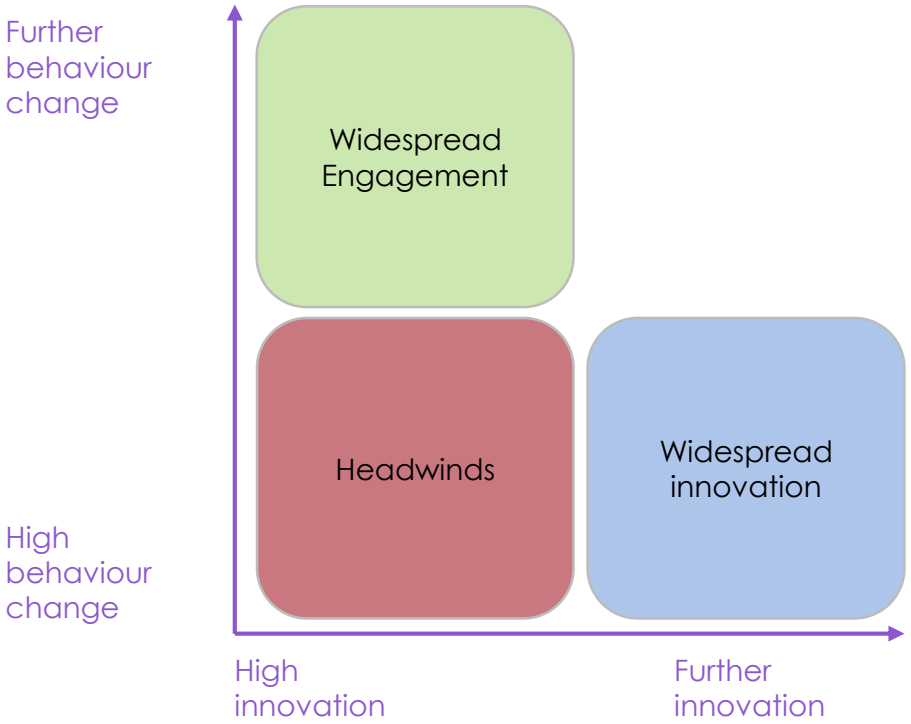
The Path to Net Zero

Advice on the UK's Sixth Carbon Budget 2033-37 – implications for Scotland

Our approach

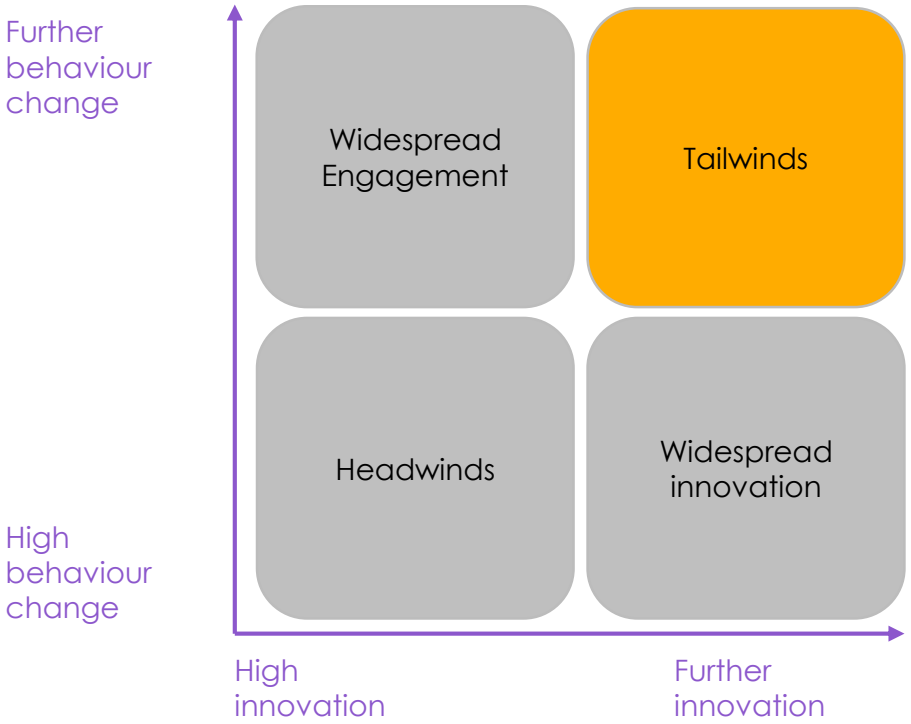
Our approach

Three exploratory scenarios to reach Net Zero by 2050



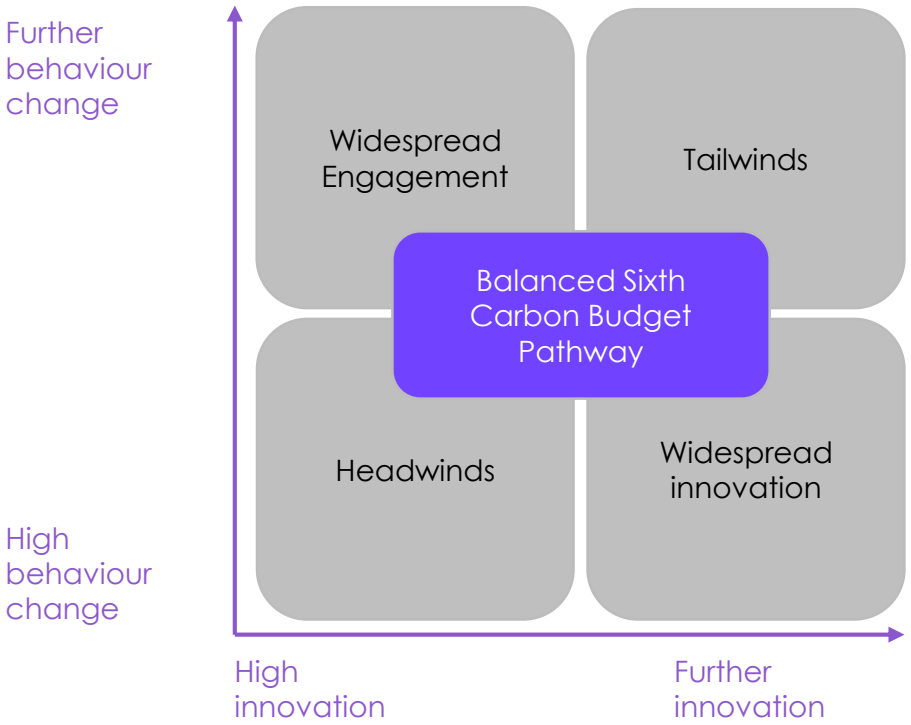
Our approach

One highly optimistic scenario with success on infrastructure, innovation, societal and behavioural change



Our approach

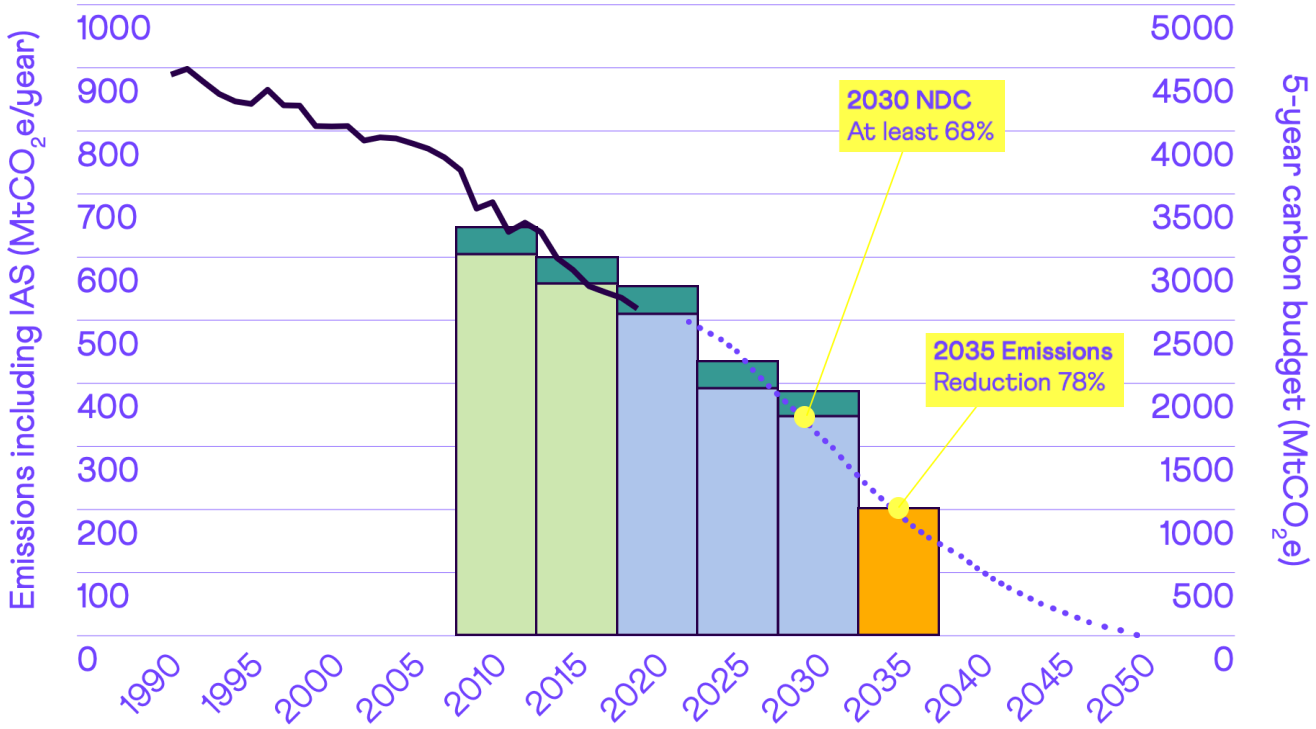
A balanced pathway to keep options open



Our recommended path

Our recommended path

The recommended sixth carbon budget and 2030 NDC

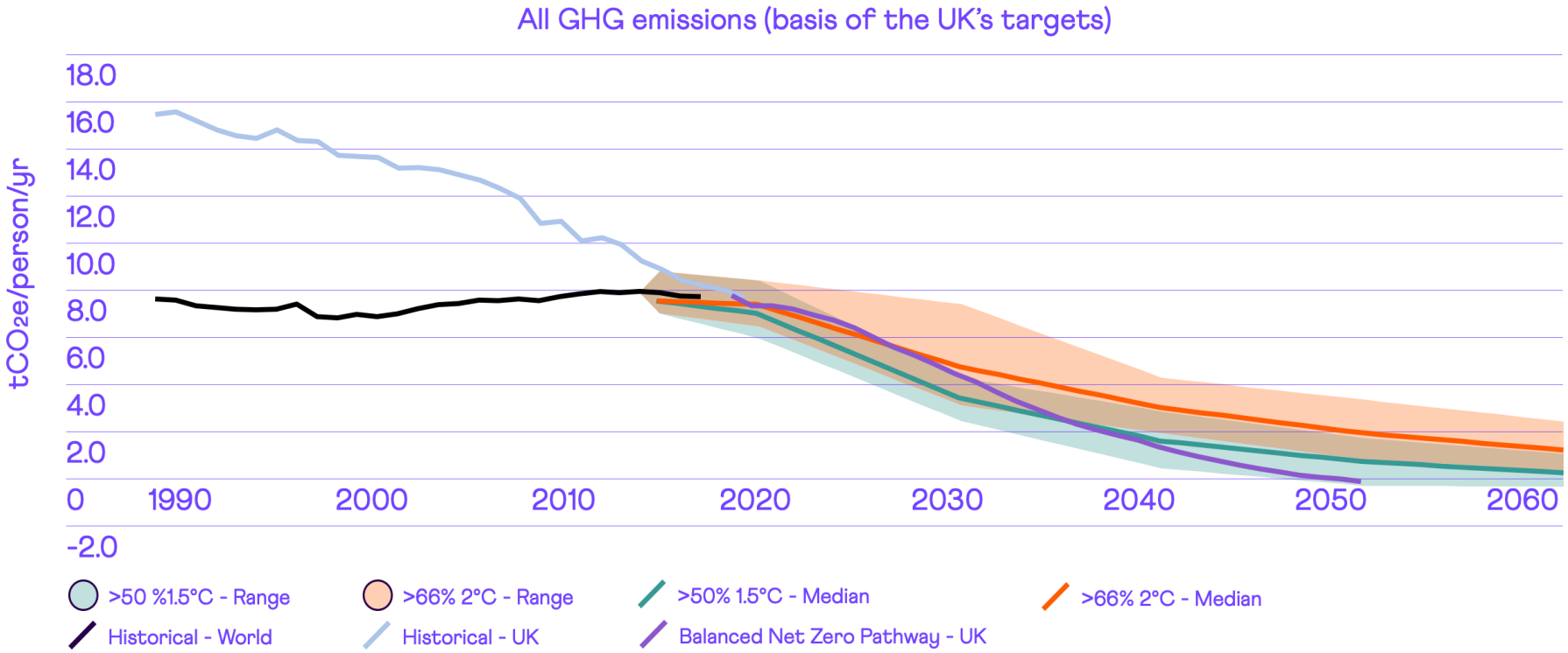


Notes:
Emissions shown including emissions from international aviation and shipping (IAS) and on an AR5 basis, including peatlands. Adjustments for IAS emissions to carbon budgets 1-3 based on historical IAS emissions data; adjustments to carbon budgets 4 and 5 based on IAS emissions under the Balanced Net Zero Pathway.

Source:
BEIS (2020) Provisional UK greenhouse gas emissions national statistics 2019; CCC analysis.

UK's offer to COP26

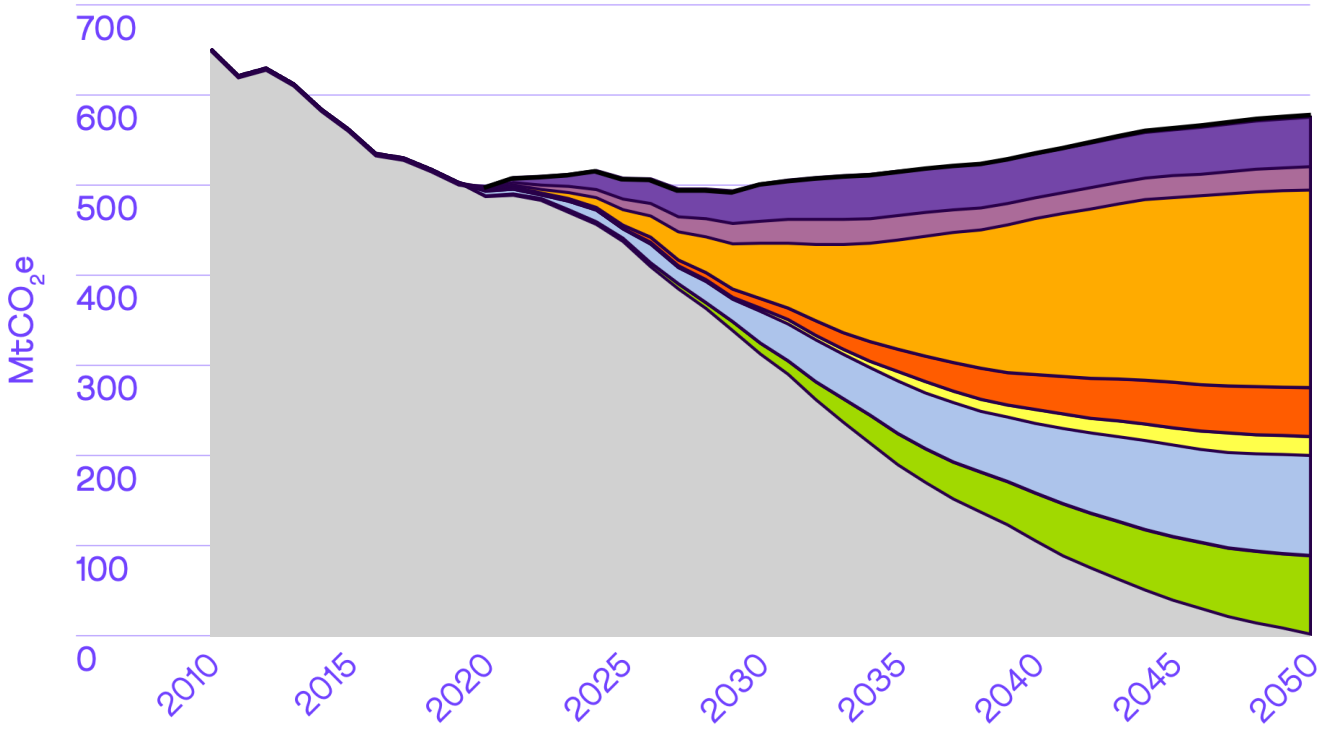
Per person emissions vs global requirements of Paris



Delivering Net Zero

Emissions abatement

Meeting the Sixth Carbon Budget requires actions across four key areas



1. Reducing demand and improving efficiency

- Reduced demand for carbon-intensive activities
- Improved efficiency in use of energy and resources

2. Take-up of low carbon solutions

- Electrification
- Hydrogen and other low-carbon technologies
- CO_2 capture from fossil fuels and industry

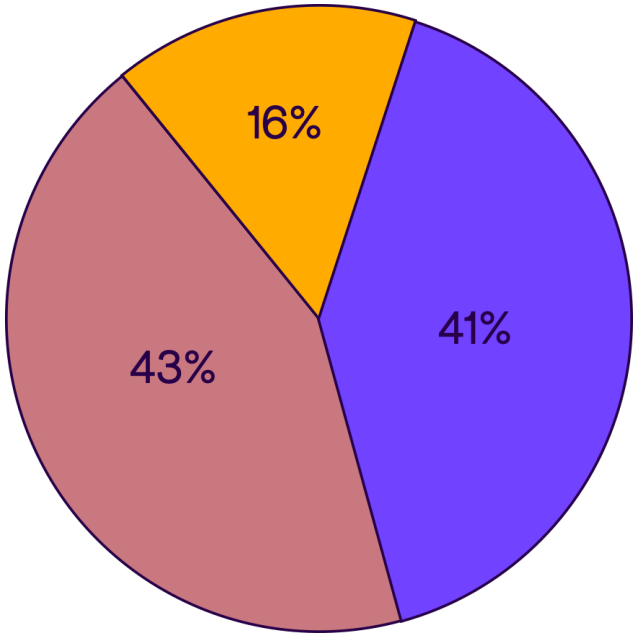
3. Expansion of low-carbon energy

- Low-carbon hydrogen and electricity production

4. Offsetting emissions

- Natural carbon storage and greenhouse gas removals

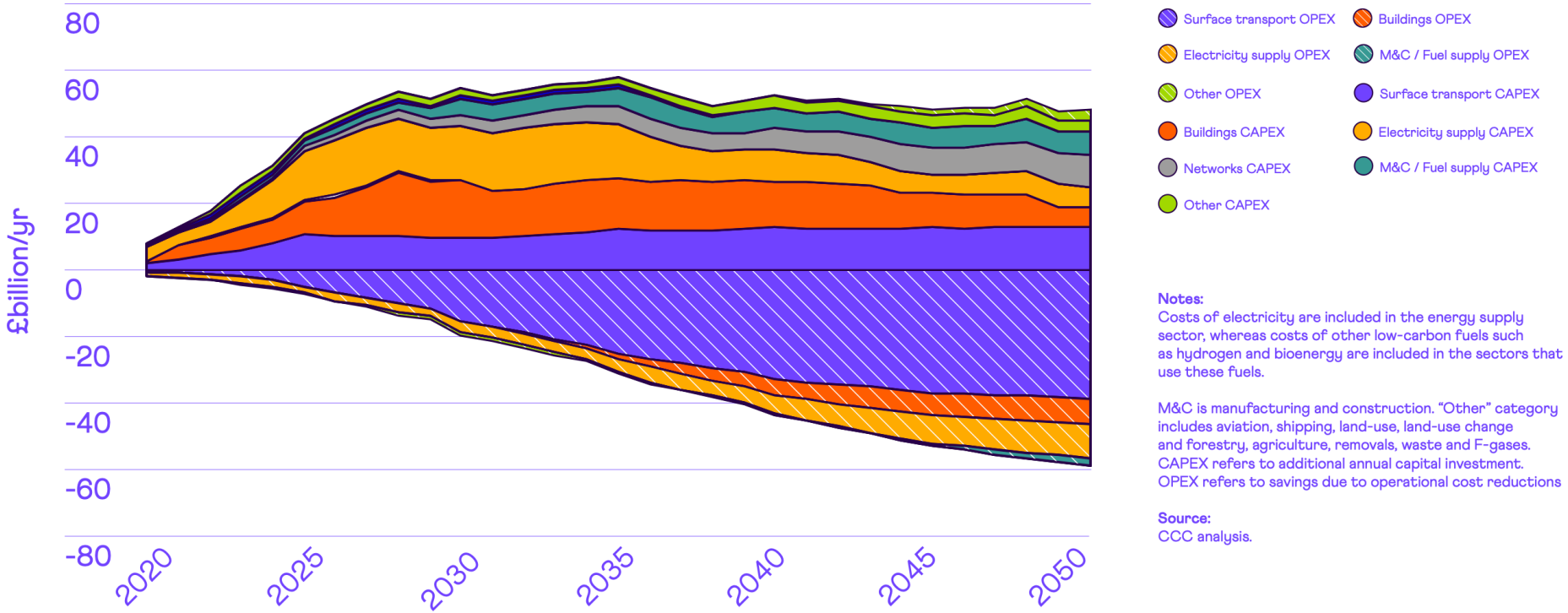
Role of behavioural and societal change in meeting the Sixth Carbon Budget



Source: CCC Analysis

Investing for Net Zero

Major investment programme, delivering offsetting operating cost savings



Notes:
Costs of electricity are included in the energy supply sector, whereas costs of other low-carbon fuels such as hydrogen and bioenergy are included in the sectors that use these fuels.

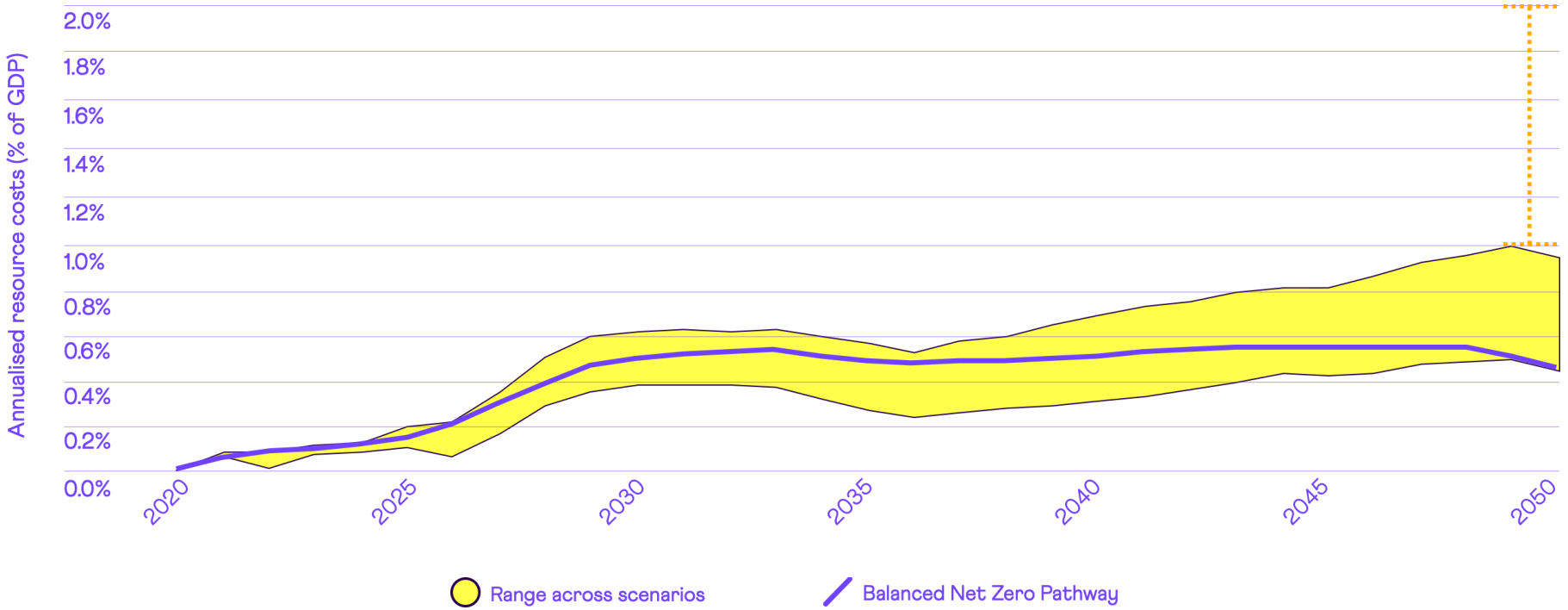
M&C is manufacturing and construction. "Other" category includes aviation, shipping, land-use, land-use change and forestry, agriculture, removals, waste and F-gases.
CAPEX refers to additional annual capital investment.
OPEX refers to savings due to operational cost reductions

Source:
CCC analysis.

Source: CCC analysis.

Resource costs

Change in resource costs over time as a percentage of GDP

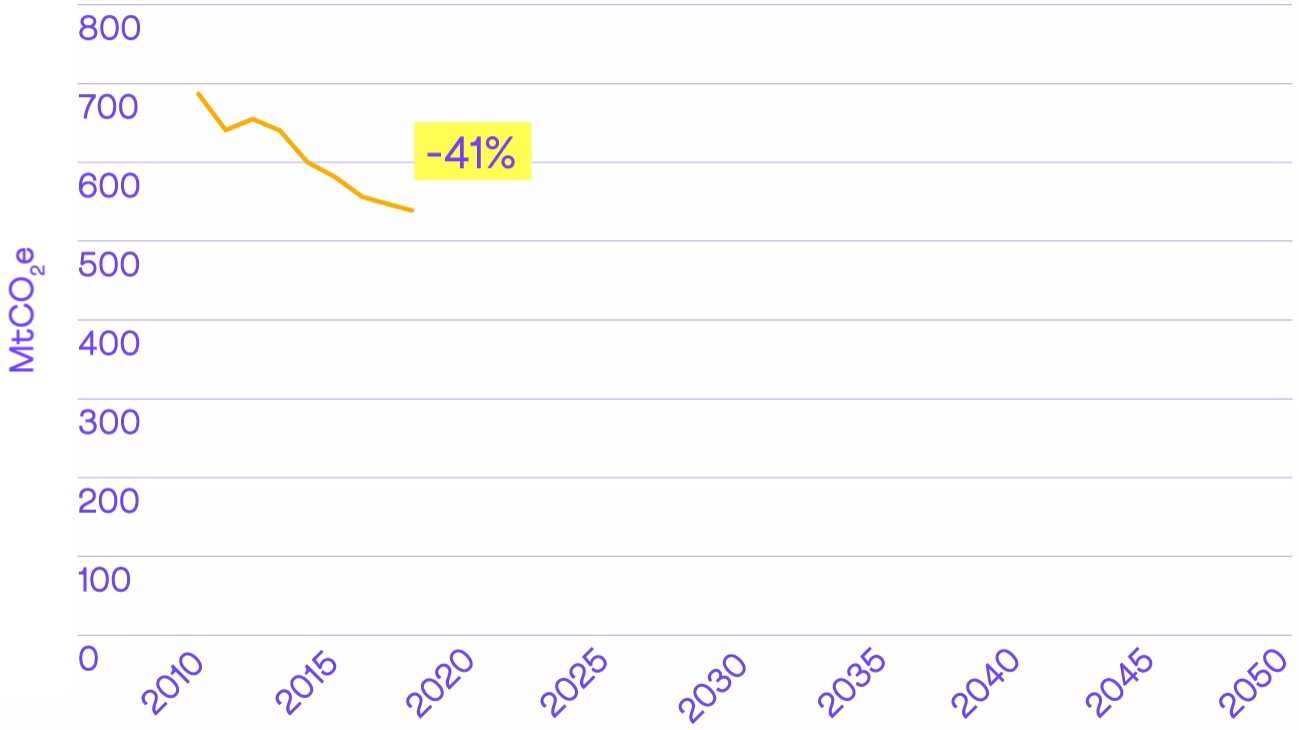


Source: CCC analysis.

What changes will we see on the balanced pathway?

What changes will we see on the Balanced Pathway

2019



Key developments

Reduced Demand

Meat consumption p/ person (% reduction)	0%
Insulation fitted (millions)	0

Low-carbon Choices

EV share of new sales (%)	13%
Low-carbon share of boiler replacements	11%

Low-carbon energy

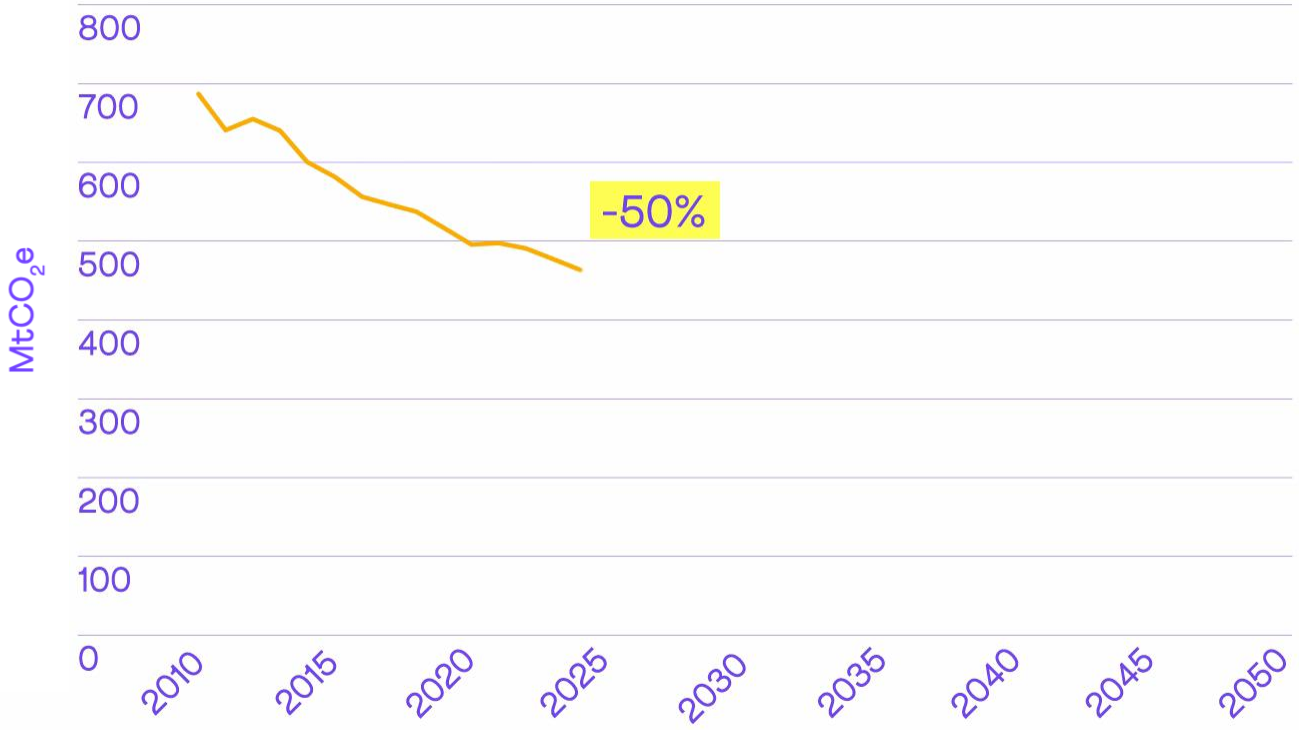
CCS ($MtCO_2e$)	0
Electricity (TWh)	205
Hydrogen (TWh)	0

Land use

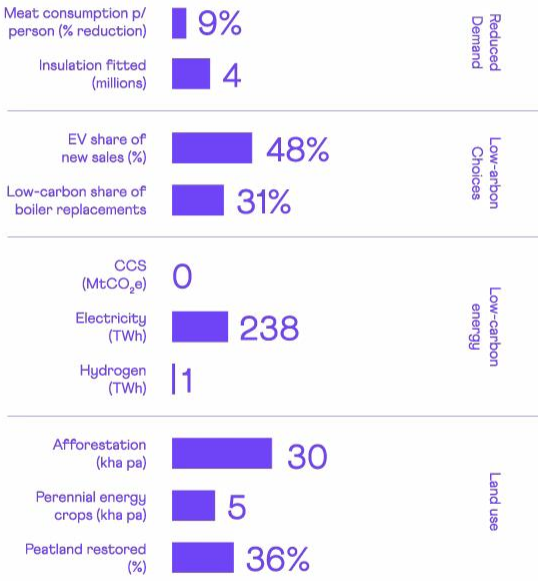
Afforestation (kha pa)	19
Perennial energy crops (kha pa)	0
Peatland restored (%)	25%

What changes will we see on the Balanced Pathway

2025

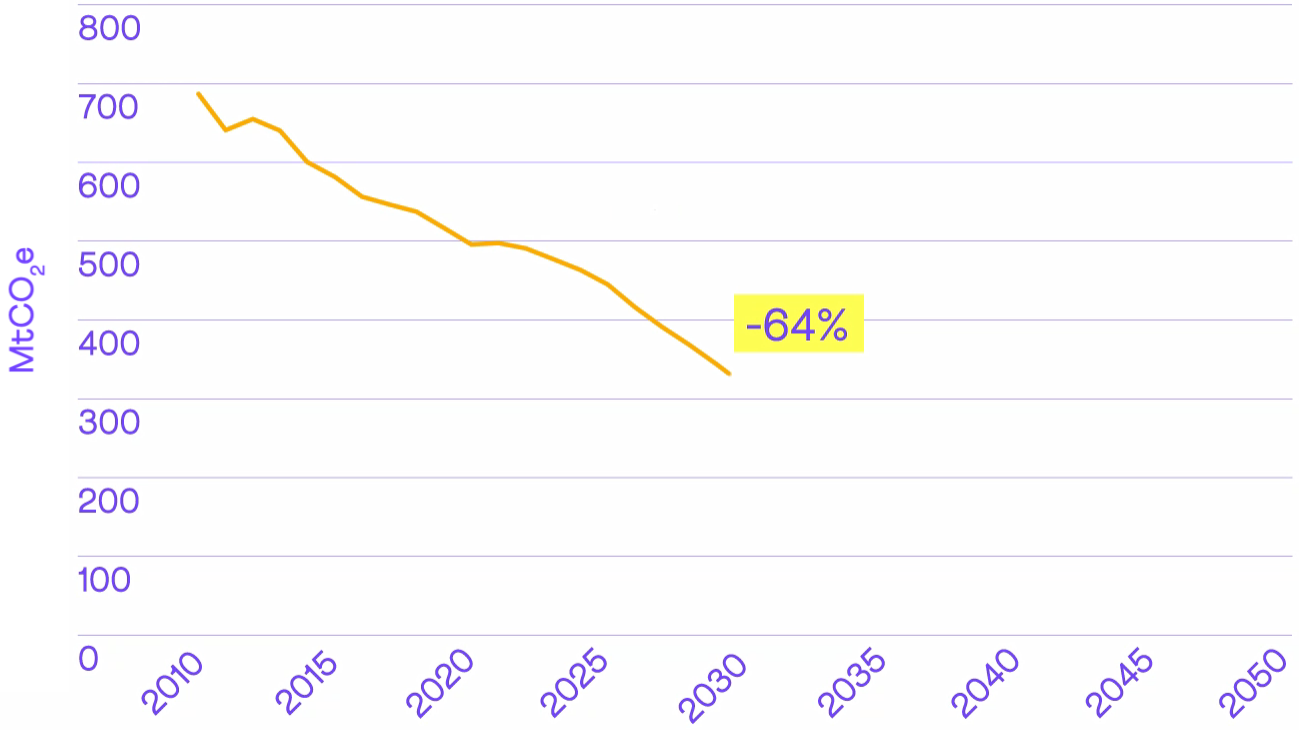


Key developments

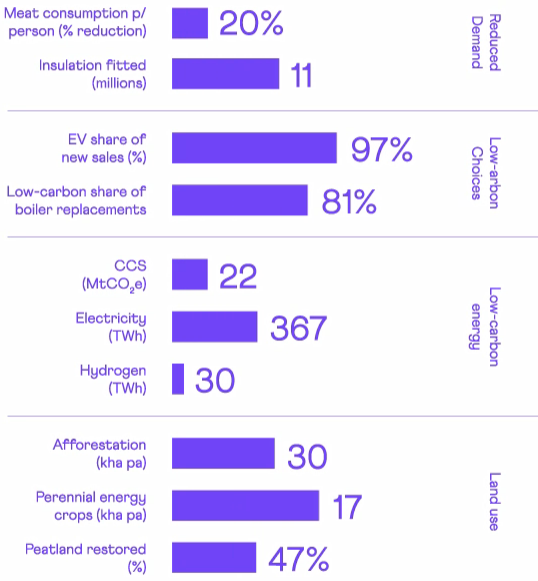


What changes will we see on the Balanced Pathway

2030

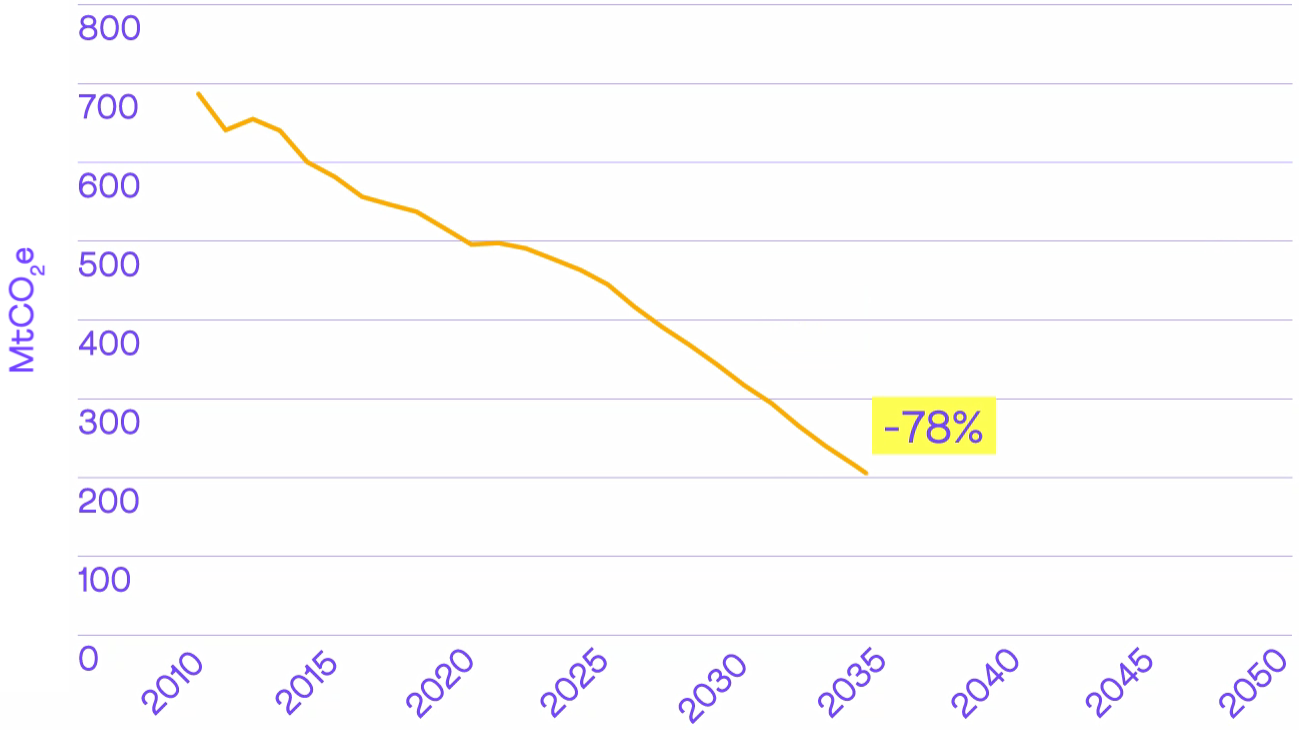


Key developments

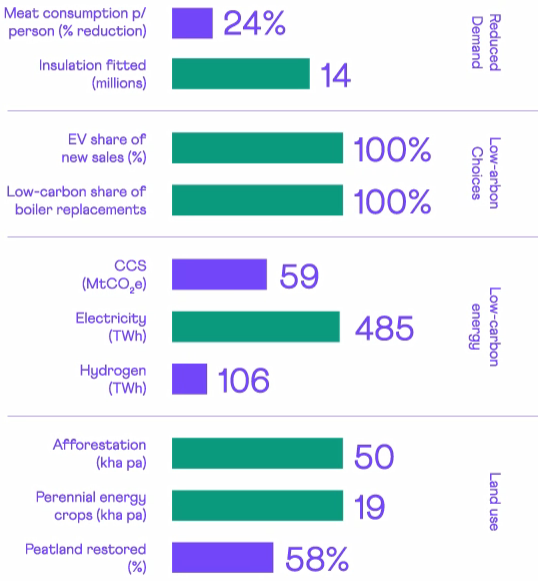


What changes will we see on the Balanced Pathway

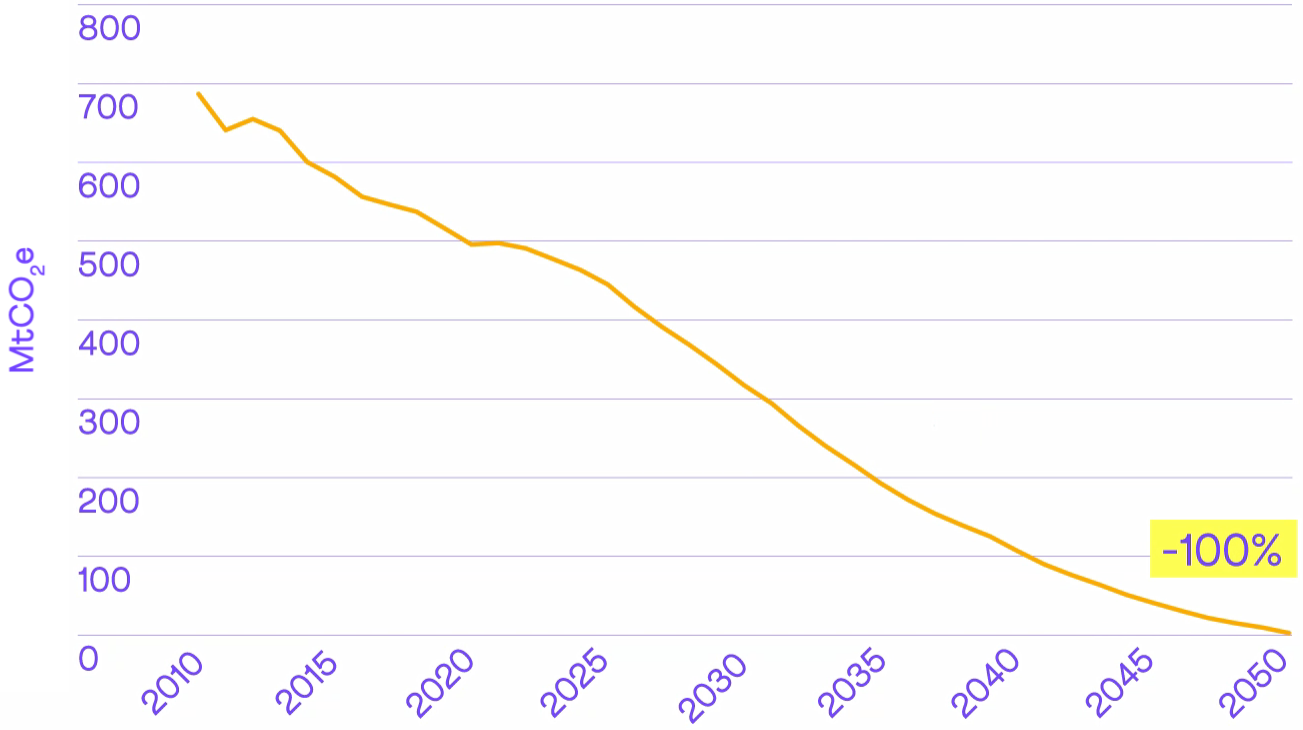
2035



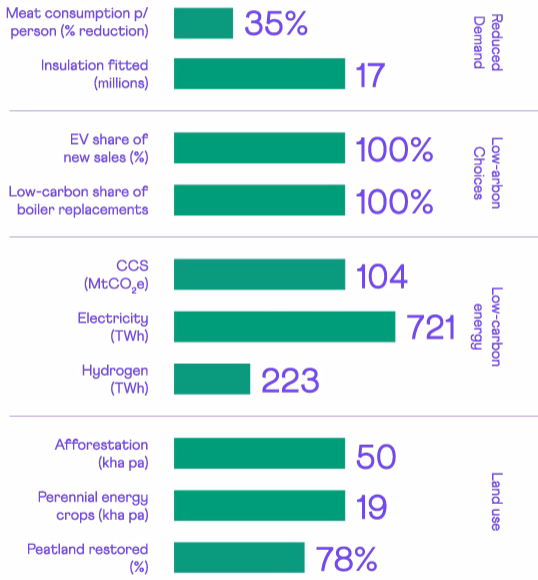
Key developments



What changes will we see on the Balanced Pathway
2050



Key developments



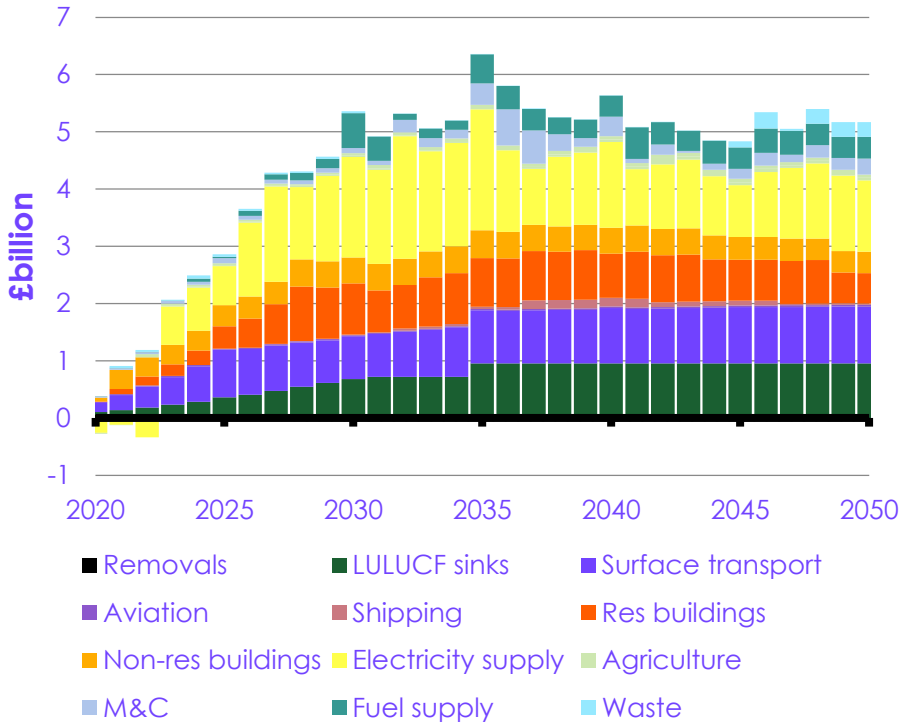
Policy timeline
2021 will be busy

Date	Outcomes and Milestones	
Before COP 26 **(November 2021)**	• Legislate the Sixth Carbon Budget at 965 $MtCO_2e$, including emissions from International Aviation and Shipping (IAS) • Net Zero strategy • Energy White Paper • Heat and Buildings Strategy • New carbon pricing regime following EU ETS • Transport decarbonisation plan • Final HMT Net Zero review • England Tree Strategy • Peatland strategy, including an immediate end to rotational burning of peat • Hydrogen strategy, and consultation on hydrogen business models • Rail decarbonisation strategy • Industrial decarbonisation strategy • Net Zero carbon hospital standard, and further commitments towards delivering a Net Zero NHS • Publication of Greening Government Commitments • Ofgem's final business model approvals for the RIIO-ED2 period should accommodate network upgrades for EVs and heat pumps • Aviation decarbonisation strategy • Next Contract-for Difference allocation round, targeting large volumes of renewables, towards 40 GW offshore wind by 2030	• Updated Nationally Determined Contribution (NDC) for at least a 68% reduction on 1990 levels (excl. IAS) • Build on the UK's NDC to increase global climate ambition in the run up to COP26 • Strengthened UK Adaptation Plans • Updated Green Book guidance on climate change • Decision on funding model for CCS infrastructure • MOD review of climate change and defence • Call for evidence on policy for GHG Removals (GGRs) • Consultation on mandatory food waste reporting • Consultation on including maritime in Road Transport Fuel Obligation (RTFO) • Scottish Government to publish updated Climate Change plan • Conclusion of Green Jobs Taskforce • Environmental Land Management pilots • Implementation of minimum device standards for EV chargers • National food strategy and white paper • Welsh Government to publish an 'All Wales Plan' for the second carbon budget

Pathway for Scotland

A large increase in low-carbon investment is required

Additional capital investment in the transition (Scotland)

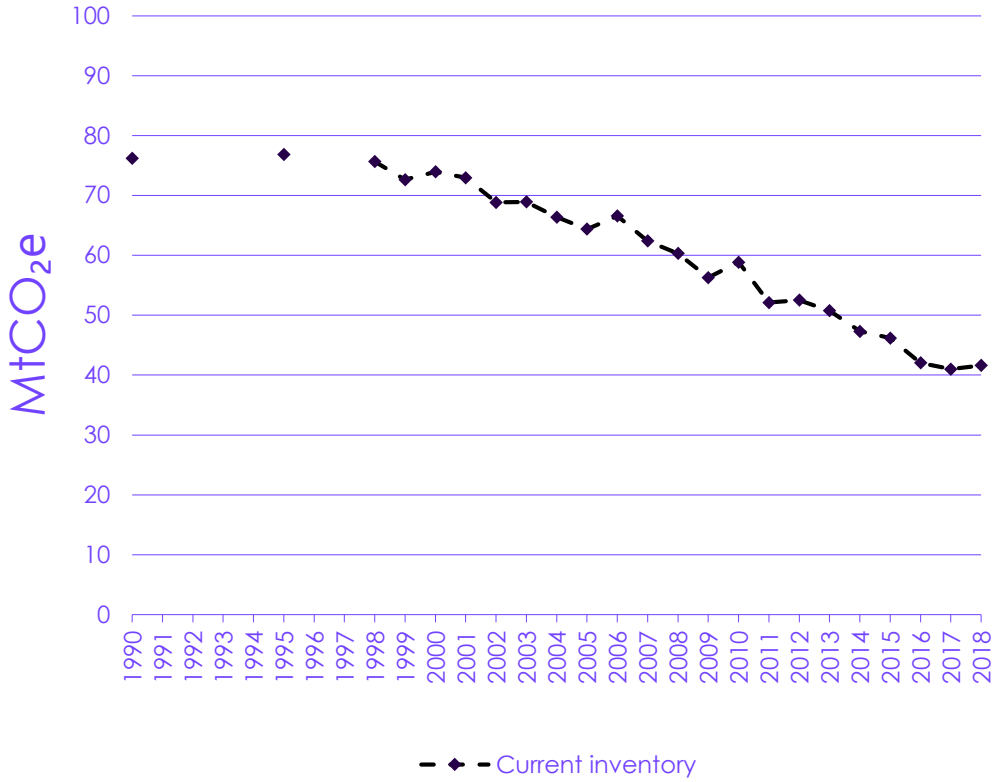


- **Low-carbon capital investment will need to scale up to nearly £5-6billion/year by 2030 in Scotland** (around £50-60 billion for the UK)
- Investment costs for electricity supply are based on electricity consumption, not generation.

Methodology changes

Particularly important for Agriculture, Land Use and Waste sector pathways – also relevant for industry

Existing inventory (41.6 $MtCO_2e$) changes → ↓		



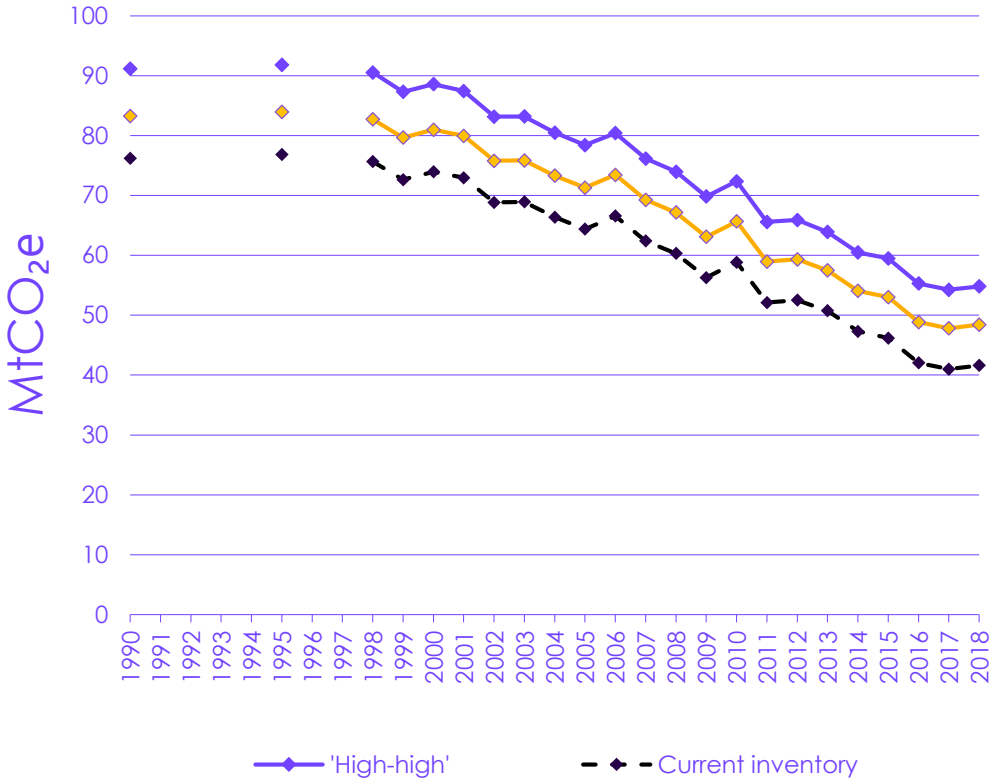
Rule of thumb converting sectoral pathways: approx. 4 MtCO2e less per year for LULUCF. Agriculture and Waste emissions around 15% lower.

Methodology changes

All pathways presented assume future changes to the Scottish GHG inventory

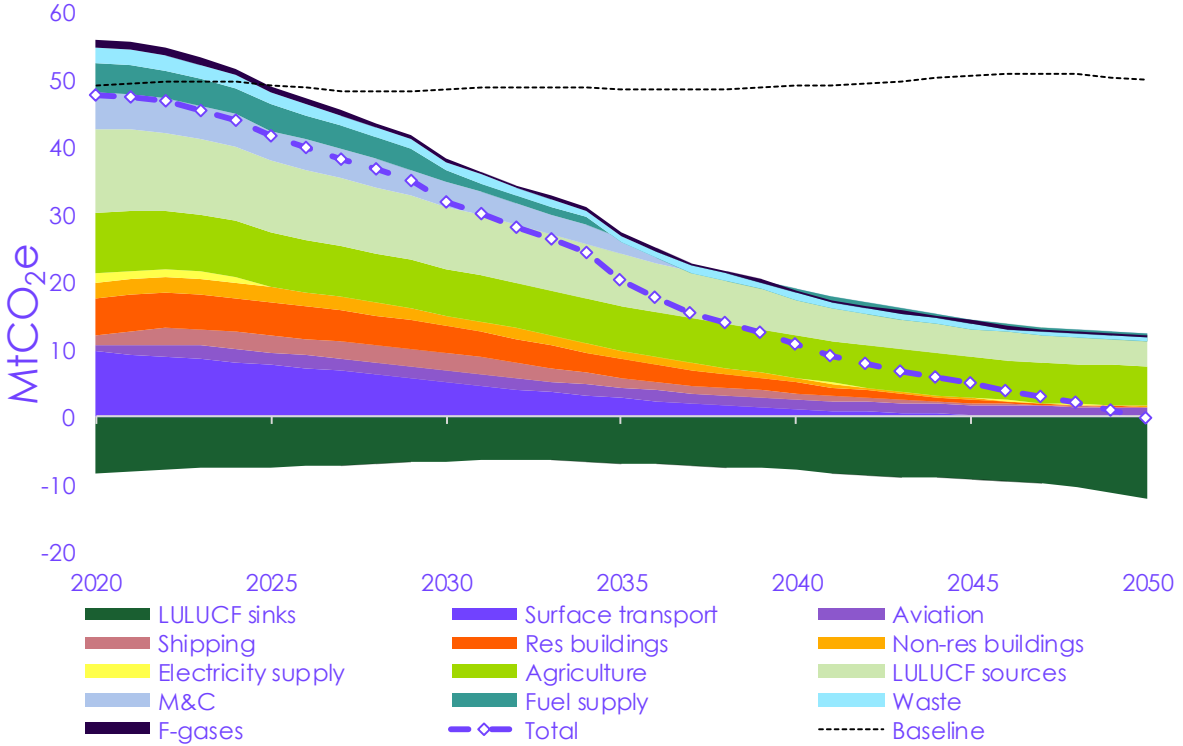
Existing inventory (42 $MtCO_2e$) changes → ↓	'low' range for peatland	'high' range for peatland
'low' GWPs (CH4 = 28 times more warming than CO2)	48 $MtCO_2e$	52 $MtCO_2e$
'high' GWPs (CH4 = 34 times more warming than CO2)	51 $MtCO_2e$	55 $MtCO_2e$

Rule of thumb converting sectoral pathways: approx. 4 MtCO2e less per year for LULUCF. Agriculture and Waste emissions around 15% lower.



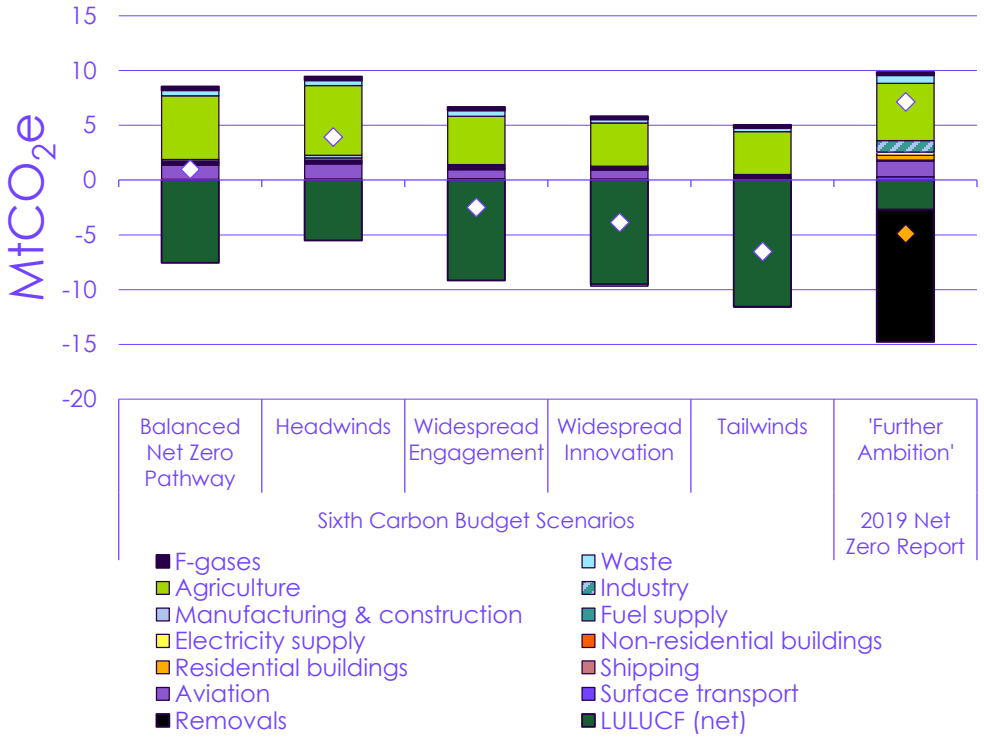
The Balanced Net Zero Pathway in Scotland
With no greenhouse gas removals

- Virtually zero-carbon energy system
- Agriculture and land dominate emissions sources and sinks by 2050
- A decisive shift - 60% of the reduction by 2050 happens in the next 15 years



2050 snapshot for Scotland

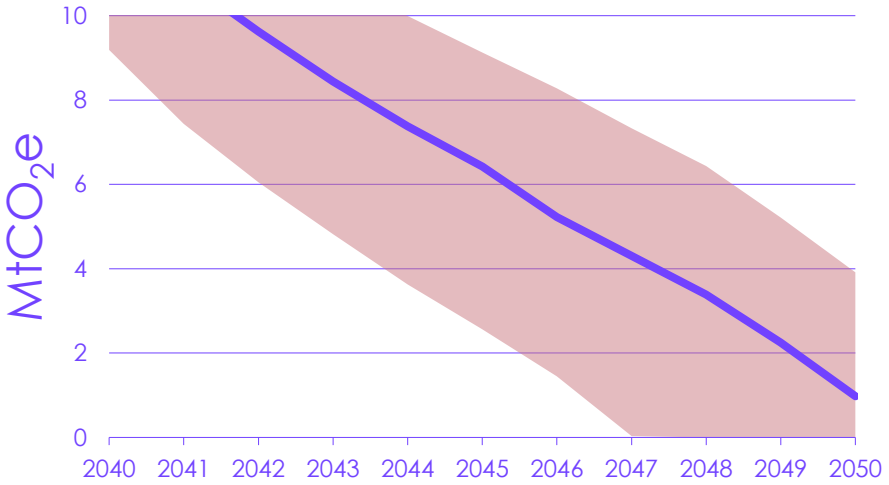
Without greenhouse gas removals



Important things to note:

- Excluding removals, all scenarios are lower than the 2019 Net Zero scenario
- The 'Industry' sector has now been split into manufacturing and construction (light blue) and fuel supply (teal) and emissions are much lower.

Greenhouse gas removals required to meet Net Zero in 2045
(Mostly BECCS)



Range of greenhouse gas removals required to meet net-zero in a given year				
	Balanced Net Zero	Range across Headwinds, Widespread Engagement and Widespread Innovation	Potential for GGRs in manufacturing and wood in construction	Amount of GGRs allocated in 2019 Net Zero Report
2045	6 $MtCO_2$	2-10 $MtCO_2$	0.5-1.0 MtCO2	12 $MtCO_2$ (in 2050)
2050	1 $MtCO_2$	0-5 $MtCO_2$	0.5-1.2 MtCO2	12 $MtCO_2$

The 2030 target

2030 target

Our Balanced Net Zero Pathway for Net Zero in 2045 does not go through the 2030 target of 75%. Our scenarios get to this level of reductions by 2033-2036.

Effectively a gap of approx. 10 MtCO2e or ~5 years

External factors

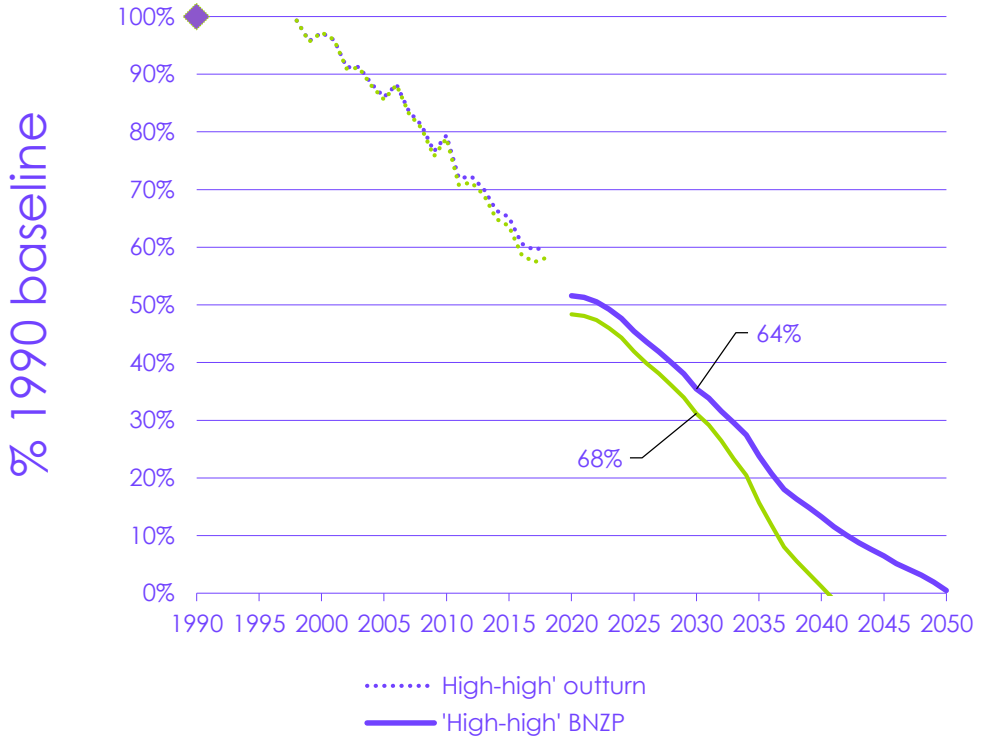
Methodology choices for UK GHG inventory

- A 6.3 MtCO2e swing due to methodology changes could make our Balanced Pathway a 68% reduction. However, contingency plans need to be in place if the 'higher' methodology options are chosen.

- Our tailwinds scenario would get to a 73% reduction.

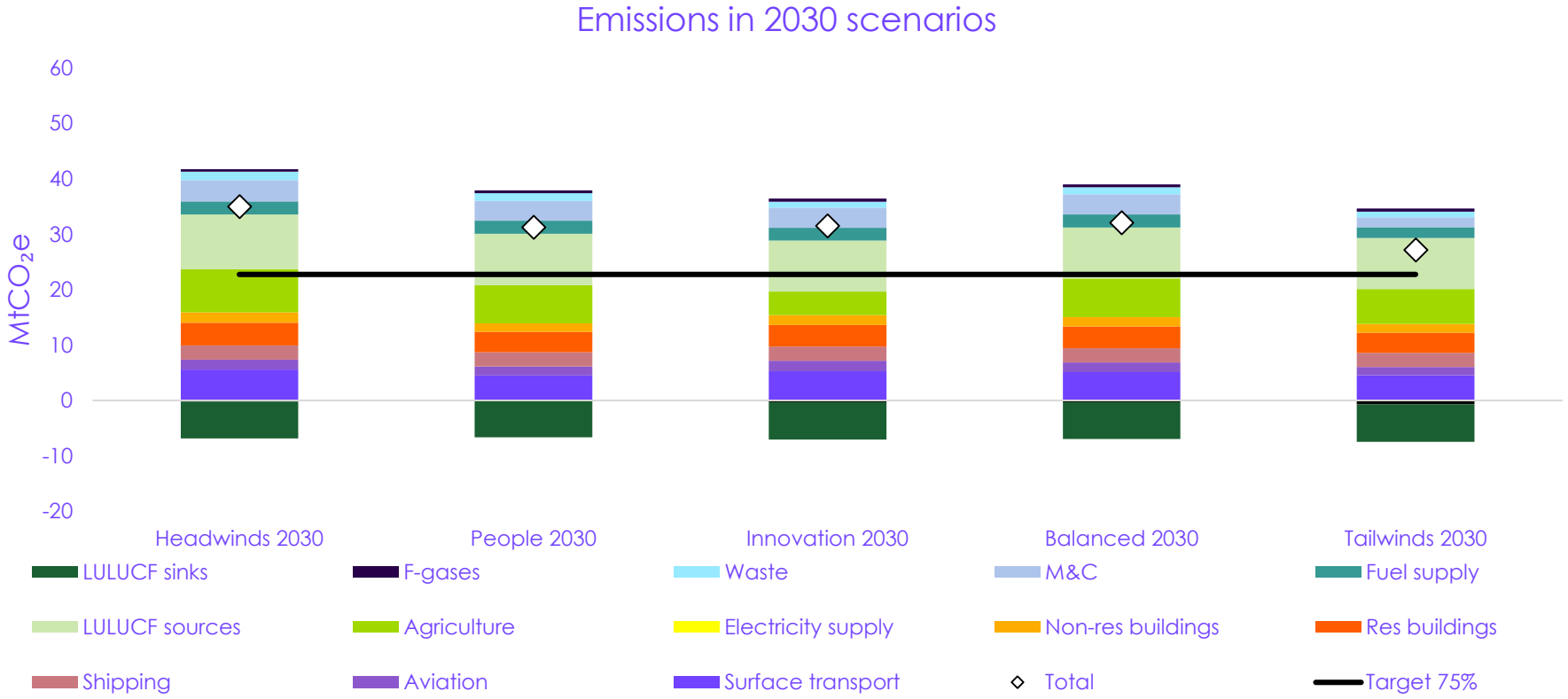
COVID-19 impacts

- Even more rapid behaviour change relating to travel
- Lower economic growth
- Long-term fall in oil price leads to reduced North Sea output (e.g. approx. 2 MtCO2e additional potential)



2030 snapshot for Scotland

75% reduction = black line



2030 target

Our Balanced Net Zero Pathway for Net Zero in 2045 does not go through the 2030 target of 75%. Our scenarios get to this level of reductions by 2033-2036.

CCC recommendations

- **We will not (cannot) recommend a change to the target** – although that option remains open to the Scottish Government through a further requests for advice.

- **Explore areas to push further:**
  - First UK industrial cluster to decarbonise and/or reduced output at Grangemouth
  - Early adoption of UK BECCS
  - Scrappage of high-carbon stock, leading to accelerated roll-out of EVs and low-carbon heat in buildings
  - Even further agricultural changes, including reduced output

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