Office for **Budget Responsibility**

Fiscal implications of climate change for the UK

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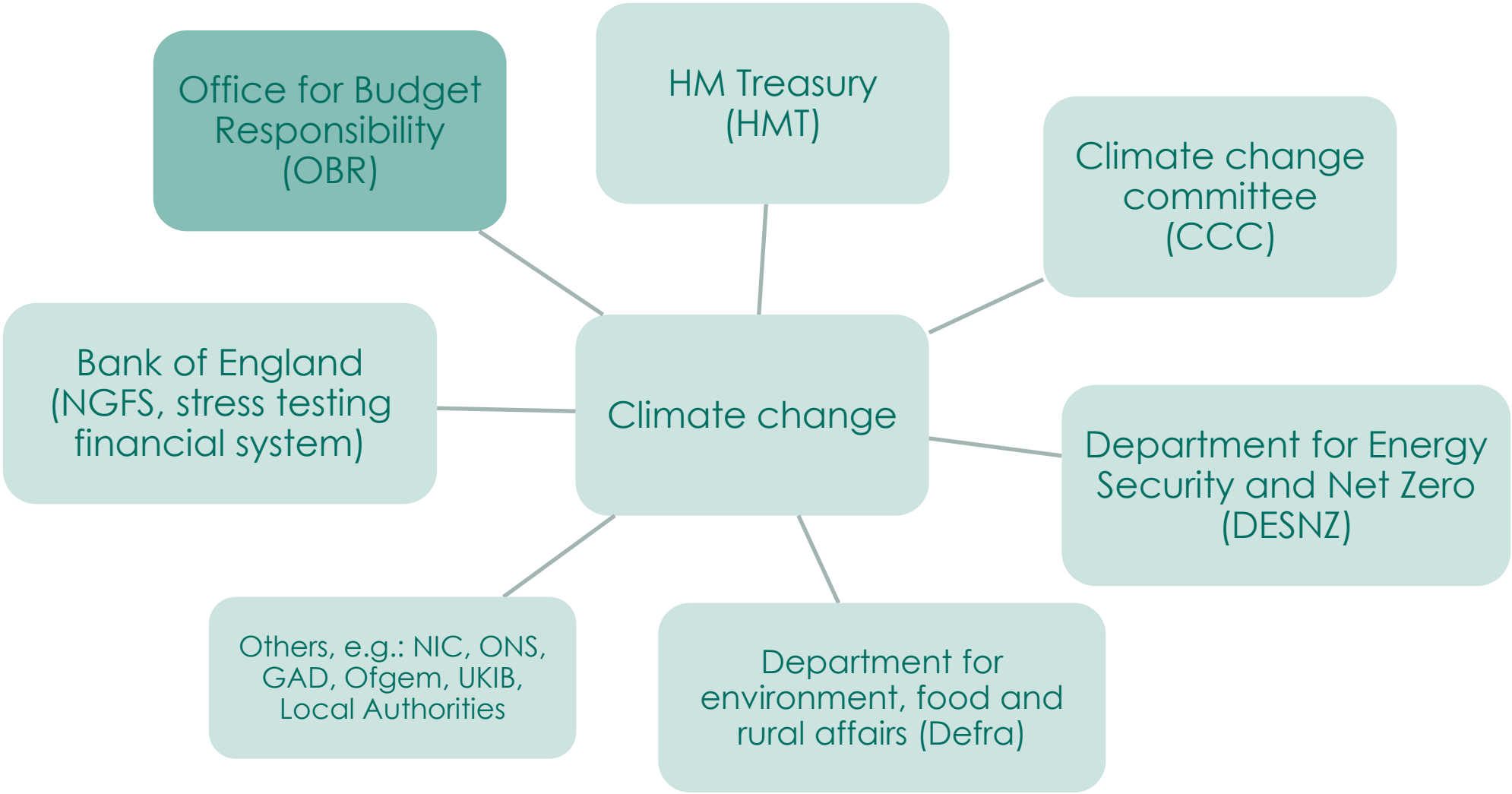
Background to OBR's climate work

- Fiscal risks report 2017 – acknowledged that climate change was a fiscal risk
- FRR 2019 – Set out a framework of climate change and transition risks
- **FRR 2021 – Chapter focused on the fiscal risks of net zero**
- FRS 2022 – energy chapter, what high gas prices could mean for net zero
- **May 2023 – emissions and tax bases working paper**
- FRS 2023 – further exploration of energy prices and decarbonisation
- **October 2023**: **Discussion paper 4: next steps for climate change analysis**

Climate change across the UK government



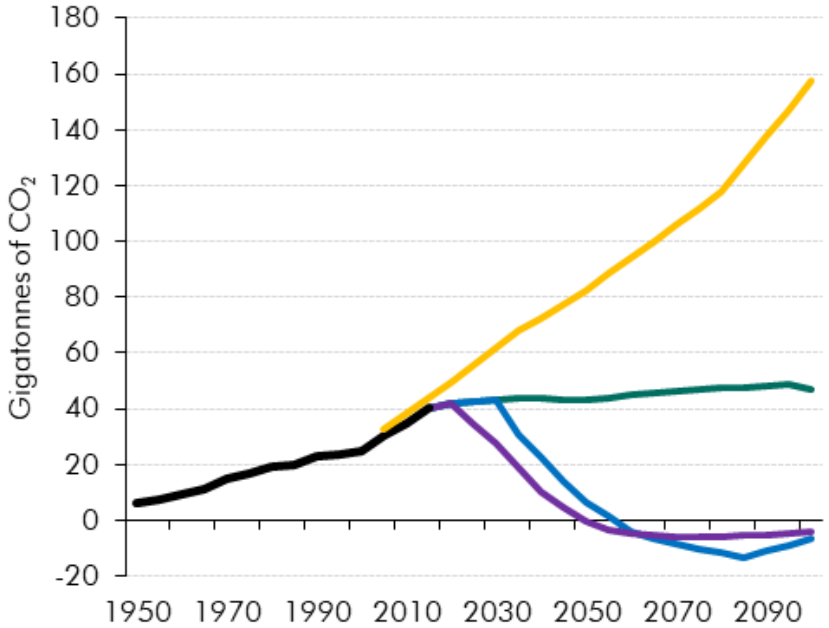
Fiscal risk report 2021 – an overview

"Standing on the shoulders of giants" approach:

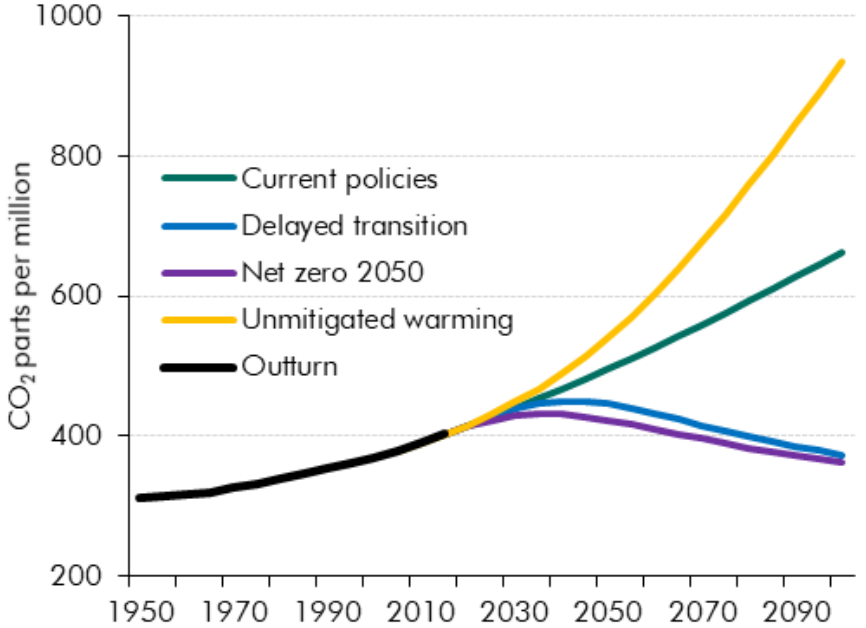
- We took the Bank's (BoE) NGFS (central bank) scenarios
- We also took the CCC 'carbon budget 6' whole economy emissions and cost pathways
- Applied our own judgement on likely fiscal shares of these costs
- Added some thoughts on what it would mean for taxes lost (and potential gained from a hypothetical carbon tax)
- And spliced them together

Global CO_2 emissions and temperatures

Global carbon dioxide emissions

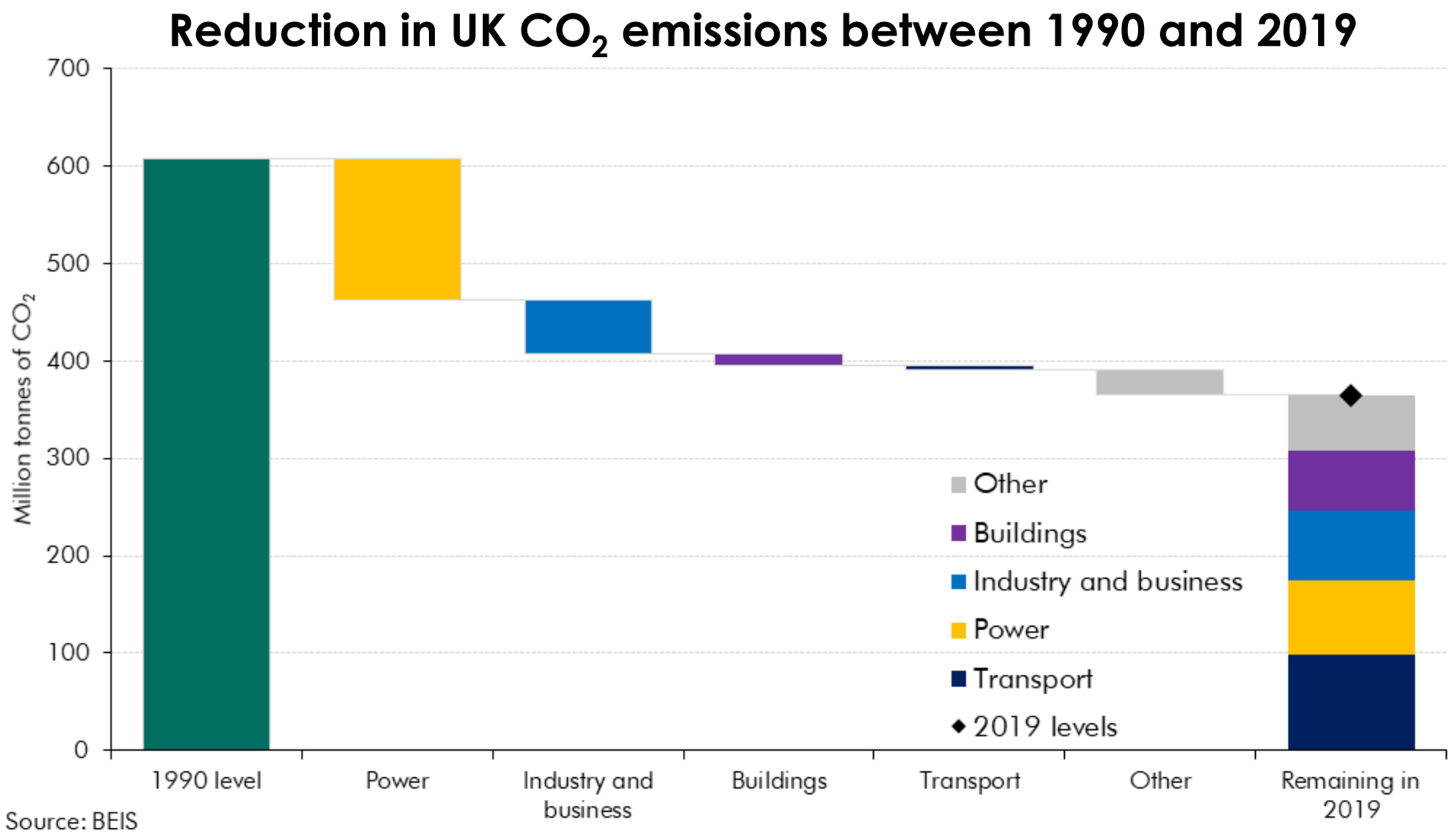


Atmospheric concentrations of CO_2



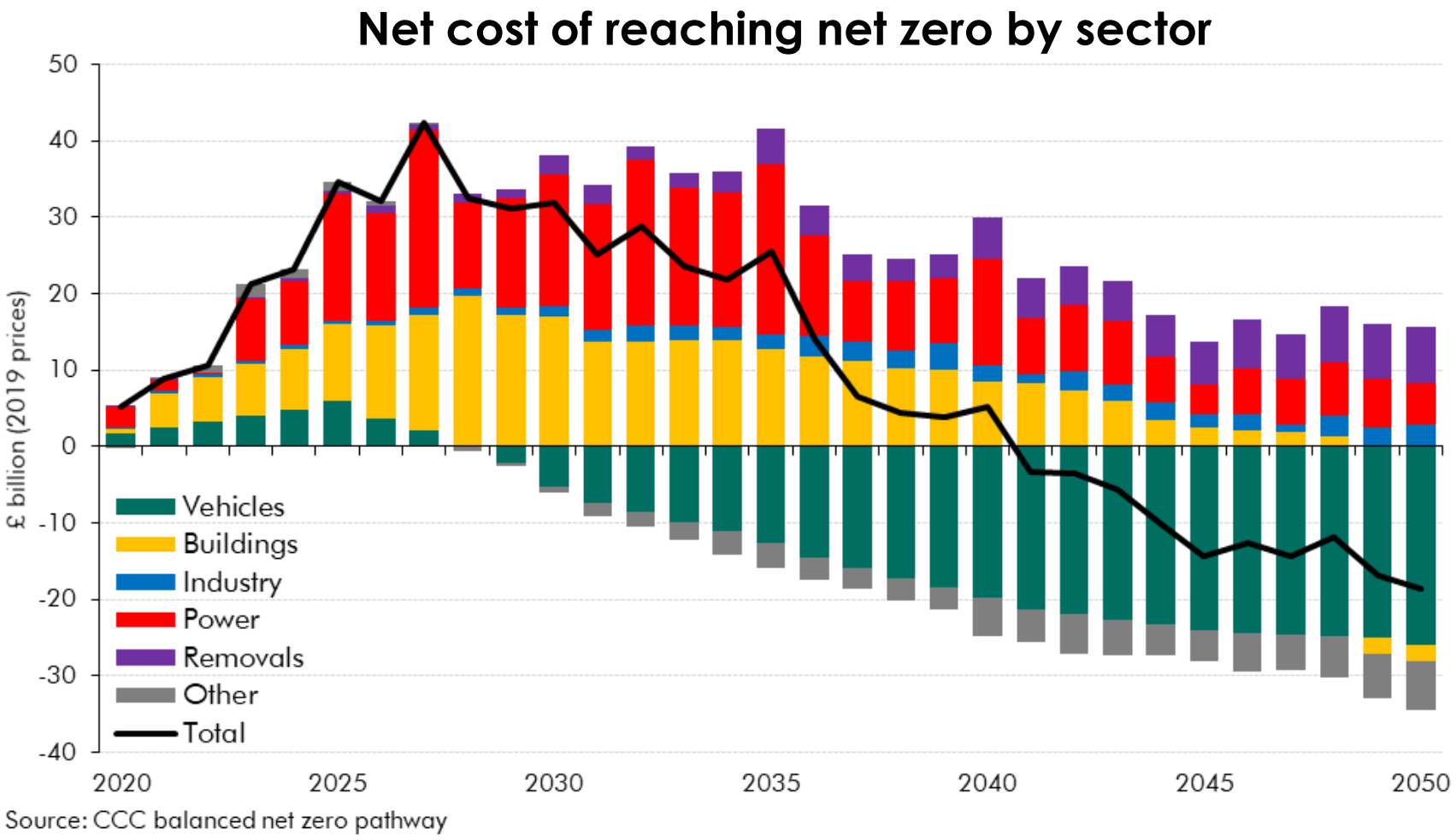
Source: Our World in Data, NGFS Climate Scenarios Database, GCAM model, International Institute for Applied Systems Analysis RCP database, Joint Global Change Research Institute GCAM database, and OBR calculations.

Contributions to cutting UK CO_2 emissions



Source: BEIS

Whole economy cost of reaching net zero



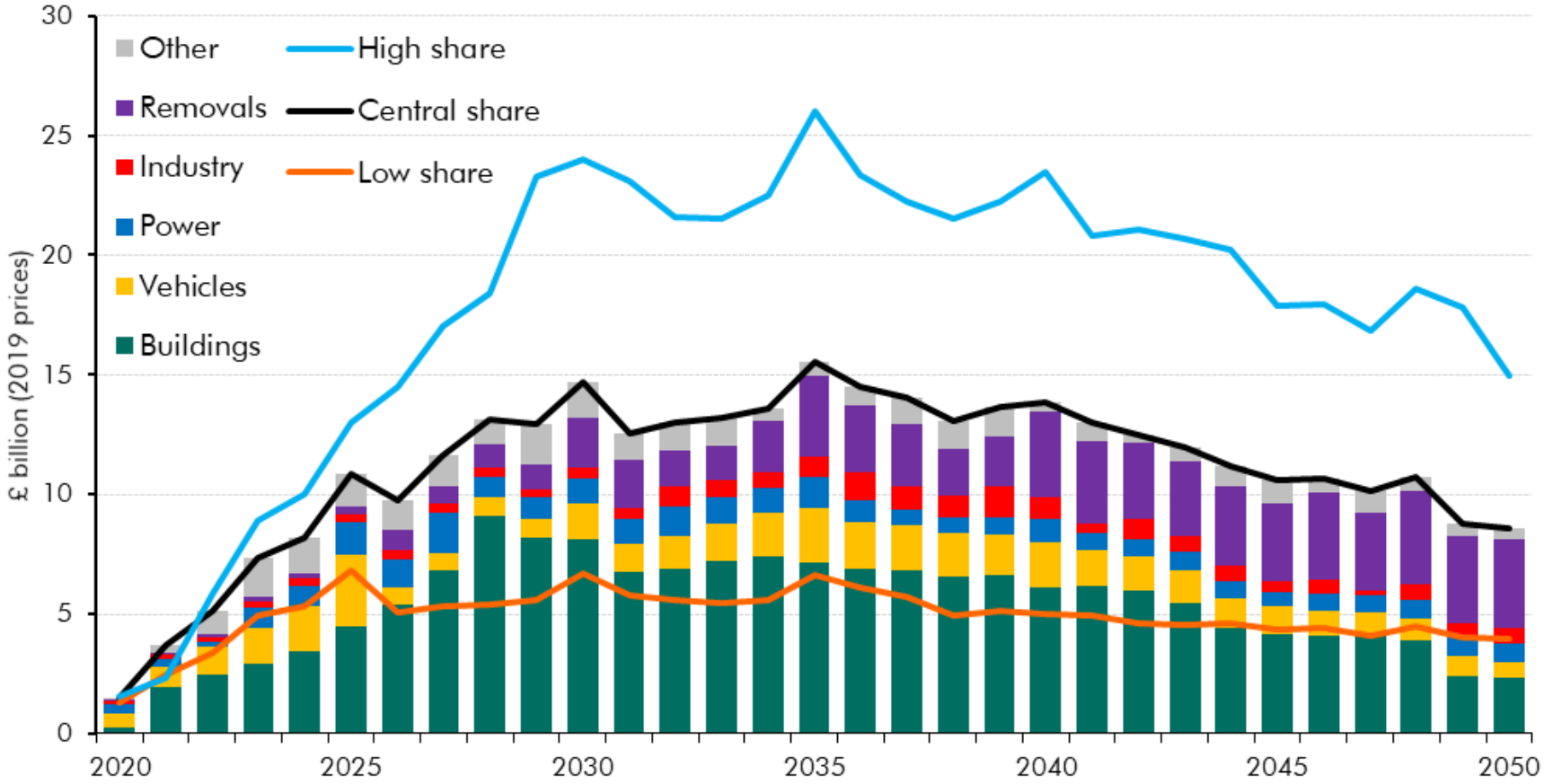
Source: CCC balanced net zero pathway

The share of costs borne by public spending

	Whole economy cost/saving £ billion (2019 prices)	Public share of costs (per cent)									
		2020s			2030s			2040s			Total
		Low	Central	High	Low	Central	High	Low	Central	High	Central
Costs											
Vehicles											
Cars	213	11	**11**	20	3	**3**	13	3	**3**	3	**6**
Car infrastructure	35	20	**29**	70	20	**20**	60	20	**20**	50	**21**
Other vehicles	69	71	**85**	94	25	**62**	85	0	**39**	76	**52**
Other infrastructure	15	25	**50**	75	25	**50**	75	25	**50**	75	**50**
Total	**332**	16	**18**	28	11	**21**	38	6	**18**	33	**19**
Buildings											
Residential	254	7	**44**	81	7	**44**	81	7	**44**	81	**44**
Non-residential	142	28	**43**	54	27	**42**	52	25	**43**	58	**42**
Total	**396**	15	**43**	70	14	**43**	71	13	**44**	73	**45**
Power	481	4	**7**	10	0	**5**	10	0	**5**	10	**6**
Industry	46	24	**54**	89	21	**42**	77	19	**31**	66	**38**
Removals	101	85	**89**	93	69	**75**	81	50	**59**	67	**64**
Other	52	59	**72**	84	41	**58**	75	30	**50**	65	**60**
Total costs	**1408**	**15**	**26**	**40**	**12**	**27**	**43**	**12**	**26**	**42**	**27**
Savings											
Vehicles	-684	3	**3**	3	3	**3**	3	3	**3**	3	**3**
Buildings	-131	5	**5**	5	5	**5**	5	5	**5**	5	**5**
Other	-272	1	**1**	1	1	**1**	1	1	**1**	1	**1**
Total savings	**-1086**	2	**2**	2	3	**3**	3	3	**3**	3	**3**
Memo: Net cost (£ billion)	321	46	84	128	58	138	226	45	113	189	***344***

Fiscal costs of reaching net zero

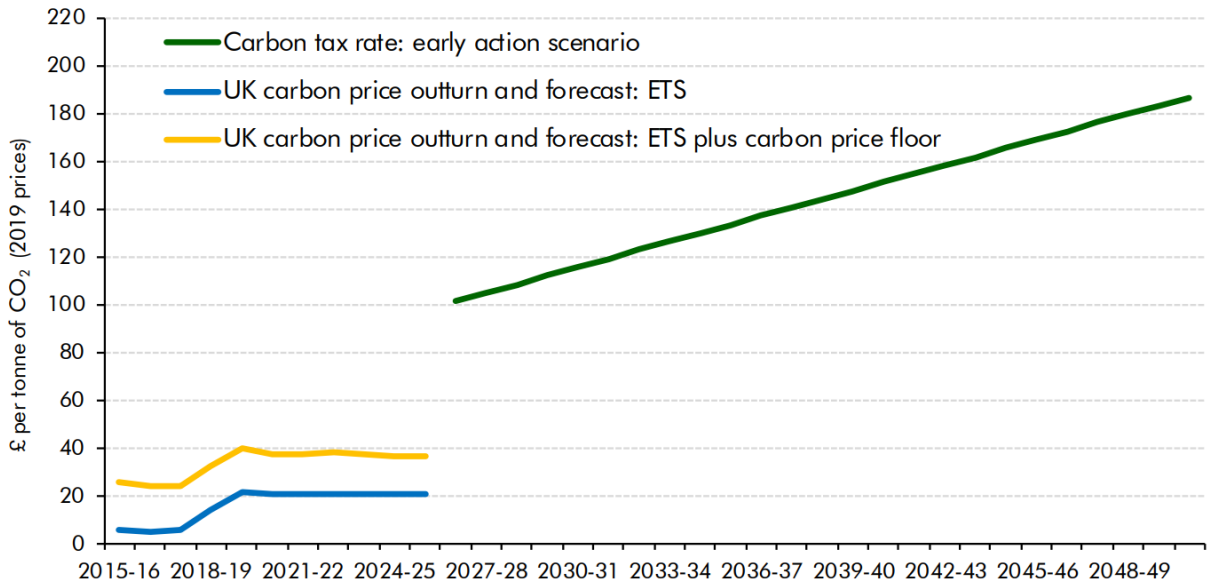
Costs to the public sector of the transition to net zero



Source: CCC balanced net zero pathway, OBR

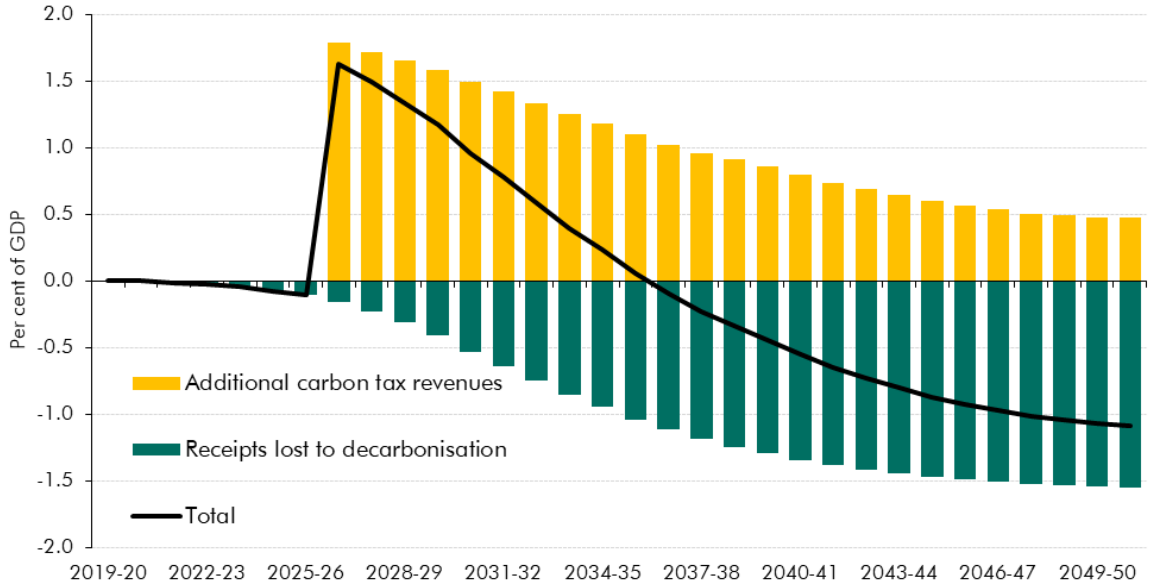
Fiscal opportunities on the way to net zero

Real-terms carbon tax rates: outturn and scenario assumption



Source: Bank of England, Datastream, HMRC, OBR

Net revenue gains/losses from decarbonisation



Source: OBR

Constructing fiscal scenarios

Baseline:

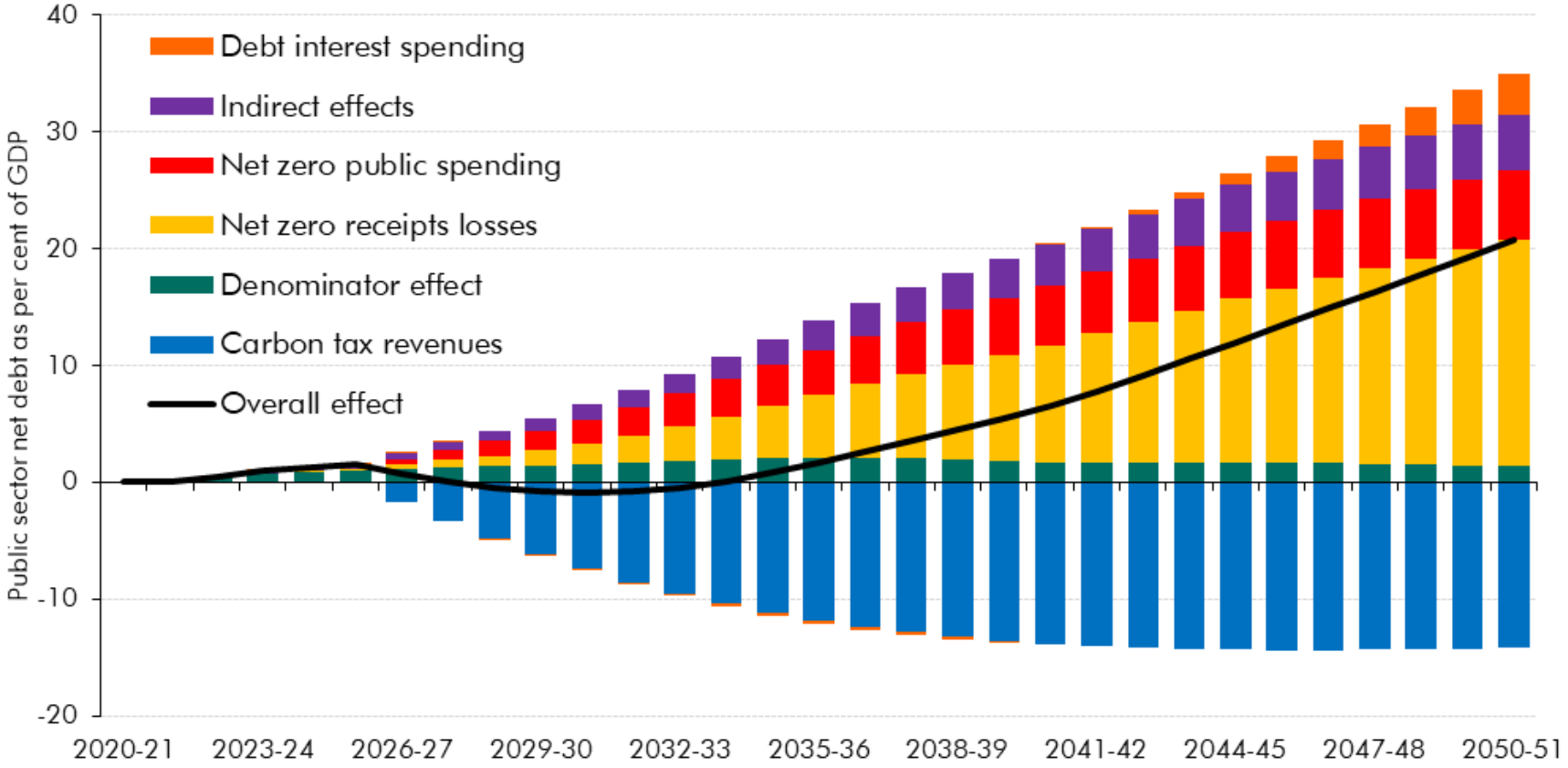
- OBR Long term economic determinants
- Assume net investment is held at its 2025-26 level as a share of GDP and the current budget is held in balance.

Then for each scenario:

- Net zero public spending
- Net zero receipts losses
- Additional carbon tax revenues
- Non-climate-related receipts
- Non-climate-related public spending
- Debt interest consequences of any differences in borrowing.

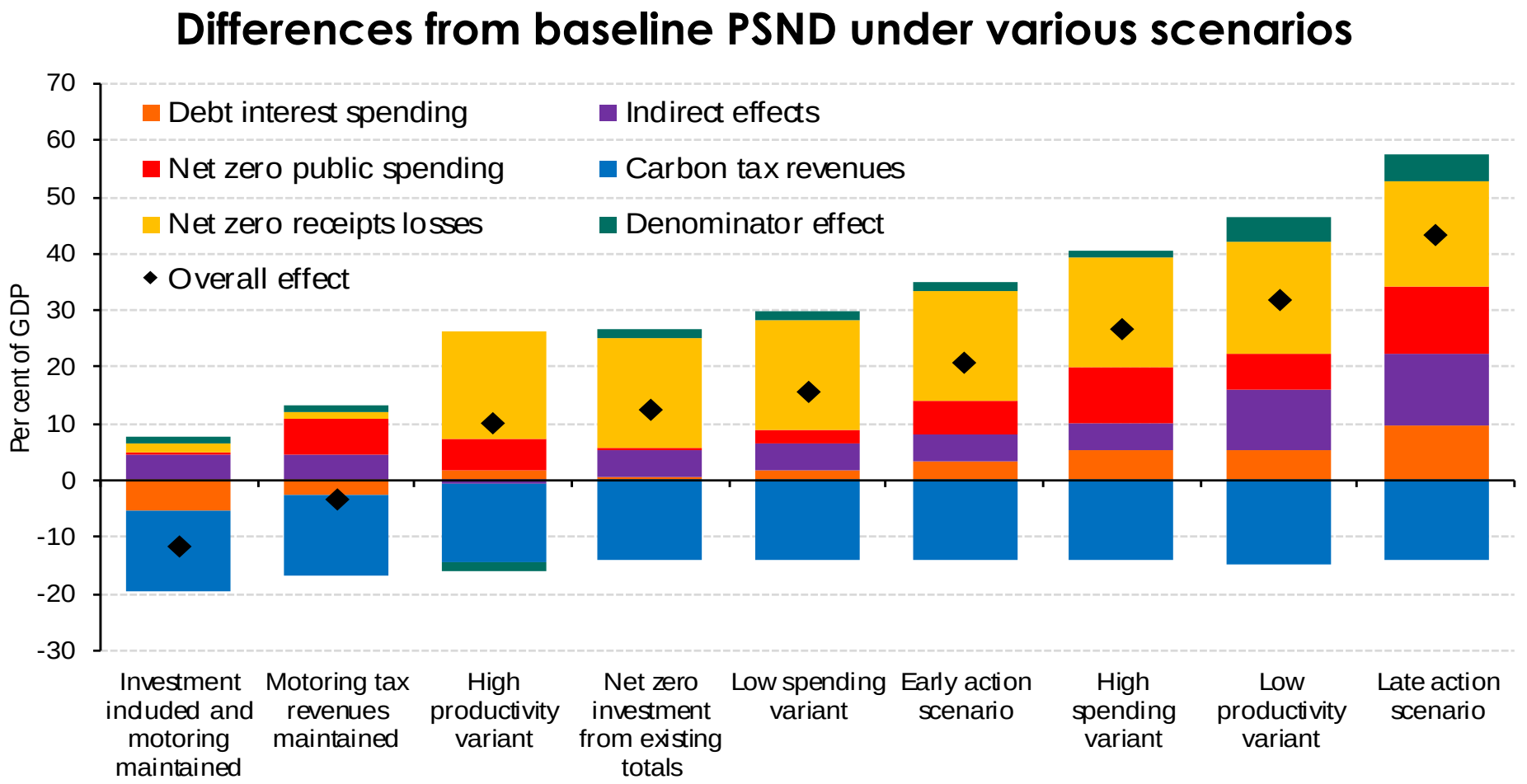
Net debt impact of reaching net zero

Early action scenario: difference in PSND from baseline



Source: OBR

Alternative fiscal scenarios toward net zero



Source: OBR

Conclusions

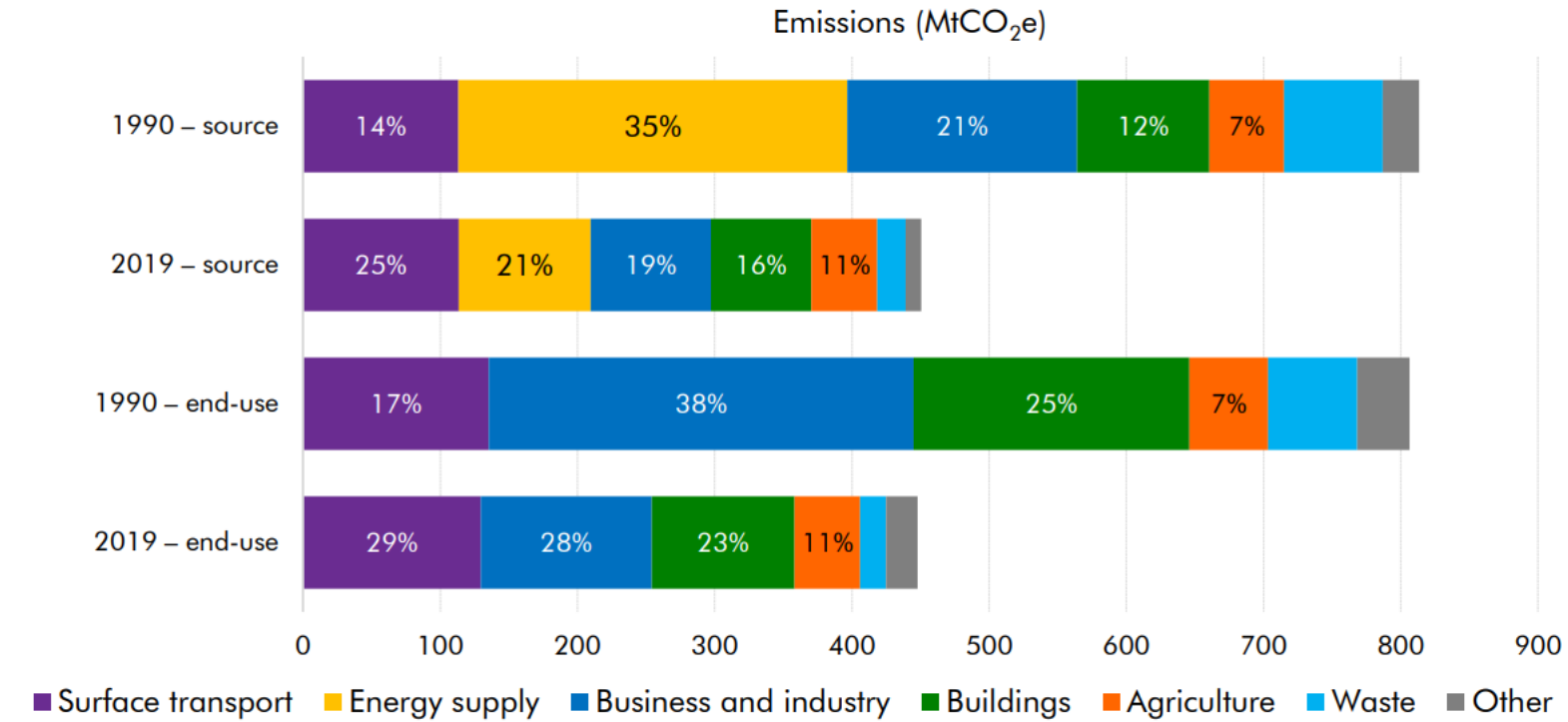
- Between now and 2050, the fiscal costs of reducing net emissions to zero in the UK could be significant but not exceptional.
- The largest fiscal cost of achieving net zero is the loss of fuel duty receipts.
- The UK has made good progress in reducing emissions, but there are greater challenges ahead.
- The costs of failing to get climate change under control would be much larger than those of bringing emissions down to net zero.
- There could be significant fiscal benefits from transitioning to net zero sooner rather than later, not least the additional revenues that would come from taxing all emissions at higher rates.
- The energy crisis has likely made the costs of net zero (relative to the baseline do nothing) cheaper.

Working paper – Emissions and our tax bases

- Wanted to investigate the link between UK emissions and our tax bases
- A primary goal: to establish why emissions forecasts are important for our statutory work – why we (as fiscal forecasters) should be in the emissions/net zero space

Emissions break downs

Chart 2.1: UK territorial emissions by sector

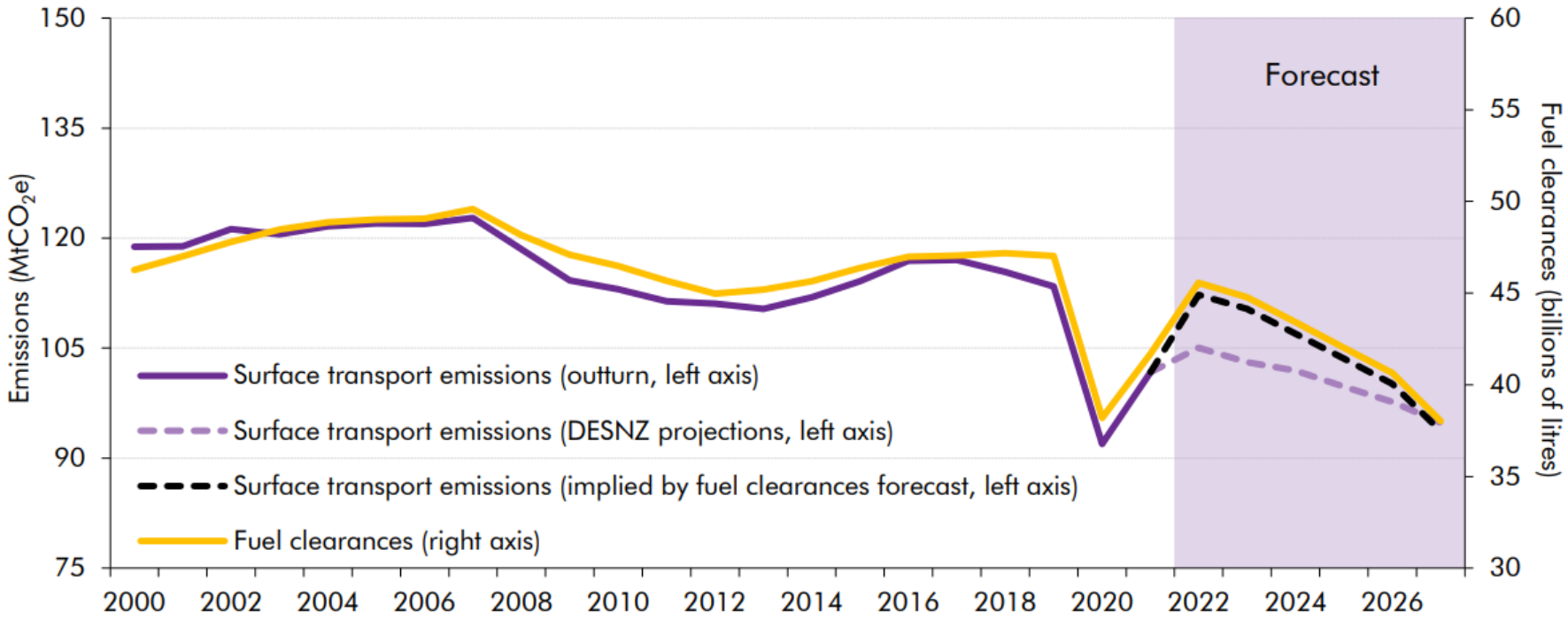


Note: 'other' includes the 'shipping', 'aviation' and 'land use, land use change and forestry' sectors, and for end-use only, 'exports'.
Source: ONS, OBR

What kinds of taxes are related to emissions?

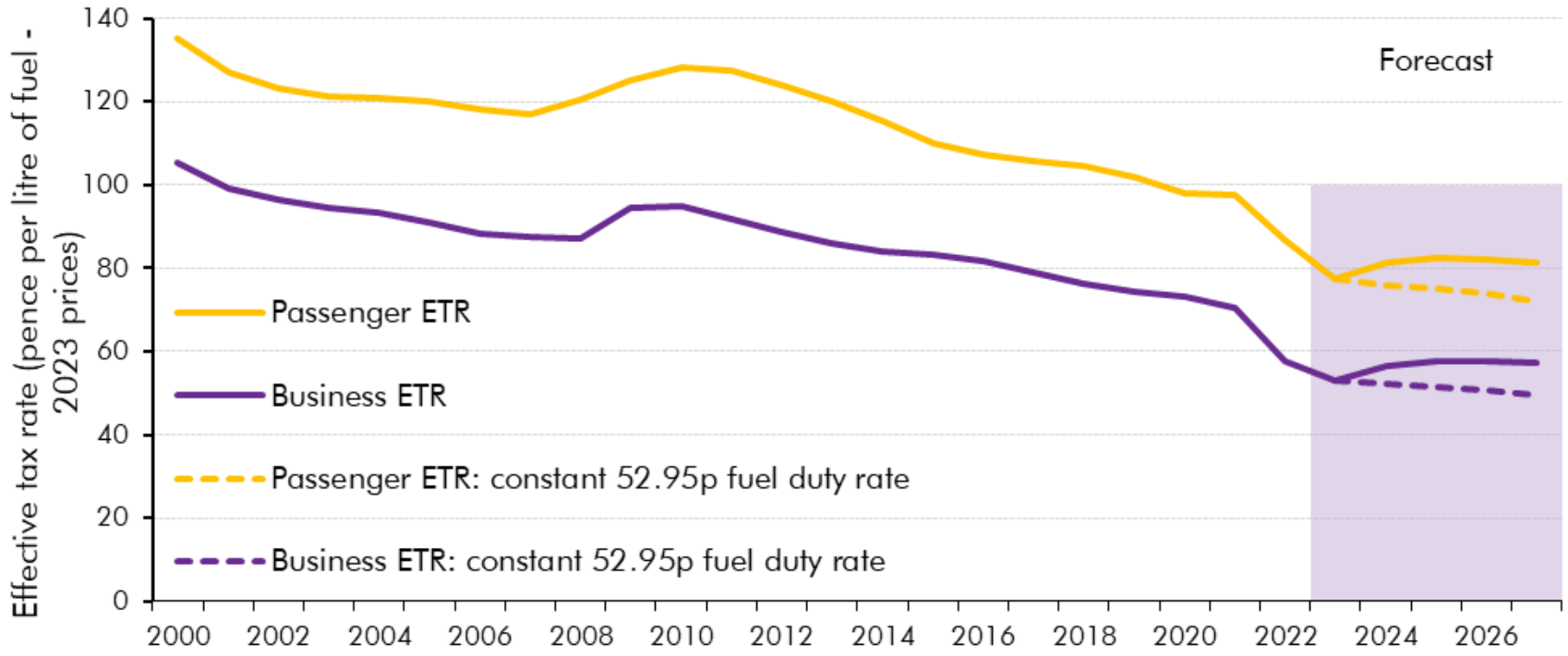
- **UK ETS** (formerly was the EU ETS, UK version started off the same): £/emission
- **Fuel duty**: tax applied to petrol and diesel fuel purchases: pence/Litre fuel (pence/emission)
- **Vehicle excise duty (VED):** charge for buying and owning a car, was vaguely CO2 linked, less so now
- **Climate Change Levy**: charge on energy used by business and industry (and other non-residential users). Applied at rate of MWh energy. Gas was lower rate than electricity (electricity double the rate), but now electricity is less emitting than gas, so not really strongly linked to emissions.
- **VAT**: value added tax applied at a discounted rate to electricity and gas used by households
- **Landfill taxes:** On tonnes of refuse, strong link to emissions, but small-ish emissions base
- **Air passenger duty**: duty per passenger, not on an emission per passenger per flight basis

Correlation between fuel duty clearances and surface transport emissions



Note: ONS outturn emissions statistics for road transport and railways (which make up surface transport emissions in this paper) have been consistently lower than the outturn transport sector emissions reported by DESNZ since 1990. Over the past five years the average discrepancy has been 7 per cent, so DESNZ emissions projections for 2022 onwards in this chart have been scaled down by 7 per cent to get the equivalent of the surface transport emissions reported in this paper.
Source: DESNZ, HMRC, ONS, OBR

Fuel duty: successive freezes in duty, means effective rate of tax has fallen



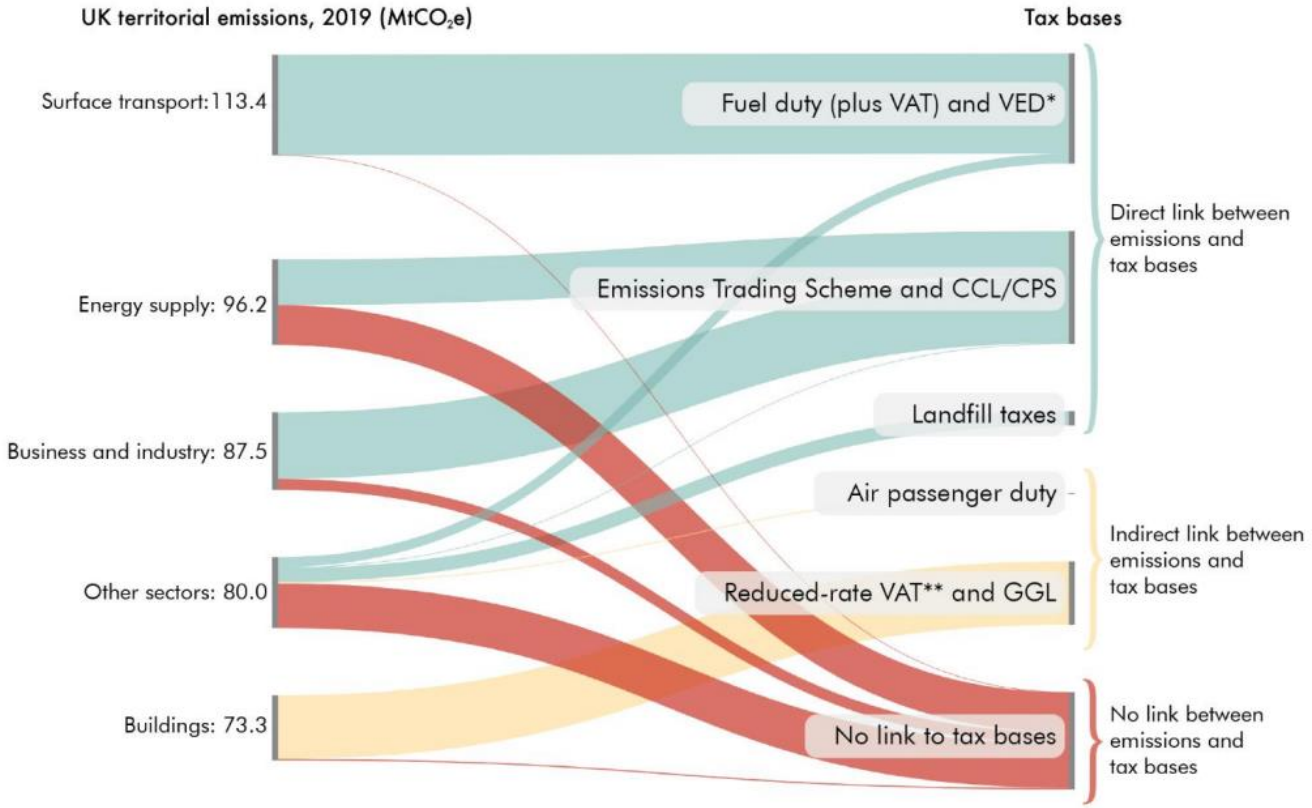
Note: This is RPI deflated, in line with how the tax rate is supposed to be uprated. The ratio between diesel and petrol usage is assumed to be the same for passenger and business travel. This analysis assumes that businesses reclaim VAT on fuel costs.
Source: OBR

Went through each of the taxes, assessing what aspects of sectoral emissions they cover

- Went through ONS (IPCC sectoral reporting framework) emissions categories and tagged them with associated taxes
- Taxes sometimes on a consumption "end-use" basis (e.g. VAT on household energy use)
- But we assessed on a production "source" basis (i.e. don't reallocate power sector to end use)
- Lots of taxes covered multiple sectors (e.g. UK ETS)
- Or would be applied by one sector, but the emissions would happen in another (CCL)
- Some covered nearly all the sector (fuel duty almost all of surface transport), some covered only bits of the sector (e.g. fuel duty covers a bit of agriculture – tractors)

Category	Tax base	1990
Passenger cars	Fuel duty, VED	72.00194749
Light duty vehicles	Fuel duty, VED	11.21960526
Buses	Fuel duty, VED	5.321348836
HGVs	Fuel duty, VED	21.721184
Mopeds & motorcycles	Fuel duty, VED	0.7682118
Road vehicle LPG and biofuel use (all vehicles)	Fuel duty, VED	0
Incidental lubricant combustion in road engines	NA	0.172906251
Urea use in abatement technology	NA	0
Railways - mobile combustion	fuel duty	1.47502382
Railways - stationary combustion	fuel duty	0.482950794
Total		113.1631783
per cent covered by fuel duty		0.998472063

Linking emissions to tax coverage



Note: Made with SankeyMATIC.
*While fuel duty directly links to tax revenues, we judge that VED has only an indirect link.
**Reduced-rate VAT receipts also relate to those emissions from the energy supply sector used in domestic electricity (which are also covered by the ETS).
Source: ONS, OBR

- 76 % of UK emissions directly or indirectly linked to a tax base
- Over half of which were strongly linked
- Tax bases linked to emissions were worth over £50 billion in 2022-23
- This is 5% of total UK receipts
- Reaffirms work in FRR21 that the biggest fiscal risk is lost revenue from fuel duty
- Understanding how emissions are changing will be important for accurately forecasting a number of our taxes

Future work

Next step is to set up a **physical damage** and **adaptation** assessment framework:

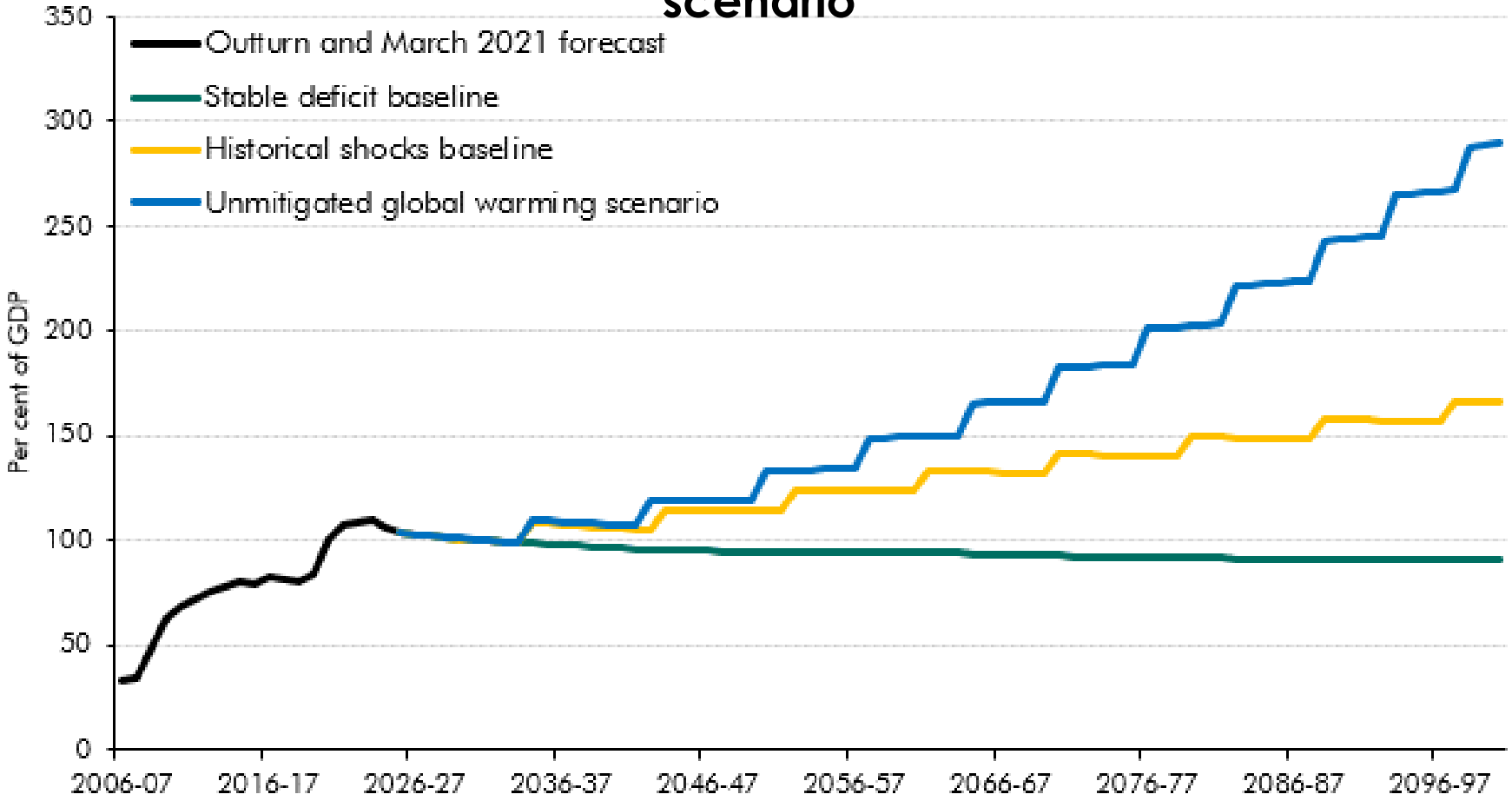
- What will be the economic and fiscal costs of climate change – what are the costs of a current policy temperature projections, or if net zero is achieved (best case)?
- How much will it cost to adapt to each of those scenarios? What are the important sectors for the UK?
- How much will it cost if we don't adapt?
- How can we get volatility into these models?
- How can we bring together stakeholders across UK government working on the same topic?
- Published Discussion Paper 4 in October 2023 calling for comment
- And have set up a cross Whitehall climate economists group off the back of it

Reflections

- A lot of our work has been built on work from two other independent bodies.
    - Each has made their own assumptions.
    - Each has produced this work for their own purpose.
- By piecing them together, we have had to make many assumptions to try to be internally consistent of which we detail in the report.
- As a non-policy and non-advisory body, we are well placed to publish best guesses on fiscal shares of the overall cost and the carbon tax rate required.
- The uncertainty around any of these individual paths is large.
- And a lot has changed since 2021 – many of our assumptions would be different if we repeated the exercise today!

Unmitigated climate change

Public sector net debt: an illustrative unmitigated global warming scenario



Source: ONS, OBR