

Independent Assessment: The UK's Net Zero Strategy

October 2021

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Executive Summary: Overall assessment of the Strategy

The UK's new *Net Zero Strategy* sets out, for the first time, how the UK Government plans to deliver its emissions targets of Net Zero in 2050 and a 78% reduction from 1990 to 2035 (-63% relative to 2019).

The UK Government's Net Zero Strategy is an affordable and achievable vision for the path to a Net Zero UK.

Our overall assessment is that it is an ambitious and comprehensive strategy that marks a significant step forward for UK climate policy, setting a globally leading benchmark to take to COP26. Further steps will need to follow quickly to implement the policies and proposals mapped out in the Net Zero Strategy if it is to be a success.

We welcome the Government's recognition that reaching Net Zero and tackling climate change is not only achievable and affordable but essential to the UK's long-term prosperity and can bring wider benefits for society, the economy and the environment.

The pathways for emissions and technologies, and the associated investment, outlined in the Strategy are broadly aligned to those set out by the Climate Change Committee in its advice on the Sixth Carbon Budget. They are accompanied by proposals for credible delivery mechanisms across the economy.

The targets cover all the UK's territorial emissions, including international aviation and shipping, and the plans aim to deliver the targets fully in the UK, without recourse to international carbon credits, while avoiding carbon leakage from industry or agriculture. The strategy as a whole is based on cautious assumptions over the lasting impacts of the Covid-19 pandemic and rules for emissions accounting.

The Net Zero Strategy is a strong example of the next step in policy development for the UK to take to COP26.

The Net Zero Strategy, with its many supporting publications, is an example of a deliverable sector-based strategy for rapid emissions reductions. Following three decades of sustained emissions reduction in the UK, the Strategy sets the path for future decarbonisation consistent with targets for both the near term and the long term that meet the demands of the Paris Agreement. This strengthens the position of the UK Presidency ahead of COP26.

In this assessment we independently appraise the Government's ambitions, its proposed policies to deliver these (both across the economy and in the major emitting sectors), areas that will require further detail and clarification, and the next steps required to proceed to implementation.

The key strengths of the strategy are its ambition and its scope:

- **Ambition.** The ambition in the Strategy aligns to the UK's emissions targets. The overall vision is similar to the Committee's: fully decarbonising electricity by 2035 and rapidly electrifying transport, heating and industry, with these actions supplemented by low-carbon hydrogen, carbon capture, and land use change. This vision is backed by clear commitments across the economy, which send strong signals to businesses, investors and consumers (e.g. 40 GW of offshore wind and 5 GW of hydrogen production capacity by 2030).
- **Cross-cutting policies (Box 1).** We are pleased that the Net Zero Strategy begins to set out how the Government will tackle some of the major cross-

cutting challenges involved in the transition. There are strong proposals on innovation and engaging business. Progress has been made on governance, including on how national and local government work together, and on skills. There are positive statements of intent on public engagement, on integration of adaptation to climate change and on fair funding, though these are not yet backed by sufficient detail or action.

The Net Zero Strategy is comprehensive and ambitious, with credible policy proposals across the economy.

- **Sector policies (Box 2).** Across the economy the Government has proposed, or begun to implement, credible mechanisms to drive delivery and rapidly scale up private investment. Many proposals (e.g. contract auctions for low-carbon power, a zero-emission vehicle mandate) are largely in line with the approaches that the Committee has recommended, combining regulation, carbon pricing and enabling measures.
- **Implementation.** Some of the policies for delivering the UK's ambitions are already in operation. For many of those that are not, consultations have been undertaken, initiated or tabled for the coming year. This is consistent with full implementation by 2024, as the Committee has recommended. The Government will report on its progress annually. Implementation must move quickly, and when needed adjustments to plans must be rapidly identified and acted upon.

This is a credible package that reflects the scale and breadth of the challenge. It is a material step forward. For the Strategy to be a success the delivery of these ambitions must follow quickly, requiring key issues to be resolved in the coming months. The Committee will be closely monitoring this progress.

- **Sector policies.** Few details have been set out for delivery mechanisms in the agriculture sector – a combined decarbonisation strategy for agriculture and land is needed urgently. The Government's ambitions for reduction of emissions from buildings go beyond the Committee's, but policies for buildings are less developed than for other sectors. These must now move forward at pace. Particular priorities that must be followed by urgent action are the consultations on standards and market mechanisms for driving low-carbon heat uptake and development of plans for energy efficiency in owner-occupied homes.
- **Enabling policies.** The Government has not yet put forward plans for a Net Zero Test, as we had recommended, to ensure that all policy and planning decisions are consistent with the path to Net Zero. Such a test is still needed to avoid locking in high-carbon developments. Considerably more action will be required on public engagement and on protection of vulnerable households. The Treasury should build on the analysis set out in its *Net Zero Review* to set out how it will use the tax system to support the transition to Net Zero, and how it will fill the fiscal gap implied by falling fuel duties.
- **Demand measures.** There is less emphasis on consumer behaviour change than in the Committee's scenarios. The Government does not address the role of diets or limiting the growth of aviation demand in reducing emissions, while policies to reduce or reverse traffic growth are underdeveloped. These options must be explored further to minimise delivery risks from an increased reliance on technology and to unlock wider co-benefits for improved health, reduced congestion and increased well-being.

The Net Zero Strategy must be followed quickly by the next steps in implementation and delivery.

Overall, the Net Zero Strategy places the UK in a strong position for the COP26 Presidency. It follows the transparent process for developing climate policy set out in the UK's Climate Change Act and is one of the most extensive national strategies for Net Zero published to date by the Parties to the Paris Agreement.

It demonstrates many of the key aspects of good climate policy within an overarching strategy that must be adopted more widely if the world is to achieve its agreed climate goals. Crucially, it moves the focus from target-setting to policy development and implementation, which must now follow rapidly and robustly.

The Committee will be closely monitoring progress through our regular statutory reports to Parliament.

The rest of this briefing is in six sections, followed by two Annexes:

1. Background to the UK's Net Zero Strategy
2. Summary of key elements of the Net Zero Strategy
3. Ambition in the Net Zero Strategy
4. Cross-cutting policies to support the Net Zero Strategy
5. Sectoral policies to deliver the Net Zero Strategy
6. Implementation and next steps

Innovation, new jobs and the role of business are integral to the Net Zero Strategy.

Box 1

Cross-cutting policy in the Net Zero Strategy

- At least £1.5 billion of public funding over 2022-2024 has been committed for **innovation**, and stretching goals set for emerging technologies such as heat pumps and greenhouse gas removals. The clear direction set by the strategy signals large future markets for such products to encourage private sector action.
- The Strategy emphasises the role of **business** in delivering the transition and includes policies designed to bring forward investment at low cost (e.g. long-term contracts for renewable and nuclear power). The *Green Finance Roadmap* intends to require firms to set and disclose their transition plans to progress towards a Net Zero economy.
- The Strategy emphasises the **jobs** entailed in the transition to Net Zero and outlines planned policies to help strengthen **skills** and to help **workers** in the transition, by working with employers to identify and deliver the skills they need and supporting workers to reskill and retrain.
- **Governance** procedures have been strengthened across central Government, including creation of two Cabinet Committees, while the Strategy proposes further development on central governance and on joining up with local government.
- Plans for **public engagement** are at an early stage, with sensible principles proposed. They need to be turned into positive collective action to achieve Net Zero.
- The Strategy places a significant emphasis on **fairness**, and the Treasury's Net Zero Review identifies the importance of how costs are distributed on households. Some policies (e.g. for energy efficiency in buildings) already reflect these needs, but others (e.g. for EVs) do not. Public funding is uncertain beyond the spending review (2024).

Box 2

Sectoral policy in the Net Zero Strategy

- **Power.** Contract auctions for low-carbon electricity generation have worked well for several years. The parameters for the next auction look set to make it the largest yet in terms of capacity and the range of technologies supported. Further schemes have been tailored to the needs of the nuclear industry and carbon capture and storage.
- **Transport.** Following upfront subsidies in recent years, the shift to electric cars and vans will be driven by a zero-emission vehicle mandate on manufacturers from 2024. This is supplemented by supporting policies on the charging network and public procurement, along with funding for walking, cycling and buses.
- **Buildings.** The new Heat and Buildings Strategy commits to developing a major market for heat pumps by improving the consumer offering and securing significant cost reductions, working with industry. The set of proposals include an obligation on boiler manufacturers, standards phasing out oil boilers in homes from 2026 and a small increase to proposed grant funds for heat pumps. There is also a commitment to look at rebalancing policy costs on electricity and gas to favour electrification. These are welcome steps, but significant delivery risks remain, notably for energy efficiency in the 60% of UK homes which are owner-occupied but not fuel poor.
- **Industry.** Carbon pricing through emissions trading underpins the UK approach to decarbonising industry. It is now supplemented by grant funding and contracts for capturing carbon from, and supplying hydrogen to, industrial clusters. Plans to support electrification and resource efficiency, and for manufacturers not covered by emissions trading, are less advanced.
- **Agriculture and land use.** Following EU exit, UK agriculture subsidies are being reformed to support provision of public goods, including emissions reductions and removals. However, no specific decarbonisation plan has yet been set out for this sector to match those in others. Some public funding has been provided for peatland restoration and tree planting, supplemented by certification schemes aiming to attract private finance – but land and agriculture policy must be better joined up if it is to succeed.
- **Other sectors.** Efforts in these five sectors (which are the largest emissions sources, covering around 80% of UK emissions) are supplemented by strategies and consultations for reducing emissions and growing decarbonisation options from other areas such as hydrogen, aviation, and North Sea oil and gas.

1. Background to the UK's Net Zero Strategy

The UK has a leading record in reducing its own emissions: down by 40% from 1990 to 2019,¹ the largest reduction in the G20, while growing the economy (GDP increased by 78% from 1990 to 2019). The rate of reductions since 2012 (of around 20 MtCO₂e annually) is comparable to that needed in the future. However, progress has been dominated by the power sector and needs to extend to the rest of the economy.

The Net Zero Strategy fulfils the requirement in the Climate Change Act for the Government to set out its policies and proposals to meet carbon budgets.

The UK's progress in climate policy has been guided by the Climate Change Act (2008).² The Act sets the UK's long-term ambition for reducing greenhouse gas emissions (Net Zero by 2050) and the path to reach it through five-yearly carbon budgets. The targets have been set based on the independent advice from the Climate Change Committee, also created by the Act. The Net Zero Strategy fulfils the requirement in the Act for the Government to present policies and proposals to meet the UK's emissions targets.

Under the Climate Change Act, the UK has adopted ambitious territorial emissions targets aligned to the Paris Agreement. The Sixth Carbon Budget requires an emissions reduction of 78% from 1990 to 2035 (63% from 2019 to 2035), effectively halving the time to meet the 2050 target that the UK adopted prior to the Paris Agreement. The UK has pledged a Nationally Determined Contribution of a 68% reduction from 1990 to 2030, on the way to Net Zero in 2050.³

These are comprehensive targets covering all greenhouse gases and all sectors, including international aviation and shipping, intended to be delivered entirely in the UK without recourse to international carbon credits.

Meeting the targets will require almost all investments and new purchases to be low-carbon by the early 2030s at the latest. It requires action from businesses and people, led by Government.

The UK's path to Net Zero is expected to support a thriving economy.

The UK targets can be met based on known technologies while improving people's lives. The Committee's analysis has shown that the aggregate costs are at worst small and the net economic effect could well be positive. The Treasury concluded that 'action to mitigate climate change is essential for long-term prosperity'.⁴ Similarly, the Bank of England conclude that 'the macroeconomic impact of transition risks [to Net Zero] is modest at an aggregate level'⁵ and the independent Office of Budget Responsibility that 'the costs of failing to get climate change under control would be much larger than those of bringing emissions down to net zero'.⁶

The Committee's independent assessment of the Strategy in this report follows our annual progress report in June, where we set out our expectations for the Strategy (Box 3).

Box 3

Expectations for the Net Zero Strategy: Extract from the CCC 2021 progress report

The full Net Zero Strategy provides an opportunity for the Government to demonstrate that it means what it says on climate action. It should fill the gaps in ambition, set up a programme of accelerated policy development, tackle the cross-cutting challenges in a joined-up way and ensure alignment of all policy decisions with Net Zero so that the 2020s becomes the decisive decade it must be:

- The public must be brought along with the transition. Better public information is needed on the changes that people should expect, and on the timing of their implementation. Meaningful public engagement will help build stronger public consent for the transition, and people should expect to understand the rationale for changes. They should also be able to see a benefit from making low-carbon choices and have easy access to the information and funding required to make changes happen.
- The Net Zero Strategy must clarify ambition across the economy to match the targets in a credible way. Quantified, credible pathways for sectoral decarbonisation, technology deployment and behaviour changes must be set out, and backed by specific policies as far as possible. If ambition falls short of the Committee's pathways in some areas the Government must explain how this shortfall will be made up elsewhere. The Net Zero Strategy must include demand-side action, which can come with a range of co-benefits (e.g. healthier diets, more exercise and better air quality), and be backed-up by policies that are carefully designed and implemented.
- The Treasury must ensure a fair and long-term approach to funding the transition. The Net Zero Strategy must be underpinned by an approach to funding that distributes the costs, savings and wider benefits of decarbonisation fairly. It must encourage action across society, while protecting vulnerable people and companies at risk of adverse competitiveness impacts. A move to longer-term funding streams and low-risk financing of Net Zero investments will be essential to making sustained progress.
- The Strategy should set clear timelines for policy development that match the urgency of the challenge. A strong, coherent and joined-up policy framework is needed. Credible policies to deliver the ambitions of the Net Zero Strategy should be fully in place by the end of the current Parliament at the latest (i.e. by 2024) to ensure that almost all investments and purchases (e.g. cars, heating appliances, new energy supplies) are low-carbon by 2030 or shortly after. All departments must increase their pace.
- The Strategy should initiate a strengthened role for local delivery. All levels of government have committed to ambitious climate action: UK, devolved administrations, city regions and local authorities. Better coordination and support is required across these levels, including workable business models, the removal of barriers to action, dedicated funding and an approach that enables sub-national action to complement action at the national level.
- All policy decisions must be compatible with the Government's climate commitments. The Net Zero Strategy should set out how the Government will achieve this, for example by introducing an explicit test to ensure compliance. Both the Net Zero Strategy itself and policy more widely must recognise the challenges of adapting as the climate changes. Planning policy (both at UK and devolved level) must also reflect these challenges.

Source: CCC (2021) Progress in reducing Emissions – 2021 Report to Parliament

2. Summary of key elements of the Net Zero Strategy

The Net Zero Strategy is suitably wide-ranging, covering the key issues that the Committee proposed should be covered.

The Net Zero Strategy brings together Government policy documents from the last two years, adds further ambition and policy, and sets their totality against the UK emissions targets. Key aspects of the Strategy are:

- **Net Zero scenarios.** The Strategy identifies different ways to meet the 2050 Net Zero target, depending on how decarbonisation options develop over the next decade or so. While there are uncertainties and future choices to be made, this is a reasonable approach given the range of planned actions to develop key options (e.g. heat pumps, hydrogen, CCS) this decade. Crucially, alongside this uncertainty the Strategy is clear what needs to be delivered over the coming decade.
- **Ambition for 2030 and 2035.** The Strategy sets out sectoral ambitions that add up to a quantified pathway to meet the UK's Nationally Determined Contribution (NDC) for 2030 and the Sixth Carbon Budget covering the mid-2030s. These are backed by specific commitments within individual sectors. In section 3, we assess these ambitions against the Committee's pathway, and we consider the Government's proposed monitoring approach.
- **Supporting policies.** The Strategy identifies various cross-cutting challenges in delivering the path to Net Zero and sets out how the Government will approach these. Issues include innovation; empowering the public; embedding Net Zero in Government; Green Jobs, skills and industries; and local climate action. Supporting publications build on these plans, particularly the *Treasury Net Zero Review* and the *Green Finance Roadmap*. We assess these plans in section 4.
- **Delivery policies.** The overall Strategy is underpinned by further strategies across most sectors, which describe in more detail how decarbonisation will be tackled. Many of these have been developed and published over the last two years. There were also new policies alongside the Strategy, most notably a Heat and Buildings Strategy. The Net Zero Strategy collates these policy plans, which we assess in section 5.
- **Implementation.** Not all policies and mechanisms have been confirmed, with a range of issues and proposals the subject of consultations. Both the Strategy and the sectoral strategies include timelines for the next steps in moving towards implementation. We consider these in section 6.

The UK has submitted the Net Zero Strategy to the UNFCCC.

The Government has submitted the Net Zero Strategy as the UK's second Long-Term Low Greenhouse Gas Emission Development Strategy in accordance with Article 4 of the Paris Agreement. It performs well against independent criteria for best practice in these submissions, and demonstrates a strong example ahead of COP26 (Box 4).

The rest of this briefing considers how well the elements of the Net Zero Strategy collectively align to the UK's Net Zero targets.

Box 4

The UK Net Zero Strategy in the context of G20 plans

The UK's Net Zero Strategy is arguably the world's most comprehensive plan to reach Net Zero, and the Climate Change Act provides a rigorous framework for monitoring progress.

Based on a high-level assessment against the rest of the G20, the UK's climate targets, plans and monitoring framework appear to be the most ambitious and advanced:

- Within the G20 set of countries, 16 have announced Net Zero targets, of which 12 are for 2050 (or earlier). Alongside the UK, Canada, France, Germany, Japan, South Korea and the EU have set their Net Zero targets in law.
- The UK, France and South Korea have so far submitted Long Term Strategies aligned to Net Zero.
- To date, nine countries have increased their 2030 ambition, with the UK NDC one of the most ambitious. For example, it requires one of the highest emissions reductions, whether judged from 1990, 2010 or 2019, and as a 'Domestic Target' it was assessed by Climate Action Tracker as being aligned to keeping warming to 1.5 degrees.⁷
- The UK appears furthest ahead on developing plans and policies to deliver on its ambition, with proposals published across the major emitting sectors including targets for deployment. France has begun developing action plans across 10 key ministries, Germany has set annual sectoral level targets,⁸ and the EU has set out its wide-ranging Fit for 55 proposals to deliver the EU's 2030 emissions target.

In addition to raising 2030 global ambition to align to the Paris temperature goal, concrete policies are needed to reduce emissions this decade. The Net Zero Strategy demonstrates that the UK is advancing both these needs.

The World Resources Institute,⁹ has set out good practice guidelines for Long Term Strategies. The Net Zero Strategy meets these guidelines, given it has a long-term vision and pathway, sectoral plans, proposed policies, milestones and a monitoring framework. It therefore represents a positive example to bring to COP26, alongside other strong Long Term Strategies, such as those submitted by Sweden and Costa Rica.¹⁰

3. Ambition in the Net Zero Strategy

The Net Zero Strategy sets out total ambition for emissions reduction and the expected contributions of each sector.

The Net Zero Strategy sets out how the Government expects each sector of the economy to contribute to the path to Net Zero. These expectations for emissions reduction are backed by expected uptake of key technologies, some of which have been adopted as explicit targets or commitments that the Government will report progress on each year. The key Tables from the Net Zero Strategy summarising these expectations and goals are replicated in Annex 2.

Indicative pathway for sectoral emissions

The overall and sectoral ambitions that the Government has proposed align well to those proposed by the Committee in its advice on the Sixth Carbon Budget (Figures 1 and 2). The ranges identified by the Government are intended to reflect uncertainty around a central delivery path that aims to keep in play multiple possible scenarios for meeting the Net Zero target in 2050. This is a sensible approach in the face of uncertainty and aligns to the Committee's approach in its advice.

The Government's range is somewhat asymmetric – overall emissions will have to be in the lower half of these ranges to deliver the Sixth Carbon Budget.

The Government also identifies the investment required to deliver its indicative pathway. Reflecting the alignment of ambition, this is also similar to the Committee's expectation – the Government anticipates additional annual investment rising to £50-60 billion by 2030, while the Committee expected around £50 billion. Reduced operating costs in later years will pay back on these initial investments.

Ambition on specific options

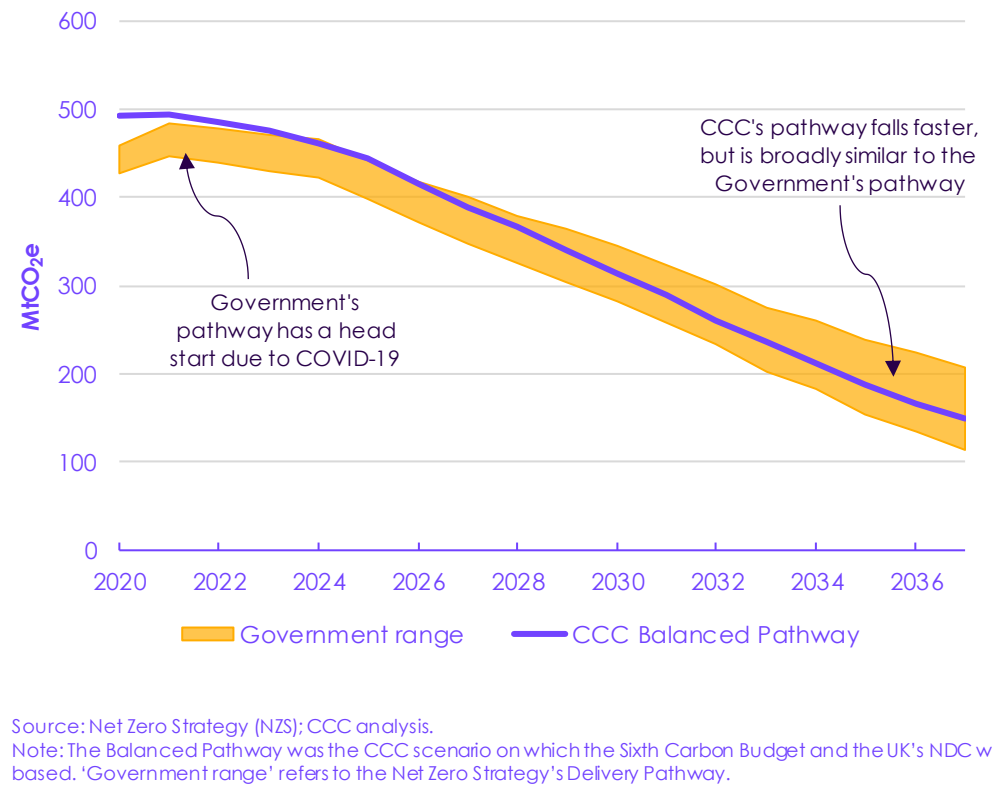
The likely general shape of the path to Net Zero is now well understood.

Importantly, the pathways that the Government considers share key elements that are in line with the Committee's scenarios:

- All sectors contribute under all scenarios, including agriculture and aviation – which are inherently hard to decarbonise – and industry and shipping, which have previously been perceived as such.
- Known technologies and solutions are prioritised, with greenhouse gas removals playing a supplementary role.
- Efficiency is improved across the economy and consumers increasingly make low-carbon choices.
- Electrification forms the backbone of the Net Zero transition, with new petrol and diesel cars and vans phased out by the early 2030s and a major scale-up in heat pumps. The power sector grows significantly to support this electrification, and is fully decarbonised by 2035.
- Hydrogen supplements this effort where the potential for electrification is more limited.
- Transformational changes occur in the UK's land, with major programmes of tree planting and peatland restoration.

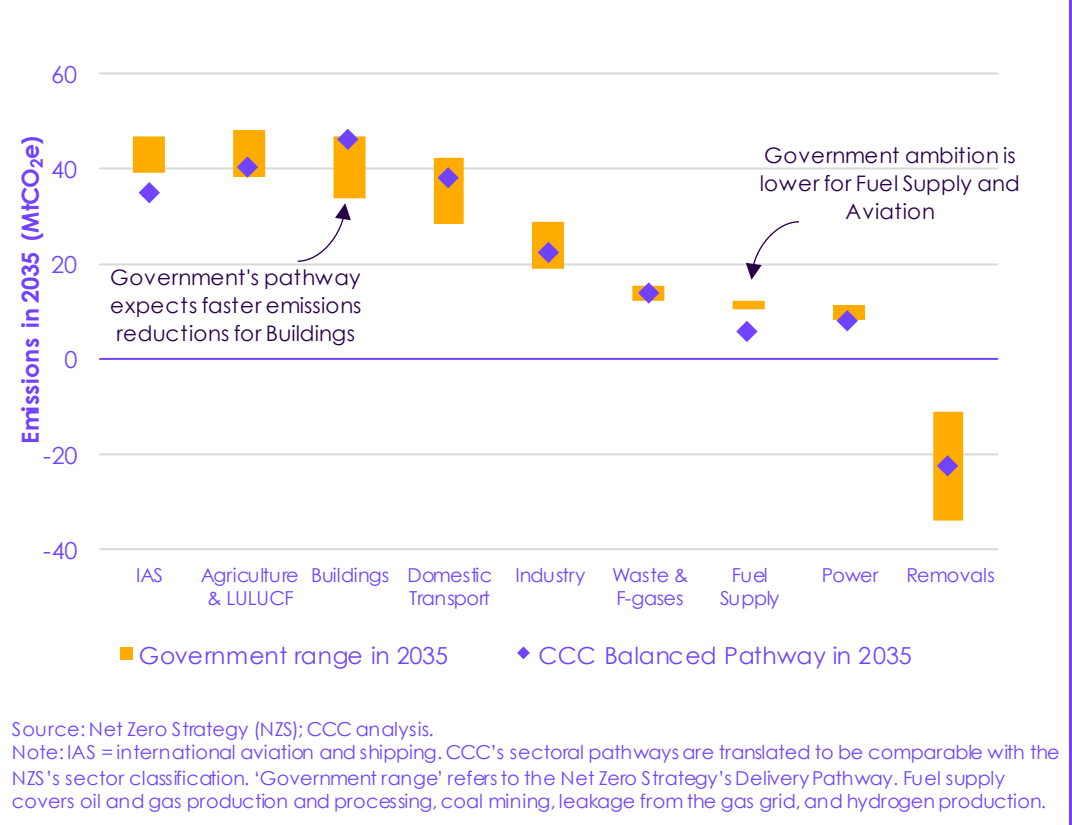
The Government's proposed overall path aligns to the CCC pathway that formed the basis for the UK's NDC and Sixth Carbon Budget.

Figure 1 Overall ambition compared to the CCC Balanced Pathway (2020-2037)



The balance of ambition across sectors is similar to the CCC's proposals, with some differences.

Figure 2 Sectoral ambition compared to the CCC Balanced Pathway (2035)



The Government has set out its plans for roll-out of low-carbon options across the economy.

These elements are reflected in Government commitments on specific sectors and technologies and other ambitions outlined in the Strategy, which also align to the Committee's scenarios (Table 1). This alignment demonstrates that the plans align to the targets and should be considered credible overall. It also sends a strong signal to businesses and consumers, and local government, as to the future direction of the Net Zero path for the UK.

In many cases, these ambitions have been strengthened in the Net Zero Strategy and related recent supporting strategies and announcements. We summarise these in section 5 below.

Remaining differences in ambition from the CCC pathway

The largest differences in any sector are in buildings and in the fuel supply sector. The latter falls 5-6 MtCO_{2e} short of the Committee's pathway, which is somewhat surprising given this sector has relatively low (and falling) emissions. This difference mainly reflects low ambition in the North Sea Transition Deal, which has not been increased in the Net Zero Strategy.

The Government expects to achieve greater reductions in emissions from buildings, even though expected deployment of low-carbon measures by 2035 is similar to the Committee's pathway (greater overall reductions in the public sector compensate for lower ambition on heat networks). This may be plausible given broader uncertainties over future energy demand, the impact of policy interventions and the effectiveness of the low-carbon options. We expect to analyse these differences further over the coming months. The higher ambition on reductions in emissions from buildings points to a need to progress policy plans quickly and robustly to ensure they deliver, as well as active consideration of options to go further on emissions reduction in other areas.

The Government plans put less emphasis on demand-side measures, which is a potential missed opportunity for reducing risk and delivering co-benefits.

Another clear difference from the Committee's scenarios is on the contribution from changes in behaviour. The Net Zero Strategy, and the earlier Transport Decarbonisation Plan, include ambitious goals for shifting travel choices away from private cars, such as by doubling cycling from 2013 to 2025. However, the Strategy has nothing to say on diet changes away from meat and dairy, or on limiting growth in flying.

These actions are valuable for reducing emissions directly and for wider effects – diets with less red meat will tend to be healthier and release land for carbon sequestration, and reduced flying cuts non-CO₂ climate effects from aviation (which are of comparable size to the CO₂ effects). We note that in each of these areas there is a possibility of progress even with little policy action, given the strong public desire to act on climate change and the possible lasting impacts of the pandemic. However, Government leadership, public engagement and wider policy can help accelerate these shifts.

Substantial progress will be needed from technologies to compensate for a lack of ambition on behaviour change. The Government plans assume this comes from sustainable aviation fuels and rapid improvements in new aircraft efficiency in aviation, while in agriculture it appears to come from improving productivity or innovations in the likes of animal health and feed additives. The exact plan is currently unclear in the absence of a specific strategy for decarbonising agriculture and land use. These ambitions are clearly very stretching, and progress will need to be monitored closely.

Table 1

Government commitments compared to the CCC Balanced Pathway between 2025 and 2035

Headline actions	Government ambition ¹	CCC pathway
Fully decarbonised electricity	2035	2035
Offshore wind	40 GW by 2030	40 GW by 2030
Nuclear power ¹	Final Investment Decision in at least one new nuclear power plant by the end of this Parliament	One new nuclear plant operational by 2030, and a further plant by 2035
Low-carbon hydrogen	5 GW (up to 42 TWh) by 2030	30 TWh by 2030
Electric vehicles	Phase-out of new fossil-fuelled car and van sales by 2030, with allowance for hybrids that offer significant zero-emission capability until 2035	Phase-out of all new fossil-fuelled car and van sales by 2032
Buildings energy efficiency	EPC band C by 2035 across the housing stock; 2028 in private rented homes	EPC band C by 2035 across the housing stock; 2028 in private rented homes
Phase-out dates for new gas and oil boilers	Homes – gas 2035; oil 2026 Commercial & public – gas 2035; oil 2024-26	Homes – gas 2033; oil 2028 Comm & public – gas 2030/33; oil 2025/26
Heat pumps in homes	Minimum 600,000 heat pump installations / year by 2028	900,000 heat pump installations / year by 2028
Low-carbon heat networks (all buildings) ²	15 TWh low-carbon district heating by 2030 29 TWh of district heating by 2035	25 TWh low-carbon district heating by 2030 47 TWh low-carbon district heating by 2035
Emissions reduction target for public buildings	Halve by 2032 (against 2017 levels) Reduce by 75% by 2037 (against 2017 levels)	Halve by 2032 (against 2017 levels) Reduce by 60% by 2037 (against 2017 levels)
Industrial fuel-switching ³	Replace 50 TWh/year of fossil fuels by 2035	60 TWh of fuel-switching per year by 2035
Tree-planting	30,000 hectares/year by 2025 50,000 hectares/year by 2035	30,000 hectares/year by 2025 50,000 hectares/year by 2035
Peatland restoration ⁴	37,000 hectares / year by 2025	67,000 hectares / year by 2025
Carbon Capture and Storage	20-30 MtCO ₂ captured and stored annually by 2030, across 4 industrial clusters, including at least one power project	22 MtCO ₂ /year captured and stored in 2030, across 5 industrial clusters, including multiple power projects
Engineered greenhouse gas removals	Ambition to deploy at least 5 MtCO ₂ /year by 2030	5 MtCO ₂ /year by 2030
Sustainable aviation fuel blending	10% of fuel use by 2030	2% of fuel use by 2030
Elimination of landfill of biodegradable waste	2028 for municipal waste only	2025 for municipal and industrial/commercial waste

Source: CCC Analysis

Notes:

¹ The Balanced Pathway produced for the CCC's Sixth Carbon Budget assumed that two new nuclear power stations (or equivalent) beyond Hinkley Point C would be in operation by 2035.

² Government commitment figures based on deployment assumptions in Net Zero Strategy – 2030 figure assumes that all new provision uses low-carbon heat sources and half of current provision is converted to low-carbon sources; 2035 figure assumes all heat networks use low-carbon sources.

³ CCC pathway has 70TWh if including industrial off-road mobile machinery in scope.

⁴ Includes commitments in the Net Zero strategy as well as commitments from Scotland (in its Updated Climate Change Plan) and the Welsh Peatland Action Programmed 2020-2025. Northern Ireland issued a consultation on its peatland strategy which closed in September 2021. It is yet to publish its strategy.

Being flexible in the face of uncertainty

The Net Zero Strategy recognises uncertainty without delaying action and proposes positive proactive steps to develop options.

The Committee agrees with the Government that planning for multiple potential pathways to meet Net Zero is appropriate, given uncertainties over how things will develop over time. Effective planning requires that possible options are developed sufficiently to allow them to play a full role if required. We are therefore pleased that the Government's plans include steps to deploy key emerging options, which will both reduce emissions in the 2020s and increase optionality thereafter:

- Scaling up heat pumps over the coming decade so that these could meet the need for low-carbon heating systems across the housing stock.
- Rapid deployment of a portfolio of low- and zero-carbon electricity generation technologies to meet the 2035 power decarbonisation target, which will keep in play scenarios for Net Zero with considerably higher electricity demand (e.g. due to larger roles for electricity-hungry options such as 'green' hydrogen from electrolysis, direct air capture of CO₂ and sustainable aviation fuels).
- Developing the hydrogen sector this decade, with a target for 5 GW of production capacity by 2030, providing optionality over its role in a range of sectors after 2030.
- Establishing four CCS (carbon capture and storage) clusters this decade, capturing 20-30 MtCO₂ annually by 2030, including an ambition for 5 MtCO₂ of engineered greenhouse gas removals. This keeps in play a wider range of pathways to deliver decarbonisation across the economy.

Development of these options must proceed with vigour – the UK's emissions targets will be missed if delivery were to fall short in some areas, without credible options to go further elsewhere. Keeping in play behavioural options such as diet change and measures to limit growth in aviation will also be important in managing risks of progress falling off track.

The presence of uncertainty makes regular monitoring and course correction crucial.

We are pleased to see the Government has begun to develop its plans for monitoring of progress. It intends to report annually and has set out an initial set of indicators that it will track. Monitoring progress will be key to ensure that corrective or compensating actions can be taken early enough to stay on track if ambition is not being delivered in any area, or emissions are not falling as expected. We will work openly with the Government as the Committee strengthens its own approach to annual progress monitoring.

4. Cross-cutting policies to support the Net Zero Strategy

The Committee emphasised the importance of tackling key cross-cutting issues in its advice on the Sixth Carbon Budget and our subsequent progress report. The Net Zero Strategy sets out the Government's progress and plans in these areas.

Innovation funding

Innovation is a key priority for the Net Zero Strategy and receives a funding boost.

The Net Zero Strategy sends a strong message on the importance of innovation in the transition to Net Zero. There is a goal for the UK to be a global leader in low-carbon technologies with a strong focus on job creation. There is a welcome commitment to increase innovation funding to £1.5 billion over the next spending review period (to 2024), from the £1 billion already committed in 2020. Funding will be provided on a competitive basis and includes additions such as the £60 million Heat Pump Ready programme, aiming to pioneer heat pump technologies. As announced in 2020, the Government is also increasing investment in R&D more broadly to £22 billion per year by 2024/2025, recognising the importance of early-stage research and the advantage this gives the UK to be a world leader in research.

The innovation funding will target priorities outlined in the UK *Net Zero Research & Innovation Framework*,¹¹ which aims to provide a clear direction to the private sector and research communities on the UK's priorities. These priorities broadly reflect those implied by the Committee's analysis for the Sixth Carbon Budget. They include but are not limited to: heat pump costs, greenhouse gas removals, floating offshore wind, aviation fuel and hydrogen. The framework is intended to target priorities in the next 5-10 years, allowing flexibility and adjustment of priorities in the longer term as developments are made.

This framework encourages investment by reducing uncertainty, while also allowing for some failure, hence retaining some riskier investments, and maintaining flexibility in the face of uncertainty. The framework includes research and innovation related to business models and socio-economic considerations as well as technology. With ambitious targets, such as reducing the costs of heat pumps to reach the roll-out of up to 1.7 million heat pumps per year, innovation will be key. The Government will later publish a delivery plan detailing prioritised publicly funded programmes. A key challenge will be to ensure that key learnings from publicly funded research are widely disseminated.

More broadly, the deployment commitments in the Strategy recognise that deployment is also important in reducing costs, and send strong signals to businesses that large future markets await those that can make a success of low-carbon products such as heat pumps, and low-carbon production processes such as CCS and hydrogen. This should encourage later-stage research, development and early deployment from the private sector.

Enabling business action and green finance

The Strategy recognises the importance of businesses, and aims to design policies that will support them to make low-carbon investments.

Businesses have a key role in delivering the transition to Net Zero, and working with businesses is one of the four 'key principles' of the Net Zero Strategy. Many of the policies in the Strategy have been designed to encourage low-cost business investment and innovation. Examples include long-term contracts for low-carbon power, funding for hydrogen and business models for carbon capture and storage.

The Government intends to require businesses to publish plans for their own Net Zero transition.

The clear direction set by the Strategy should help reduce risks and lower costs of capital for the large increase in investment required.

In the *Green Finance Roadmap*,¹² the Government sets out its long-term ambition to green the financial system, with particular emphasis on improving the information available to financial decision-makers. A particularly welcome new commitment is a proposed requirement for certain companies to set and disclose transition plans consistent with the wider UK transition to Net Zero.

- The detail of 'transition plan' standards including their advice on carbon 'offsetting' will be critical to the impact of the initiative, as will the range of businesses covered by the requirement.
- Previous Government commitments to require TCFD (Task Force on Climate-related Financial Disclosure) compliance by 2025 and to develop a UK Green Taxonomy are reaffirmed.

The Roadmap goes some way in ensuring the additional information translates into shifts in financial flows, but more details will be needed.

- The Roadmap highlights Government expectations that investors will act on the new information, and an intention to assess progress in this regard in 2023.
- We look forward to more details on the framework for assessing progress. Progress assessments should be conducted regularly and assess investment needs and financial flows in relation to Paris Agreement alignment. We also look forward to more detail on plans from the Financial Conduct Authority to develop sustainable investment labelling.
- Successful design of these levers will be vital to ensure the additional information leads to shifts in financial flows to support Net Zero.

In the wider Net Zero Strategy and accompanying documents, we welcome the new regulatory signals and emphasis on engaging businesses. New requirements for business reporting on food waste and further exploration of environmental labelling of products, goods and services could have significant impacts on business emissions.

Regulation and Government initiatives have a vital role in encouraging and enabling businesses to play their full part in the transition to Net Zero.

The Government must continue to work with businesses beyond COP26, building on the Race to Zero and Race to Resilience campaigns and the Business Climate Hub. Continued initiatives should provide sufficient resources to support businesses of all sizes to engage fully in the transition.

Governance and local delivery

Central governance

The Net Zero Strategy sets out a range of ways through which the Government is strengthening governance of Net Zero delivery. This includes the delivery of Net Zero across Government as a whole, as well as the wider public sector:

- **Central governance of Net Zero.**
 - The Government has established two Cabinet Committees dedicated to climate change, which are chaired by the Prime Minister and by the COP President Designate.

The Government has strengthened its processes to ensure climate change is suitably prioritised throughout policy-making.

These are aimed at bringing Net Zero to the centre of Government decision-making. They are supplemented by a bi-monthly Ministerial meeting of the UK Government and the Devolved Administrations, and various cross-Government groups at official level.

– The Net Zero Strategy recognises the importance of taking a whole-systems approach, as the challenge of Net Zero cuts across all areas of the economy and requires joined-up actions that reinforce rather than hinder progress. Good coordination between Government Departments and delivery bodies will be vital to achieving this.

- **Net Zero as a core public sector delivery objective.** The Net Zero Strategy sets out how Net Zero will become a core delivery objective across the public sector, including for central Government (e.g. through the No. 10 Delivery Unit), for departmental spending and procurement processes (e.g. the Green Book and the National Procurement Policy Statement), and for regulators (e.g. Ofgem).
- **Embedding Net Zero in Government decision-making.** The Committee has previously recommended that the Government implement a 'Net Zero Test' for policy development. The Government will use the Environment Bill to ensure environmental considerations are reflected in national policy-making through five key principles. These five key principles are a welcome step towards the Committee's recommendation, but will need further development to ensure that all policy decisions are subject to a rigorous assessment of how they contribute to meeting Net Zero.
- **Integrating adaptation needs into policy for Net Zero.** The Net Zero Strategy recognises the need to tackle mitigation (i.e. reducing emissions) and adaptation (i.e. adapting to the changing climate in the UK) together to successfully deliver the UK's legally-binding emissions reduction goals. These ambitions must flow through to specific policy designs. The inclusion of overheating, flooding and water availability risks within stated objectives for new-build housing policy is welcome, together with the acknowledged need to design the zero-carbon electricity system to be resilient to future climate risks. Adaptation must be fully integrated within any future agriculture and land decarbonisation strategy to ensure land-use changes deliver against the full range of the Government's environmental objectives.

Strengthened governance arrangements do not yet constitute a full Net Zero Test to ensure all policy and planning decisions are consistent with Net Zero.

Net Zero policies will need to integrate climate adaptation, particularly for the land sector and for buildings.

Taken together, these are a welcome step for governance and delivery of Net Zero. However, the absence of a robust, cross-cutting Net Zero Test, as recommended by the Committee, represents a gap in the current policy-making context. The Committee's view remains that the Government should take forward further development of a Net Zero Test, either through the Environment Bill's five principles or separately, to ensure that Net Zero is rigorously incorporated into all Government policy-making.

Local governance

The Net Zero Strategy recognises that 30% of the emissions reductions that will be needed depend on actions that involve local authorities. It represents a positive first step in acknowledging the role that local leaders can play in engaging their communities and delivering change that works within their local contexts, and in identifying steps to unlock effective local delivery.

To enable a full contribution from local actors, clearer expectations, greater clarity on roles, adequate resourcing and strengthened capacity and capability are needed.

However, greater clarity is needed on the roles of different layers of Government to enable a full contribution from local actors, along with adequate resourcing and strengthened capacity and capability.

The Strategy sets out three key areas in which Government needs to act:

- The need to set **clearer expectations** for how the partnership between local and central Government should work and how action at all levels should fit together.
- Providing **adequate resourcing** to enable local places to deliver strong contributions to Net Zero and broader priorities.
- The importance of **building capacity and capability** at the local level.

To deliver this, BEIS will chair a Local Net Zero Forum, which will bring together senior officials from across Government departments and leaders from local government.

- The Forum's first task will be to establish clearer delivery roles. Thereafter it will provide a single engagement route into central Government, and will allow local voices to play a role in shaping local delivery policy. This is welcome and aligns with recommendations that we¹³ and others,^{14,15} have made. The Strategy does not specify whether the Forum will operate across all of the UK or just for England.
- The network of five Local Energy Hubs – now rebranded Local Net Zero Hubs – are seen as playing a crucial role in sharing best-practice, coordinating approaches, and supporting authorities to develop projects that are attractive to investors.
- The Heat and Buildings Strategy is vague on the role for local area energy planning, although progress on zoning for heat networks is a welcome step.
- The Net Zero Strategy acknowledges the recent assessment by the National Audit Office¹⁶ of the fragmented funding landscape that local authorities currently face. It recognises that longer-term and more coordinated funding streams can stimulate investment and deliver better value-for-money and pledges to explore opportunities to consolidate funds to this end.

Action must now follow to deliver on the good intentions set out in the Strategy for supporting local climate action.

The increased policy certainty provided through this strategy and supporting sectoral strategies should enhance local authorities' ability to plan projects and leverage private investment. To enable this, it will be crucial for the Forum to promptly develop an agreed understanding of the role of local government in delivering Net Zero. Furthermore, Government must ensure that critical enabling processes, such as the planning system and appraisal methodologies, are properly aligned to these pathways. Coherent, predictable and long-term funding settlements will help realise effective local delivery that works across communities.

Workers and skills

The Net Zero Strategy takes forward recommendations from the Green Jobs Taskforce.

The Government has recognised the transition to Net Zero as one of the dominant labour market trends of the next 30 years and has set out an ambition to support 440,000 jobs across Net Zero industries in 2030. Plans to make this ambition a reality take forward several recommendations from the **Green Jobs Taskforce** – set up by Government in November 2020 to set the direction for the labour market on the path to Net Zero.¹⁷

These include:

- **Develop supply chains and maximise job opportunities** including a commitment to publish sector and supply-chain development plans for critical low-carbon sectors, working with industry to maximise job opportunities from the Net Zero transition. As part of this, Government will set up an Energy Supply Chain Taskforce – a government and industry partnership set up to guide policy – which will also consider how to ensure that green jobs are high-quality jobs.
- **Education and skills.** Reforming the skills system to make it more responsive to the needs of employers, including through:
 - A £65 million pilot **Development Fund**, to identify employers' skills requirements and build the capacity of local further education providers to deliver these skills (e.g. by purchasing equipment, bringing in industry expertise to provide training).
 - The **Lifetime Skills Guarantee**, which supports workers to reskill and retrain, including through Skills Bootcamps in areas like housing retrofit and vehicle electrification, with approximately 16,000 places available in 2021-22 and plans to explore extending it further.
 - The **Free Courses for Jobs** offer, launched in April 2021, which gives adults access to free Level 3 courses, including qualifications linked to buildings and construction, engineering, environmental conservation, agriculture, horticulture and forestry. An estimated 11 million adults are eligible for these courses in England, and Government plans to continue working with employers to extend the offer to deliver additional skills needed for the transition.

The Government has clearly recognised the importance of education and skills in delivering a fair transition and the intention to extend opportunities already on offer is welcome. It will be important to ensure that adequate funding is attached to these packages and that pilots are rolled out into permanent schemes where they are found to work, to deliver the skills needs of the transition and make jobs ambitions a reality.

Public engagement

Reducing emissions on the path to Net Zero is a task for all of society. Over half of the emissions reduction needed to meet the Sixth Carbon Budget involves people making low-carbon choices, whether adjusting to the different characteristics of low-carbon technologies or by changing consumption patterns. This level of change will not be achieved unless people are engaged effectively, understand the rationale for changes, and are enabled to make changes happen. Giving people a voice and building social buy-in around what is needed is essential to a successful transition.

The Net Zero Strategy recognises the need for public engagement in meeting Net Zero, and sets out a set of principles around enabling people to make greener choices, communicating, offering trusted advice and support, and enabling people to shape and improve policies. However, it does not set out how or when the Government proposes to do this.

These principles now need to be turned into clear and meaningful action.

Next year the Committee will give further advice on what a comprehensive engagement plan should look like, for example with clear milestones for

The Net Zero Strategy recognises the vital role of people and public engagement in the Net Zero transition, but does not yet set out clear actions to make progress.

appropriate engagement processes with the public and key delivery partners on key aspects of Net Zero. This will build on lessons learnt from deliberative and other processes in the UK and internationally, and set out priorities for action and how we plan to track progress in this area.

The driving objective should be for Government to put forward a positive collective framing for the transition to Net Zero and a better Britain – in line with the framing of the Net Zero Strategy. The Government should help show UK citizens how they can play a positive part in that transition by changing their spending and behaviours to better their lives and the planet.

Fair funding

The UK Treasury has been clear that climate action is essential for long-run prosperity.

The Government's Net Zero Strategy and the Treasury's Net Zero Review¹⁸ start to set out principles and plans to fund the transition. Importantly, these two documents recognise that despite upfront investment costs, climate action is essential for long-run prosperity, and the transition to Net Zero is expected to result in net benefits to society.

However, this work is far from complete. Further clarity will be needed not only on policies to deliver Net Zero, but also on how they will be funded and their impact on different groups:

- The Net Zero Strategy outlines **four principles to minimise costs and deliver the transition fairly**: working with the grain of consumer choice, ensuring the biggest polluters pay the most, protecting the most vulnerable and working with business to deliver cost reductions. While policies developed in some sectors are in line with these principles (e.g. upfront grants for efficiency and low-carbon heating in residential buildings; innovation funding for greenhouse gas removal technologies) policies in several areas remain under-developed and under-funded.
- The Strategy recognises the role of targeted **public spending** in mobilising private investment and points to commitments in last year's Spending Review. Ahead of this year's spending review, it has not been possible to determine the full extent of public investment that will be put towards Net Zero. The Strategy also highlights the success of the UK's first **Sovereign Green Bond**, which has already raised £10 billion (and aims to raise a further £5 billion this financial year) towards investment in Net Zero and other green projects. The Government's **Green Financing Framework**¹⁹ has set out where this money can be invested, and an annual allocation report on Eligible Green Expenditures will provide transparency in future as to where it has been spent.
- The **HMT Net Zero Review** adds to this picture by setting out **principles to guide public spending on decarbonisation**, which include: targeting investment to drive down costs through innovation, managing risks of carbon leakage, mitigating distributional impacts of a 'polluter pays' approach and resolving market failures more generally. It also highlights the need for a sectoral focus to public investment, as household characteristics (e.g. car or home ownership) will affect their exposure to the costs of decarbonisation in a given sector. The Review argues against using borrowing to fund transition costs based on the polluter pays principle and intergenerational fairness; we note that much of the transition costs are investments that will bring benefits to future generations, and that the Treasury is already borrowing specifically to fund the transition through its Green Bonds issuance.

- The Review also assesses potential **fiscal implications** of the transition more broadly, flagging the reduction in tax revenue brought about by the loss of fuel duty as the most significant issue. Decisions on how to address this have not yet been made, however – despite a growing recognition that a shift to road pricing is likely to be needed, and that the transition will be easier to manage the sooner it is initiated. Details on how much of the transition will be funded beyond 2024 are still missing. Public spending is relatively generous in some areas (e.g. innovation, EV charging infrastructure) but low in others (e.g. heat pumps and heat networks). This puts a lot of pressure on market mechanisms, for which plans are at an early stage and will need to be developed at pace.

Tax and spending are important levers in the Net Zero transition. Having established that principle the Treasury should go further and map out how it intends to use them.

The Treasury Review is an important step forward in recognising the multiple challenges faced in the transition from the UK's finance ministry. Most of the Treasury's conclusions are in line with those that the Committee set out in its advice on Net Zero and on the Sixth Carbon Budget.

Now the Government must start to map out the solutions. The Committee will continue to develop analysis on the merits and risks of different decarbonisation delivery mechanisms and funding options, particularly with consideration to their distributional impacts.

5. Sectoral policies to deliver the Net Zero Strategy

Since the UK legislated its Net Zero target in 2019, the Government has published a set of decarbonisation strategies for individual sectors – some recently, others dating back up to a year. The Net Zero Strategy collates these and adds some further specific commitments on top.

New sectoral decarbonisation strategies

Important sectoral strategy documents covering buildings, transport and hydrogen have been published since our progress report in June. These strategies help to address the key gaps that we identified in ambition and policy:

The Heat and Buildings Strategy is more reliant on standards and market mechanisms than the Committee envisaged. These now need to be developed urgently.

- **The Heat and Buildings Strategy.** The new strategy backs electrification of heating (via heat pumps) as the primary route to decarbonisation, alongside heat networks and with development of hydrogen as a potential alternative. It focuses on work with industry to cut costs and improve the consumer offering on heat pumps. Some public funding is continued, while standards and market mechanisms are proposed to drive the targeted scale-up in installation of heat pumps and efficiency.
 - There is a clear ambition to phase out installation of gas boilers by 2035. The Government plans partly to scale the low-carbon heat market by ending new fossil fuel boiler installations in new homes from 2025, and in off-grid homes from 2026. A low level of grant funding will support the current retrofit market to 2024.
 - Meeting the Government's goal of at least 600,000 annual heat pump installations by 2028 will rely on an obligation, proposed to be on boiler manufacturers (enabling cross-subsidisation of heat pumps), which is out for consultation. To support electrification the Government has committed to “addressing existing distortions between electricity and gas prices” to “ensure heat pumps will be no more expensive to run than gas boilers” – this step, which is yet to be consulted on, will be vital to success.²⁰
 - The Government's proposals aim for stronger cost reductions than the Committee assumed and move more quickly away from public funding to a market mechanism. If successful, this would be a desirable outcome, but it brings different delivery risks, which will need to be carefully managed.
 - In parallel, the Government will develop hydrogen as an option, with trials and testing ahead of a strategic decision on its role by 2026. This twin-track approach reflects the challenges ahead and is in line with the Committee's recommendations.
 - On energy efficiency, public funding for public buildings, social housing and the fuel poor are extended. Standards for residential and commercial rented properties should drive improvement in the rented stock. However, a significant gap remains for the 60% of homes which are owner-occupied and not fuel poor. Targets for mortgage providers have been proposed, initially voluntarily, with an option to make these mandatory in future, and the Government plans to consult on further

options. These plans must progress quickly and be implemented robustly, with more public funding likely to be required, if the Government is to meet its goals for efficiency improvement.

- While there are some efforts to improve information, enforcement and skills, concerns remain in these areas. Funding overall, and specifically for heat networks, the public sector and heat pumps, appears to be relatively low. The lack of an integrated offer on home retrofit for the majority of households remains a real source of concern, and contrasts with international best practice as exemplified by the decade-long KfW scheme in Germany, which is largely self-funding and widely celebrated as a major policy success.²¹

A zero-emission vehicle mandate will be the key delivery tool for electric vehicles, as recommended by the Committee.

- **The Transport Decarbonisation Plan** is a reasonably comprehensive strategy for transitioning to a system in which almost all journeys are zero-carbon.

- This is based primarily on strong commitments to phase out sales of new fossil-fuelled vehicles, enabled by the introduction of a zero-emission vehicle mandate (as recommended by the Committee) for cars and vans from 2024. This will be supported by continuation of plug-in vehicle grants and further investment in public charging infrastructure. The accompanying 2035 Delivery Plan sets out clear milestones and targets for delivering this transition. The Government has also consulted on phasing out new non-zero-emission heavy goods vehicles (HGVs) by 2040 (2035 for smaller HGVs), and is consulting on buses.
- At the same time, the plan recognises that more needs to be done to reduce reliance on private car travel. The plan outlines a place-based approach supported by increased funding allocated to lower-carbon alternatives through recent bus and active travel strategies.^{22,23} This is a positive step and will be crucial in both reducing near-term emissions and realising a range of co-benefits. It now needs to be turned into more detailed targets and delivery plans to enable widespread uptake of more sustainable travel choices.

The Hydrogen Strategy sets out plans for 5GW of production capacity by 2030, with a twin-track approach for green and blue hydrogen.

- **Hydrogen Strategy.** The strategy provides a roadmap to 2030 on how Government intends to support the development of a hydrogen economy. However, some key questions are yet to be answered.

- The Government reaffirmed a target of 5 GW of hydrogen production capacity by 2030 and is adopting a twin-track approach to develop both electrolytic 'green' hydrogen and CCS-based 'blue' hydrogen. The Government has committed funding for hydrogen production, but the mix of production sources will not be set out until publication of the Hydrogen Production Strategy in 2022, including finalising the Low Carbon Hydrogen Standard.
- On hydrogen use, the Government has set out clearly the role for hydrogen in decarbonising the manufacturing sector and has committed to finalising the Hydrogen Business Model in 2022 to subsidise hydrogen use. Care must be taken to ensure a level-playing field across hydrogen and low-carbon alternatives. While the Net Zero Strategy recognised a role for hydrogen in achieving the 2035 power decarbonisation target, no detail has yet been set out. Work to build the evidence base for potential use of hydrogen in buildings is ongoing, with a strategic decision on its possible role due by 2026.

Existing sector decarbonisation strategies

A year on from the Prime Minister's Ten Point Plan, many of the proposals have now been confirmed and plans have been developed.

These newer plans add to those already assessed in our June report:

- The **Ten Point Plan for a Green Industrial Revolution** and the accompanying **National Infrastructure Strategy** set a series of headline commitments across the economy that could contribute to Net Zero. Key commitments by 2030 included: 40 GW of offshore wind capacity, 5 GW of hydrogen production capacity, phasing out new petrol and diesel cars and vans by 2030 (with some hybrids permitted until 2035), four CCS clusters capturing 10 MtCO₂ annually and 600,000 heat pumps installed annually (by 2028). The Plan allocated initial funding including a £1 billion **Net Zero Innovation Portfolio** and kicked off processes to support delivery of the headline goals and others such as tree planting, sustainable aviation fuels, low-carbon buses and HGVs, greenhouse gas removals, nuclear power, and green finance. Job creation was a key objective, supported by the launch of a **Green Jobs Taskforce**.
- The **Energy White Paper** took further steps to support the Ten Point Plan. These included consultations and exploration of policy options to support a fairer and more flexible energy system, commitments to support at least one power CCS project by 2030, an aim for a final investment decision on one nuclear power plant this Parliament and additional funding for advanced nuclear innovation, a review of institutional arrangements for the energy system, support for electric vehicle charging, a commitment to phase out installation of fossil gas boilers by the mid- 2030s, a commitment to set up a UK ETS and to align its cap to the path to Net Zero, and announcements on hydrogen, CCS, industry and oil and gas extraction.
- The **Industrial Decarbonisation Strategy** set a goal to cut industry emissions by around two-thirds from 2018 to 2035 and committed to several calls for evidence. This ambition was increased in the Net Zero Strategy (see below).
- The **North Sea Transition Deal (NSTD)** committed to 50% emissions reductions by 2030 relative to 2018 levels from the production and processing of oil and gas in the North Sea. However, this level of ambition falls well below the Committee's Sixth Carbon Budget recommendation of reducing emissions by 68% on the same scope of emissions by 2030. The NSTD target is now embedded in the Net Zero Strategy, which also has relatively low ambition in the rest of the fuel supply sector.
- The **Peat and Trees Action Plans** published in May sets out England's ambition for peat restoration (35,000 hectares by 2025), and for new woodland to contribute to England's share of the UK commitment to plant 30,000 hectares of new trees annually by 2025. The Plan commits to consult on a long-term woodland creation target for England in 2022. The Nature for Climate Fund will be the main source of public funding during this period, providing £750 million (up from £640 million before the Net Zero Strategy) for peatland restoration and tree planting to 2025, with options being developed to leverage private sector finance. Various plans for woodland creation and peatland restoration in the Devolved Administrations have also been published,²⁴ which are seen as important elements of their climate strategies. The Scottish Government has recently raised its tree planting ambition to 18,000 hectares per year by 2024/5, with ambition in Wales of at least 5,000 hectares per year.

New sector commitments in the Net Zero Strategy

The Net Zero Strategy commits to zero-carbon power by 2035, and more action on industry, CCS, landfill, GHG removal and sustainable aviation fuel.

The Net Zero Strategy makes several further commitments to close the ambition gap to the carbon budgets:

- **Decarbonising electricity generation.** The Government has now committed to fully decarbonising electricity generation by 2035, subject to ensuring security of supply, in line with the Committee's recommendation. This is a big step forward. It will require ending the use of unabated fossil fuels for electricity generation, replaced by offshore wind, onshore renewables, nuclear, CCS and hydrogen capacity. The next round of Contract-for-Difference auctions will start shortly and is expected to procure a large volume of offshore wind and up to 5 GW of onshore renewables. A more flexible electricity system will be needed in future in order to balance the increasing levels of variable renewables. The Government has published both a Smart Systems and Flexibility Plan and a Digitalisation Strategy, which set out the steps it plans to take to deliver this. Calls for Evidence have also been issued on how to incentivise new schedulable low-carbon generation through the capacity market, how to ensure this is ready for carbon capture and storage or hydrogen, and how to bring forward large-scale long-duration storage. A key near-term priority must be to develop and implement an overall plan to achieve the 2035 decarbonisation target.
- **Industrial decarbonisation.** The Net Zero Strategy has increased the Government's ambition on decarbonising industry to between a 63-76% reduction from 2019 levels, going beyond the ambition set out in the March 2021 Industrial Decarbonisation Strategy. This brings ambition broadly into line with the Committee's pathway. The Net Zero Strategy also confirmed that funding for initial use of hydrogen and CCS in industry will be supported by a new Industrial Decarbonisation and Hydrogen Revenue Support Scheme. The Strategy states this will receive initial taxpayer funding, but that revenue support for hydrogen production will shift to being levy funded from 2025 at the latest, subject to consultation. Policy on industrial electrification is substantially further behind, which is a cause for concern, although there is a commitment to look at rebalancing pricing of electricity and gas, which is welcome. The Strategy also sets out a view to exploring a maximum level for embodied carbon in buildings and infrastructure, and reiterates that it is considering the Committee's recommendation to set a target for ore-based steelmaking to reach near-zero emissions by 2035.
- **Ending landfill of biodegradable waste.** The Government will explore policies to achieve the near-elimination of municipal bio-degradable waste going to landfill by 2028. This is a welcome development to address methane emissions from landfill, although it is less stringent than our recommendation, which covered municipal and commercial/industrial wastes, to be achieved by 2025.
- **Carbon capture and storage.** The Net Zero Strategy increased the commitment on CCS deployment from the Ten Point Plan's 10 MtCO₂ captured and stored annually by 2030 to 20-30 MtCO₂/year by the same date. This is in line with the Committee's pathway (22 MtCO₂/year by 2030).
- **Greenhouse gas removals.** Within this commitment to CCS, the Strategy set an ambition for deployment of engineered greenhouse gas removals (e.g.

biomass with CCS, direct air capture of CO₂ with CCS) of 5 MtCO₂ annually by 2030. This is also in line with the Committee's analysis.

- **Sustainable aviation fuels.** Subject to consultation, the Strategy set out an intention to put in place a sustainable aviation fuels blending mandate of 10% by 2030, backed by funding to support UK production. This is above the level assumed by the Committee (2%).

Devolved governments have their own climate targets and a vital role in successful delivery.

The governments of Scotland, Wales and Northern Ireland have a pivotal role to play in delivering the Net Zero Strategy, and have their own emissions targets to deliver. While some policy levers are devolved, others in key areas remain reserved to the UK Government. This means that coordinated effort from both sides will be needed to implement sectoral and cross-economy policies that are transformative enough across the UK.

- The Net Zero Strategy makes an effort to account for policies designed and implemented on a devolved level. It also outlines the areas of every sector in which the UK Government is aiming to work closely with the devolved administrations.
- On a practical level, however, the links between the Strategy and devolved plans is less clear. Scotland published an update to its Climate Change Plan last year, and Wales will soon be publishing its Net Zero Delivery Plan. How these plans interact with and fit into the Net Zero Strategy will be a strong indicator of its inclusiveness and readiness for delivery.

Joining up policy and ambition throughout the UK is particularly important for those areas with the most devolved powers. For example, combined ambitions for tree planting across the UK authorities aligns to the level needed in aggregate. This also needs to be established and laid out clearly for peatlands, on-farm agricultural abatement and bioenergy production.

Conclusion on proposals for policies to deliver the plans

Credible policy proposals for reducing emissions have been made across the economy.

Together, the proposals represent a strong foundation for policy to reduce emissions across the economy. In most areas, the Government has set goals aligned to the path to Net Zero and put forward credible policy packages to deliver them. Funding and incentives appear to be being set at around the level required and generally plans involve a balanced mix of the possible solutions. Table 2 summarises our assessment of where policy development currently stands for the most emitting sectors, based on our sectoral assessments set out in Annex 1.

However, the Government has not quantified the effect of each policy and proposal on emissions. So while the Government has proposed a set of ambitions that align well to the emissions targets, it is not clear how the mix of policies will deliver on those ambitions – albeit in theory they could. This makes it hard to assess the risks attached to the plans and how best to manage these. The Committee will return to these questions in the coming months, and we encourage the Government to increase the transparency of how the policies will support the plans.

The combined ambition of the policies is clear – together they must deliver the ambitions for implementation of measures, and ultimately emissions reduction in each sector as has now been set out by the Government. We replicate some of the key tables from the Net Zero Strategy summarising these ambitions in Annex 2.

Table 2
UK Climate Policy – State of Play

Sector	Domestic transport ¹	Buildings	Industry	Power ²	Agriculture and Land Use
Emissions share (2019)	23%	17%	15%	11%	12%
Plan published?	Good plans	Good plans	Good plans	Generally good plans with some risks	More risks
Sufficient ambition?	Good plans	Good plans	Good plans	Good plans	Generally good plans with some risks
Credible delivery policies?	Generally good plans with some risks	More risks	Generally good plans with some risks	Generally good plans with some risks	More risks
Proper funding and/or incentives?	Good plans	More risks	More risks	Generally good plans with some risks	More risks
Balanced mix of options?	Generally good plans with some risks	More risks	More risks	Good plans	Significant risks
Timelines for implementation?	Generally good plans with some risks	More risks	Generally good plans with some risks	More risks	More risks
What important areas remain to be resolved?	Implementation (e.g. of ZEV Mandate), clear targets and credible policy to reduce traffic, delivery plans for phase-out of diesel HGV sales and diesel trains.	Able-to-pay energy efficiency funding, standards on owner-occupied homes, funding for heat pumps to allow the market to grow.	Electrification, efficiency standards, UK ETS cap, policy for manufacturers not covered by ETS, medium-term carbon leakage approach.	Strategy for unabated gas phase-out and market design, mechanisms for investment in networks & storage, remove barriers to generation at scale.	Agriculture Strategy, implementation of CAP replacement, ambition for peatlands across the UK. Role of consumers and wider supply chain missing.

Source: CCC analysis.

Notes:

¹ Includes domestic aviation and shipping. ² Includes energy from waste. See Annex for further details on the scoring criteria.



6. Implementation and next steps

Implementation is now required to deliver the plans in the Net Zero Strategy.

Now the Government has set out its plans, focus must turn to delivery.

Some of the key delivery policies are already up and running. The Government has been running auctions for low-carbon power contracts for seven years. The Green Homes Grant Local Authority Delivery Scheme has been improving energy efficiency in buildings. The Renewable Transport Fuel Obligation has been increasing the share of biofuels in our vehicles. These proven functioning schemes bring the most confidence of continued success.

In most areas, policies are still under development. Good policies cannot be designed and implemented overnight, especially if they are to meet the needs of businesses, investors and consumers. The failure of the Green Homes Grant shows some of the challenges in rushed implementation, although we note that other schemes with longer gestation periods such as the Green Deal have also failed.

The Net Zero Strategy reflects the need for policy development time. It signals plans but many are not yet fully implemented. There is little time to develop, test and refine policies and meet the Net Zero path; work must proceed apace.

Where timelines have been set for consultations, they should be stuck to. Where timelines have not yet been set, progress is needed this year and next.

In most cases, the Net Zero Strategy sets out timelines for undertaking consultations and implementing policies – these must now be delivered on. Key actions for the coming years include:

- **Implementing the Transport Decarbonisation Plan (Box 5).** This included a clear roadmap for delivering the transition to electric vehicles, based on a zero-emission vehicle mandate. Phase-out dates for other types of non-zero-emission road vehicles have also been proposed, sending clear signals to the market. Alongside this, there is recognition of the need to reduce road traffic growth, supported by spending commitments on active travel and public transport. These now need to be turned into measurable targets and clear delivery policies to achieve this ambition.
- **Implementing the Heat and Buildings Strategy (Box 6).** The key delivery mechanisms for decarbonising buildings were proposed alongside the Net Zero Strategy. These market mechanisms will be complicated to get right, and progress should start without delay:
 - Following its consultation, the Government must decide quickly on the design and implementation of the proposed 'market-based mechanism' to install a growing proportion of heat pumps.
 - No timelines have been set for the Government's plans to consult on options to encourage energy efficiency for able-to-pay owner-occupiers. This should happen soon given the risk of undermining the overall Heat and Buildings Strategy.
 - If costs do not fall as rapidly as the Government expects, or the market mechanisms stall, increased public funding may prove necessary.
- **Rebalancing energy levies and taxes.** The stated intention to remove distortions between gas and electricity prices is a necessary condition for success. The Strategy commits to the launch of a Fairness and Affordability

Rebalancing policy costs that affect energy prices to favour electrification is a necessary step.

Call for Evidence on rebalancing options, with a view to taking decisions in 2022. This must progress in the coming months.

A strategy for fully decarbonising the power sector by 2035, including a review of market arrangements, is needed.

- **Continuing to deploy low-carbon electricity.** The Government has announced that the next round of auctions for low-carbon electricity contracts will start before the end of 2021 and conclude by mid-2022. They have also committed to reviewing the frequency of these auctions, which currently happen on a less-than-annual basis. In other areas, the Net Zero Strategy commits to milestones across a range of technologies, including a final investment decision on new nuclear within this Parliament, implementing decarbonisation readiness standards for new power plants by 2023, and bringing forward at least one power CCS plant in the mid-2020s. The Strategy also commits to consider whether broader reforms are needed to electricity market frameworks. The Committee has been calling for such a review as part of a broader strategy for fully decarbonising the power sector by 2035; it should proceed without delay and complete by 2023.
- **Implementing hydrogen and CCUS business models** (including CO₂ transport and storage) for industry. The Strategy commits to awarding the first contracts to industrial carbon capture facilities from 2023, and to responding to its consultation on hydrogen business models in 2022. It also commits to setting out initial steps to support the uptake of electrification in industry by the end of 2021, which should address how to develop a level-playing field between electrification and hydrogen over the medium term.
- **Setting a future UK ETS cap** to align with carbon budgets and the pathway to Net Zero – the Government has committed to consult on an appropriate cap consistent with Net Zero in the coming months, with a view to implementation by January 2023, or January 2024 at the latest. The Government has also said it will review: the role of the ETS in providing a long-term market for greenhouse gas removals; potentially expanding the ETS to new sectors; the future of free allowances and options to mitigate risks of carbon leakage.
- **Implementing resource efficiency policies.** The Government has committed to consulting on further extended producer responsibility schemes in 2022 and to a call for evidence on demand-side policy for products by Spring 2022. The commitments should be delivered and cover all manufactured consumer goods that have a high environmental impact.
- **Agriculture and land use:** A combined strategy for agriculture and land use is urgently needed to bring together ambition and delivery mechanisms in these sectors across the UK.
 - Stretching targets have been set for tree planting and peatland restoration, funded largely through the Nature for Climate Fund. Implementation needs to scale up immediately across all of the UK to reach the levels of ambition set out. The UK Government has committed to explore a statutory tree-planting target for England in its consultation on Environment Bill targets.
 - The Farming Innovation Programme and other commitments to provide further funding for farms to implement low-carbon practices and technologies must start now to accelerate on-farm mitigation. Options to accelerate private investment in nature need to be

The Government will soon consult on a cap for the UK ETS consistent with Net Zero.

brought forward in the next few years to provide important longer-term funding for climate and wider environmental goals.

- The National Food Strategy is a Government-commissioned independent review of the Food System, published in July this year. It sets out a systemic view of the food system and calls for fundamental changes in what food is produced and how it is produced. The Government has committed to respond to the Strategy within six months. This should set out clear targets for the food system's impact on health, nature and climate and include the role of consumers and the wider supply chain.
- The Government has also committed to publishing a Biomass Strategy in 2022. The Committee set out our recommendations on biomass in a dedicated report published in 2018.²⁵

An agriculture and land decarbonisation strategy is needed.

This is not an exhaustive list of the actions that will be needed. In part this reflects that some of the Government's plans are in early development and timelines have not yet been set for the next stages. These gaps will need to be filled in rapidly and implementation progress if new policies are to contribute towards meeting the UK's NDC and Sixth Carbon Budget, which are only 9 and 12 years away.

An outstanding issue across the board is public funding beyond the Spending Review horizon to 2024. This has been set out in some areas, but not in others, and in some cases agreed funding to 2024 looks low. It is quite likely that buildings will require more funding in future to meet the Government's targets, depending on progress with the market mechanisms. Industry may also need increased funding if it is to decarbonise while avoiding carbon leakage, as the Net Zero Strategy and the Treasury Net Zero Review intend.

The Government has set out a roadmap for delivering its transport plans. These must be achieved, alongside rapid development of credible demand-side action.

Box 5

Implementing the Transport Decarbonisation Plan

The Transport Decarbonisation Plan sets out a roadmap for decarbonising the UK's transport system. For some areas, the plan proposes clear deliverable policies that can be followed to deliver these targets, while in others – notably on reducing road traffic in favour of more sustainable modes – further work is needed to lay out the actions that are needed. In all cases, it is now crucial that Government takes forward plans to implement these policies in order to deliver the decarbonisation pathway for the sector.

- **Electric cars and vans.** The Government has committed to a zero-emission vehicle mandate as the main mechanism to drive the uptake of electric cars and vans.
 - The Government intends to consult on the design of this scheme and how it will be enforced in early 2022 for implementation from 2024.
 - This is currently accompanied by support for UK electric vehicle manufacturing and innovation and grants for purchasers.
- **Charging infrastructure.** The Government is investing £1.3 billion over the next four years to accelerate charge-point deployment. As private business involvement increases, the focus will move to policy and regulation to support private delivery that meets user needs.
 - The focus of Government investment is increasingly turning to providing public charging facilities to meet the needs of drivers who cannot install home chargers.
 - They intend to publish an Infrastructure Strategy later this year, with a vision for the charge-point roll-out, and the roles for the public and private sectors in delivering it.
- **Zero-emission HGVs.** The Government recently allocated the first funding for pre-deployment testing and small-scale trials of zero-carbon heavy-goods vehicles

(HGVs). These will be expanded to demonstrate three zero-emission technologies on UK roads. Delivery plans for phasing out new diesel HGV sales should build on the findings of these trials and the mechanisms being implemented for electric cars and vans.

- **Decarbonising buses and rail.** The Government is pursuing the dual objectives of rebuilding and increasing passenger numbers on public transport following the pandemic and switching the vehicles used away from fossil-fuel power.
 - Decarbonising buses is being driven by funding for 4,000 zero-emission buses and the infrastructure to support these, alongside support for Coventry to become the UK's first all-electric bus city. Beyond this, consultations are underway on phase-out dates and appropriate regulatory frameworks.
 - The Government aims to remove all diesel-only trains from the network by 2040. A clear strategy is needed to set out the Government's plan for how this will be achieved. This should include an ongoing programme of track electrification as well as consideration of the role for hydrogen, battery-electric and hybrid trains.
- **Reducing demand for car travel.** The Transport Decarbonisation Plan represents a big step forward in recognising the need to reduce traffic growth, along with goals for half of all journeys in towns and cities to be walked or cycled and to increase average car occupancy. Measurable targets and credible policy are now needed to enable these to be achieved.
 - Government recently allocated £2 billion of additional funding to increase walking and cycling. It also allocated £3 billion to increase bus passenger numbers significantly, with a focus on place-based solutions, high-quality, coordinated infrastructure and behavioural influencing approaches. However, the Government has not set out timelines or an overall approach to allocate this funding in a way that will improve people's lives and reduce emissions from reliance on private cars.
 - A clear approach is needed to rebalance costs between car and public travel, making public transport better value and more competitively priced. Further, concerns remain about the relative size of these investments compared to the ongoing roadbuilding budget.
- **Aviation and shipping.** Development and supply of low-carbon fuels will be supported through extending the scope of the Renewable Transport Fuels Obligation, innovation funding and a sustainable aviation fuels blending mandate.

Now that decisions have been made on direction, policy-making for buildings must progress more quickly than it has recently – both implementing plans and managing delivery risks.

Box 6

Implementing the Heat and Buildings Strategy

The Heat and Buildings Strategy represents a step forward in the Government's thinking on how to develop a new market for heat pumps and deliver on the ambition of at least 600,000 sales by 2028 – with a review in 2023 of whether higher ambition is needed. It also targets important cost reductions, including 'cost parity' with boilers by the end of the decade. The success of this transition will depend on the Government's ability to implement and sustain the market-based approach they have opted for – and manage any associated risks. This includes being prepared to step in with alternative approaches should the market under-deliver.

There are a number of delivery risks – new policies such as the boiler manufacturer obligation require implementation along rapid timescales and may require primary legislation. Gaps in other areas – notably insulation policy for owner-occupied homes – could also undermine efforts on home heating:

- There is more work to be done to **link up policy areas** – so that all households can receive an integrated offer covering insulation and heating, backed with good-quality information, and assisted by skilled project managers in the form of the retrofit coordinator to manage the process.
- There is a **role for Government** in enforcing standards and in helping to coordinate local and national infrastructure plans. Other policy ambitions, such as the expansion of low-carbon heat networks, rely on action by local authorities who may lack the capabilities and resources to deliver this.
- Maintaining public consent – with both real and perceived **fairness** – is essential. The Government has committed to taking an important step in rebalancing policy costs between electricity and gas so that heat pumps lower bills, but this must be done in a way which mitigates any impacts on the fuel poor. This means cross-Government action to work out an approach to targeting fuel-poor households who are not in receipt of benefits.
- Progress in **commercial buildings** will rely on the anticipated EPC B requirement in 2030 on private-rented buildings and the roll-out of in-use performance rating (likely only to kick in across the sector in the mid-2020s) incentivising upgrades to both efficiency and low-carbon heating. If signs of change are not seen in the next few years, additional signals or requirements, such as an earlier phase-out date for installing gas boilers, will be necessary.
- Progress in **public sector buildings** will rely on the requirement to disclose emissions plans, coupled with funding through the public sector decarbonisation plan. A joined-up strategy for monitoring progress, prioritising funding and advising on priority upgrades would help de-risk implementation.

Next steps for implementation

Many of these policy proposals remain subject to ongoing or future consultation. Key questions relating to implementation need to be resolved in the near future. For example, decisions due in 2022 include: ending gas-grid connections to new homes, off-gas-grid regulations, developing the market-based mechanism for low-carbon heat, minimum standards for the private rented sector and owner-occupier commercial buildings, and heat network regulations.

Endnotes

- ¹ The 40% reduction in UK emissions from 1990 to 2019 includes emissions from international aviation and shipping. Emissions trends are sometimes quoted without international transport – which is dealt with separately in the UN process – in which case the reduction has been 44%.
- ² More information on the Climate Change Act and its implementation are set out on the Committee's website in a series of briefings: [REDACTED]
[REDACTED]
- ³ The UK's Nationally Determined Contribution does not include international aviation and shipping (IAS), in line with convention, but the Sixth Carbon Budget, covering the mid-2030s, does. On comparable bases, the UK's targets are for a 68% (2030) then 82% (2035) reduction without IAS, or a 64%, then 78% reduction with IAS included.
- ⁴ HMT (2021) *Net Zero Review Final Report*.
- ⁵ Bank of England (2021) *Key elements of the 2021 Biennial Exploratory Scenario: Financial risks from climate change*.
- ⁶ Office for Budget Responsibility (2021) *Fiscal risks report*.
- ⁷ CAT's overall assessment of the UK's ambition is 'almost sufficient', the second highest category. Only the Gambia currently has the highest rating of '1.5°C Paris Agreement Compatible'.
- ⁸ [REDACTED]
[REDACTED]
- ⁹ What is a Long-term Strategy? | World Resources Institute: [REDACTED]
[REDACTED]
- ¹⁰ Sweden: [REDACTED]
[REDACTED]
- ¹¹ HMG (2021) *Net Zero Research and Innovation Framework*.
- ¹² HMT (2021) *Greening Finance: A Roadmap to Sustainable Investing*, p16
- ¹³ Climate Change Committee (2020) *Local authorities and the Sixth Carbon Budget*.
- ¹⁴ UK100 (2021) *Power shift*.
- ¹⁵ Green Alliance (2020) *The local climate challenge*.
- ¹⁶ National Audit Office (2021) *Local authorities and Net Zero in England*.
- ¹⁷ HMG (2020) *Green Jobs Taskforce*.
- ¹⁸ HMT (2021) *Net Zero Review Final Report*.
- ¹⁹ HMT (2021) *UK Government Green Financing Framework*.
- ²⁰ Quotes taken from the Net Zero Strategy, p143.
- ²¹ Sebi, C. et al (2018) 'Policy strategies for achieving large long-term savings from retrofitting existing buildings', *Energy Efficiency* [REDACTED] German Federal Ministry for Economic Affairs and Energy (2021), 'New 'Federal Funding for Efficient Buildings', [REDACTED]
[REDACTED]
- ²² DfT (2020) *Gear change: a bold vision for cycling and walking*.
- ²³ DfT (2021) *Bus back better: a national bus strategy for England*.

²⁴ See for example Scottish Government (2020) *Climate Change Plan Update*; Welsh Government (2021) *Written Statement: Trees and Timber*; Northern Ireland (2020) *Forest for the Future*.

²⁵ CCC (2018) *Biomass in a low-carbon economy*.

Annex 1: Policy assessment for key sectors

This annex sets out the Committee's summary assessment of the current state of policy proposals in the five largest sectors of the economy – domestic transport, buildings, industry, power and agriculture / land use – together covering around 80% of UK emissions.

We consider:

- Whether a strategy has been published covering the key aspects of the transition to Net Zero.
- Whether ambition has been set in line with the scale of the challenge.
- Whether credible policy mechanisms have been proposed to deliver on that ambition.
- Whether proper funding has been allocated.
- Whether a suitable mix of options are being pursued.
- What remains to be done and if timelines for this action have been set out.

Table A 1 sets out the criteria we apply for this assessment, and the following five sections set out our assessment for each sector.

Table A1
Scoring criteria for policy assessment

	Good plans	Generally good plans with some risks	More risks	Significant risks
Has a plan or strategy for reducing emissions been published?	Yes, and it covers all of the important elements in the sector	Yes, but it misses a small number of key elements, or; No, but key elements addressed across other publications	Yes, but it misses several key elements	No comprehensive plan or strategy; or plan/strategy missing most key elements
Does the proposed ambition broadly align to the UK climate targets?	Clear ambition close to or beyond CCC recommendations	Ambition broadly in line with climate targets, subject to clarification in a small number of areas	Ambition could be close to climate targets, but clarification needed in several areas	Ambition has not been set out or does not go far enough
Has a credible delivery policy been proposed or put in place?	Credible, proven policy that is already working, or credible policy announced in recent reports with clear timescales and commitments	Credible policy covering the majority of abatement, with clear timescales and commitments	Credible policy in some areas but not comprehensive, either in sectoral coverage or clear commitments to timescales for action	Some policies announced but not enough policy detail / policies lack credibility
Is it properly funded and/or does it contain sufficient incentives to drive the transition?	Yes, combination of public funding and plans to encourage private funding are credible; incentives already in place or timely commitments to put incentives in place have been announced	Combination of public funding and plans to encourage private funding are credible, thought given to incentives but timescales for putting in place not yet given	Some funding commitments but unclear where significant part of the funding will come from; recognise delivery challenges but have not yet developed incentives to deal with them	Unclear where the bulk of funding will come from; not yet considered delivery challenges or incentives to address these
Does the policy support a balanced mix of solutions to minimise risk on the path to Net Zero?	Yes, policy suite recognises the need for a portfolio of technological and behavioural solutions and sets out what these will be	Recognition of need to develop range of solutions (technological and behavioural), but no policies to develop some of the key potential solutions yet set out	Recognition of need to develop range of solutions, but policies weighted too much towards a single or narrow solution	No, policies putting too much weight on a single or narrow solution, with very limited consideration of other options
Has the government set out timelines for resolving remaining issues?	Yes, timelines laid out for resolving all major issues	Yes, for most issues	Some important issues have no timelines set out	No, timelines have not been proposed for most issues

Source: CCC Analysis.

Notes: The last question is covered in Table 2 and section 6 but not in this Annex.

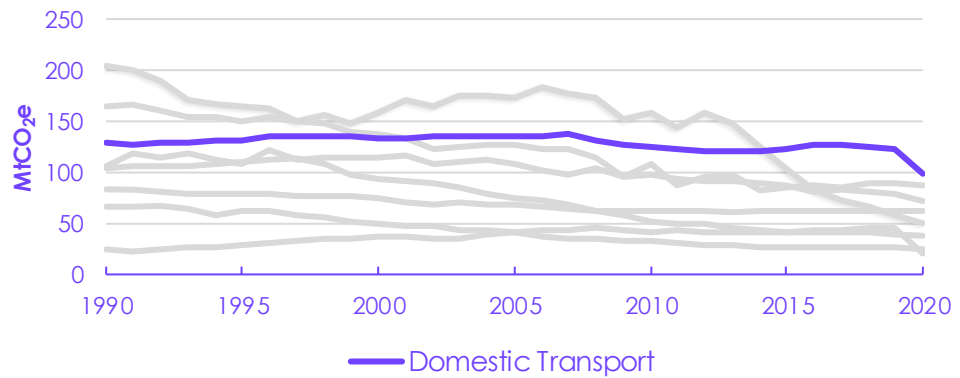
Domestic Transport (23% of UK emissions, 2019)

Emissions reduction from 2019-2035:

69%
CCC Balanced Pathway

66-77%
NZS Delivery Pathway

Figure A1 UK emissions by sector



Source: BEIS (2021) 2020 UK Greenhouse Gas Emissions, Provisional Figures

Progress Summary – Domestic Transport

State of Play	Assessment
<p>Has a plan or strategy for reducing emissions been published?</p> <ul style="list-style-type: none"> Yes – the Transport Decarbonisation Plan (July 2021) 	
<p>Does the proposed ambition broadly align to the UK climate targets?</p> <ul style="list-style-type: none"> The plan sets out a vision of a transport system in which virtually all journeys are zero-carbon. The trajectories published in the Net Zero Strategy would deliver decarbonisation of the domestic transport sector at a rate that is closely aligned with our Sixth Carbon Budget pathways. This includes strong commitments to end sales of fossil-fuelled vehicles across all modes of transport, transitioning to zero-emission alternatives. The timescales for these transitions generally match what is needed to remove the large majority of fossil-fuelled vehicles from the fleet in time to deliver Net Zero. The plan represents a big step forward in recognising that more also needs to be done to reduce traffic growth. The strategy also aims to achieve Net Zero in domestic aviation by 2040 and to phase out the sale of new non-zero-emission domestic shipping vessels. 	
<p>Have credible delivery policies been proposed or put in place?</p> <ul style="list-style-type: none"> The plan introduces credible, detailed policy to deliver end-of-sales dates for fossil-fuelled vehicles, including proposing a zero-emission vehicle mandate which would ensure that electric vehicle sales ramp-up at the rate needed to deliver the transition. It confirms the intention to introduce this requirement from 2024. DfT published a 2035 Delivery Plan alongside the plan, setting out key timelines and milestones to accelerate the shift to zero-emission vehicles. The first £20 million has been allocated to projects to conduct pre-deployment testing and small-scale trials of zero-carbon heavy goods vehicles, and the strategy confirms that these will be expanded to demonstrate three zero-emission technologies on UK roads. 	

<ul style="list-style-type: none"> • While the recognition of the need to reduce traffic growth is a big step forward, a more comprehensive set of measures and more measurable targets (including on total car-kilometres) are needed to give confidence that the continuing trend of traffic growth can be reversed. • Consultations were issued alongside the plan on the proposed 2040 Net Zero target for domestic aviation and introducing a blending mandate for sustainable aviation fuels. 	
<p>Is it properly funded and/or does it contain sufficient incentives to drive the transition?</p> <ul style="list-style-type: none"> • The strategy's estimates of the overall levels of investment that will be required to deliver the transition for this sector are similar to our scenarios. Current funding represents a good starting point, but we will need to see this investment continue throughout the coming decade to deliver the sustainable transport infrastructure that is required. This should include both public funding and leveraging private financing. • Plug-in vehicle grants have been secured until at least 2022/23 and significant investment has been contributed to drive public charging infrastructure deployment, continuing to support electric vehicle uptake. This includes a further £620 million of new investment to focus on local on-street residential charging and targeted plug-in vehicle grants. • Through the plan and recent active travel and bus strategies, significant increases in funding have been allocated to these areas. Over the course of this Parliament, Government will invest a total of over £12 billion in local transport systems. • We still have some concerns around the relative size of the road-building budget compared to these funding pots, however. • Place-based decarbonisation solutions will require funding and skills for local authorities. 	
<p>Does the strategy support a balanced mix of solutions to minimise risk on the path to Net Zero?</p> <ul style="list-style-type: none"> • Policy progress is strongest on the technological side, setting out a clear path to delivering a transition to zero-emission vehicles. • However, the plan's recognition that this will not be sufficient, and that reducing reliance on private car travel is also necessary, is welcome. This will be crucial in reducing near-term emissions and delivering a range of co-benefits, including better air quality, reduced congestion, and improved public health. • There are promising new commitments on shifting urban journeys to walking/cycling and increasing car occupancy, alongside an intent to deliver a world-class cycling and walking network by 2040, more low-traffic neighbourhoods, and school streets. The strategy also discusses potential approaches to influencing behaviour change through targeted personal incentives. There is also recognition of the need to rebalance costs between car and public travel, making public transport better value and more competitively priced. • However, these will need to be turned into more detailed targets and delivery plans to enable widespread uptake of more sustainable travel choices. 	
<p>What important areas remain to be resolved?</p> <ul style="list-style-type: none"> • Implementation of the proposals currently being consulted on (e.g. the zero-emission vehicle mandate). • Turning the ambition to reduce car traffic into clear, measurable targets and credible delivery policy. • Full delivery plans for delivering the end-of-sale date for diesel HGVs and the removal of diesel trains. 	

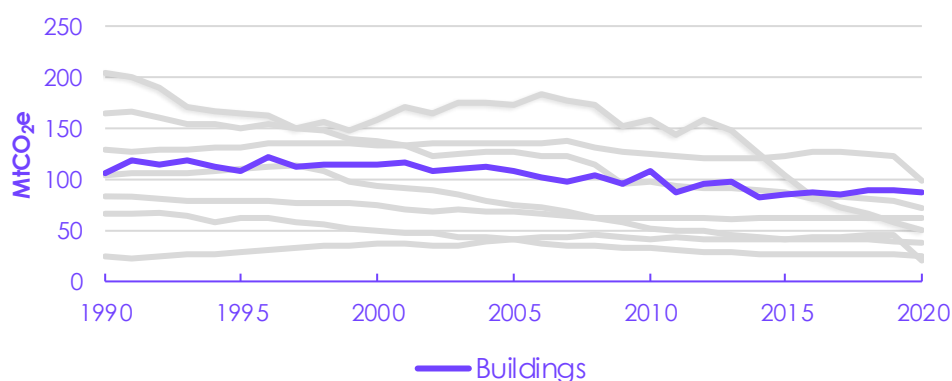
Buildings (17% of UK emissions, 2019)

Emissions reduction from 2019-2035:

48%
CCC Balanced Pathway

47-62%
NZS Delivery Pathway

Figure A2 UK emissions by sector



Source: BEIS (2021) 2020 UK Greenhouse Gas Emissions, Provisional Figures

Progress Summary – Buildings

State of Play	Assessment
<p>Has a plan or strategy for reducing emissions been published?</p> <ul style="list-style-type: none"> Yes – the Heat and Buildings Strategy (October 2021) 	
<p>Does the proposed ambition broadly align to the UK climate targets?</p> <ul style="list-style-type: none"> The strategy sets out a vision for the UK where almost all buildings produce zero emissions by 2050. That is backed by a 2035 target date to upgrade most of the housing stock to an EPC C efficiency rating (in line with our analysis) and to phase out installation of natural gas boilers (marginally later than our analysis recommends: 2033 for most buildings, and 2030 for public buildings). The Government will consult on phasing out installation of high-carbon fossil fuel boilers in off-grid buildings by 2024 (non-domestic) and 2026 (residential) – more ambitious than our proposals for homes (2028), and similar for non-domestic buildings (2025/26). The emissions trajectories and proposed roll-out of low-carbon technologies published in the Net Zero Strategy are broadly in line with our Sixth Carbon Budget pathways. These plans represent a step forwards by recognising the need to develop capacity to build zero-carbon buildings and retrofit existing ones, allowing capabilities and supply chains to scale in time. 	
<p>Have credible delivery policies been proposed or put in place?</p> <ul style="list-style-type: none"> The Future Homes Standard will regulate to ensure that new homes built from 2025 (at the latest) do not need fossil-fuel heating. Public funding to 2025 will support energy efficiency and some low-carbon heat for social housing, those in fuel poverty, local authorities and public sector buildings, plus a small number of heat pumps and some heat networks. Standards for rented properties will require efficiency improvements to inefficient properties. For the 60% of homes which are owner-occupied and not fuel poor, there are no mechanisms to allocate costs or stimulate the market for efficiency aside from a voluntary target on lenders. The Net Zero Strategy says the Government plans to consult on options. Poor progress here would undermine the SAP C target and all associated low-carbon heating savings. 	

<ul style="list-style-type: none"> Wider roll-out of heat pumps is to be driven by standards and a market mechanism. The Government will consult on an obligation on boiler manufacturers to grow their sales of heat pumps. Details are currently limited, and this approach relies on industry successfully driving down costs and strengthening the consumer offering. Delivery risks are set out in Box 6. For heat networks, the Government will provide some funding and introduce some enabling measures, such as heat network zoning by 2025. The Strategy commits to introduce Heat Network Market Regulation as soon as possible. Strong, well-designed regulations will be needed to support the planned roll-out. For commercial buildings, the main levers are standards – on landlords to improve efficiency and (subject to consultation) on the phase-out of installations of fossil fuel boilers. Large buildings will also have sector-by-sector energy reduction targets and information to support these. Some decisions are not yet finalised and further details are needed. For public sector buildings, the delivery policy focuses on providing funding and capacity to public sector organisations and asking them to disclose progress annually against their emissions reduction plans. It is unclear how effective these plans will be. There is no suggestion of an EPC or in-use performance-based target for public sector buildings. 	
<p>Is it properly funded and/or does it contain sufficient incentives to drive the transition?</p> <ul style="list-style-type: none"> The Strategy allocates less funding than anticipated in our Sixth Carbon Budget advice. However, this in part reflects greater reliance on standards and market mechanisms, and a more back-loaded trajectory for heat pump roll-out. <ul style="list-style-type: none"> The strategy extends funding out to 2025 for existing programmes targeting the Home Upgrade Scheme (£950 million) and the Social Housing Decarbonisation Fund (£800 million), each over three years. These cover energy efficiency and heat. It includes a small increase in the funding pot for heat pumps - £450 million over three years, with grants of £5,000 for air source or £6,000 for ground source heat pumps. A £270 million Green Heat Network Fund will run from 2022-25, to support new and existing heat networks. The Government expects around £1 billion of additional investment will be leveraged by proposals for heat zoning. In CCC pathways, £4.9 billion is required for heat networks from 2022-25, indicating a funding gap even if the Government's expected levels of public and private investment occur. For public sector building decarbonisation 2022-25, £1.9 billion investment is needed for heat pumps and energy efficiency, rising to £2.6 billion if heat networks investment is included. The Government has committed a little over £1.4 billion over the period 2022-25, through the public sector decarbonisation scheme. Depending what proportion of the additional £338 million committed to heat networks funding is directed to the public sector, this leaves a public sector funding gap of between £0.9-1.2 billion. 	
<p>Does the strategy support a balanced mix of solutions to minimise risk on the path to Net Zero?</p> <ul style="list-style-type: none"> The strategy supports a mix of heating technologies – deployment of efficiency, biomethane and district heat networks, scale-up of market capacity for heat pumps and development of hydrogen as a potential future option. This aligns to the strategy proposed by the Committee. Within efficiency, policy is weak for owner-occupied, able-to-pay households, which means that supply side issues in home insulation are likely to persist. 	
<p>What important areas remain to be resolved?</p> <ul style="list-style-type: none"> There is a major gap on policy to deliver the EPC C target, specifically for owner-occupied properties. This affects 60% of homes. Proposed targets for mortgage lenders are voluntary (though with potential to make mandatory if they progress well), and only capture properties at the point of purchase, renovation, and re-mortgage. The transition to low-carbon heating in commercial buildings currently relies on EPC requirements in 2030, and disclosure of in-use performance for large commercial buildings. This needs to be addressed, potentially through an earlier phase-out date for installing gas boilers in non-domestic buildings. The effect of increased demand for electricity on generation and transmission remains an unresolved risk. The strategy proposes ongoing collaboration between BEIS, Ofgem and Distribution Network Operators (DNOs) to collect and share data on the impact of heating assets on the electricity networks. However specific plans for strategic investment in electricity networks are not expected until later this year. 	

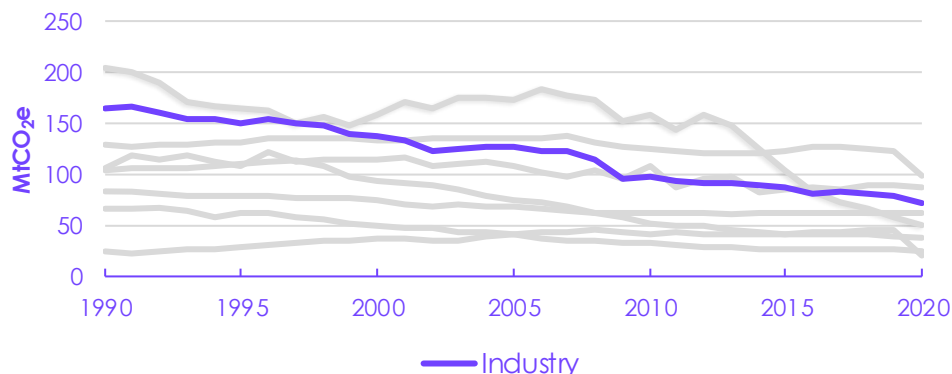
Industry (15% of UK emissions, 2019)

Emissions reduction from 2019-2035:

71%
CCC Balanced Pathway

63-76%
NZS Delivery Pathway

Figure A3 UK emissions by sector



Source: BEIS (2021) 2020 UK Greenhouse Gas Emissions, Provisional Figures

Progress Summary – Industry

State of Play	Assessment
<p>Has a plan or strategy for reducing emissions been published?</p> <ul style="list-style-type: none"> Yes – the Industrial Decarbonisation Plan (March 2021), which is extended by the Net Zero Strategy. 	
<p>Does the proposed ambition broadly align to the UK climate targets?</p> <ul style="list-style-type: none"> The Net Zero strategy sets out ambition to reduce industrial emissions by 63-76% by 2035 from 2019 levels. This represents a substantial step forward in Government's ambition, and is broadly aligned to the CCC Balanced Pathway, in which the equivalent emissions are reduced by 71% by 2035. 	
<p>Have credible delivery policies been proposed or put in place?</p> <ul style="list-style-type: none"> The UK Emissions Trading Scheme will provide a credible central policy lever if the Government's upcoming review of the ETS cap sets a cap consistent with ambition on emissions reduction. However, for manufacturers not covered by the UK ETS, energy and carbon pricing mechanisms need reform. On fuel switching and CCS, the proposed business models to support initial industrial CCUS and hydrogen fuel switching appear investable, and we expect will bring forward decarbonisation. However, these leave a gap in support for demonstrating and deploying industrial electrification. More detail is required to assess upcoming policies to encourage resource efficiency, and these will need to be broadened and strengthened. A clear medium/long-term policy strategy to managing carbon leakage is also still required. 	
<p>Is it properly funded and/or does it contain sufficient incentives to drive the transition?</p> <ul style="list-style-type: none"> Our Balanced Pathway contains around £1.5 billion of additional incentives (private or public) for industrial fuel switching and CCS over the period to the end of 2024. Current Government commitments are around half this level (some of which will support resource and energy efficiency), leaving a funding gap. The main support includes the Industrial Energy Transformation Fund (£315 million), the Industrial Decarbonisation and Hydrogen Revenue Support Scheme (£140 million), Industrial Decarbonisation Challenge (£170 million Government and £200 	

<p>million industry match-funding) and Net Zero Innovation Programme (~ £100 million for industrial innovation).</p> <ul style="list-style-type: none"> • The UK Emissions Trading Scheme should incentivise some further private investment. The level of incentive will depend upon the ambition of the update to its cap, which Government is due to consult on. Before the update to the cap it is unlikely that the ETS would provide sufficient incentive to increase incentives to the level in our Balanced Pathway. • Overall, there is potential for there to be a gap in incentives. Government should provide further information to demonstrate that incentives are sufficient. 	
<p>Does the strategy support a balanced mix of solutions to minimise risk on the path to Net Zero?</p> <ul style="list-style-type: none"> • The set of proposed policies for hydrogen and CCUS are substantially more developed than those for electrification and resource efficiency. 	
<p>What important areas remain to be resolved?</p> <ul style="list-style-type: none"> • Establishing an incentive mechanism to support demonstration of electrification and initiate the development of standards to improve energy and resource efficiency. • Setting a cap for the UK ETS consistent with the path through the Sixth Carbon Budget to Net Zero. • Reforming energy and carbon pricing for manufacturers not covered by the UK ETS, to provide a clear and strong incentive for decarbonisation. • Setting out a medium/long-term approach for managing carbon leakage, which will require the development of measurement standards. • Consulting on reforms to how energy levies and obligations are applied to prices of electricity and other energy sources to help rebalance prices and avoid distortions. 	

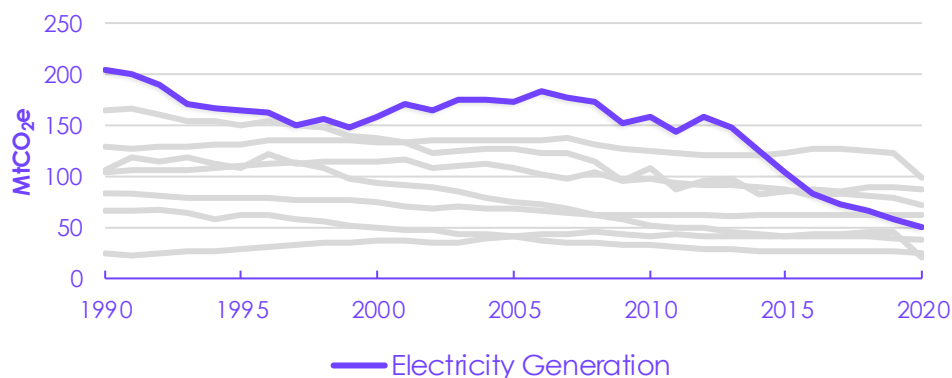
Power (11% of UK emissions, 2019)

Emissions reduction from 2019-2035:

86%
CCC Balanced Pathway

81-86%
NZS Delivery Pathway

Figure A4 UK emissions by sector



Source: BEIS (2021) 2020 UK Greenhouse Gas Emissions, Provisional Figures
Note: Power includes emissions from Energy from Waste.

Progress Summary – Power (including Energy from Waste)

State of Play	Assessment
<p>Has a plan or strategy for reducing emissions been published?</p> <ul style="list-style-type: none"> While a self-standing plan has not been published, the broad elements of a strategy are visible across the range of Government publications. 	
<p>Does the proposed ambition broadly align to the UK climate targets?</p> <ul style="list-style-type: none"> The Net Zero Strategy commits to decarbonising electricity generation by 2035 (subject to ensuring security of supply), which is in line with the CCC's recommendation. The Government has committed to a stretching target of 40 GW of offshore wind capacity by 2030, compared to around 10 GW today. This would significantly increase the amount of low-carbon generation and provide the foundation for full decarbonisation of the sector. 	
<p>Have credible delivery policies been proposed or put in place?</p> <ul style="list-style-type: none"> Policy is in place (e.g. Contracts for Difference), and has been proven to deliver capacity and reduce costs of renewable generation. Further clarity is needed on the auction schedule and pathway of volumes to be procured to 2030, which the Government has committed to review. In other areas, the Government has proposed a range of delivery policies (e.g. a Regulated Asset Base, RAB, model for new nuclear, and Dispatchable Power Agreements for power carbon capture and storage, CCS), but these are not yet fully in place or operational. To develop a more flexible electricity system, the Government has published a Smart Systems and Flexibility Plan, a Digitalisation Strategy, and a call for evidence on large-scale long-duration storage. The Government is also considering reform of the status and role of the Electricity System Operator, with a view to it taking a stronger role in network planning and provision of advice across the wider energy system on how to drive forward Net Zero ambitions. However, it is not clear whether the combination of these policies and proposals will be sufficient to meet the overall objective of fully decarbonising electricity generation by 2035. 	

<p>Is it properly funded and/or does it contain sufficient incentives to drive the transition?</p> <ul style="list-style-type: none"> • Significant funding has been announced for Contract-for-Difference auctions, which will support deployment of low-carbon generation across the 2020s. • Funding has also been announced for a range of nuclear innovation projects. • In other areas, particularly for schedulable low-carbon generation (e.g. gas or bioenergy with CCS, or hydrogen), incentive mechanisms have been proposed but still need to be implemented. 	
<p>Does the strategy support a balanced mix of solutions to minimise risk on the path to Net Zero?</p> <ul style="list-style-type: none"> • Policy progress is strongest on bringing forward low-carbon electricity generation, where policies largely either already exist or have been proposed across a range of technologies. • The Government has also recognised that increased flexibility will also be required in order to balance an increase in variable renewable generation, and have published a number of strategies and proposals aimed at delivering this (e.g. the Smart Systems and Flexibility Plan). • To improve the enabling infrastructure necessary to facilitate new investment in low-carbon generation, the Government is undertaking a review of the offshore transmission network and has committed to publish, jointly with Ofgem, an Electricity Network Strategy for onshore networks. 	
<p>What important areas remain to be resolved?</p> <ul style="list-style-type: none"> • Publishing a comprehensive strategy for phasing out unabated gas generation by 2035. • Turning proposals into firm policy (e.g. RAB model for new nuclear, Dispatchable Power Agreements for gas CCS), and developing proposals and policies for bioenergy with CCS and hydrogen. • Developing a strategy for market design under a fully decarbonised electricity system, such that it gives certain and predictable investment signals, rewards both supply and demand, and ensures security of supply. • Developing mechanisms for strategic investment to ensure that electricity networks can accommodate increased future demand levels, and for investment in long-duration storage building on the call for evidence. • Addressing potential barriers to deploying and using low-carbon generation at scale (e.g. the planning and consenting regime for renewables and networks, exposure to climate risks). • Setting out a clear plan to deal with rising Energy from Waste (EfW) emissions, including stating capacity and utilisation requirements of EfW consistent with recycling and waste prevention aims, and consulting on an EfW emissions tax (possibly as part of the UK Emissions Trading Scheme). 	

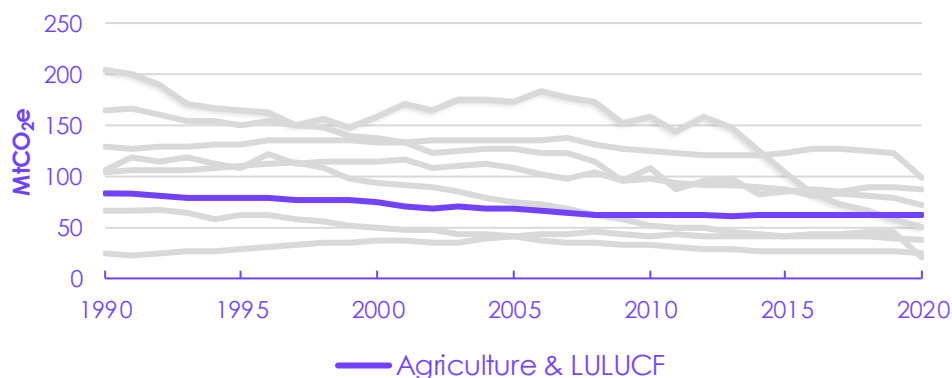
Agriculture and Land Use (12% of UK emissions, 2019)

Emissions reduction from 2019-2035:

36%
CCC Balanced Pathway

24-40%
NZS Delivery Pathway

Figure A5 UK emissions by sector



Source: BEIS (2021) 2020 UK Greenhouse Gas Emissions, Provisional Figures

Progress Summary – Agriculture and Land Use

State of Play	Assessment
<p>Has a plan or strategy for reducing emissions been published?</p> <ul style="list-style-type: none"> No separate strategy published, though England has a Tree Action Plan and a Peat Action Plan. 	
<p>Does the proposed ambition broadly align to the UK climate targets?</p> <ul style="list-style-type: none"> Ambition is close to CCC pathways. Recognition that land use will need to change to meet Net Zero, address biodiversity loss and deliver wider environmental and other objectives. Clear commitments to increase tree-planting rates and restore peatlands, support the take-up of low-carbon farming practices, and improve farm productivity. However, timescales are not all clear and focus mainly on the shorter term. Government has committed to work closely with the Devolved Administrations to deliver the plan, but clear UK-wide ambition missing in places. 	
<p>Have credible delivery policies been proposed or put in place?</p> <ul style="list-style-type: none"> Policy progress is strongest on actions to incentivise landscape change through woodland creation and peatland restoration in the shorter term. The role of regulatory options is limited. Plans to ban the use of peat in horticulture are in train. A clear delivery plan for agriculture and land use is not in place across all the UK. A strategy for Biomass will be published in 2022. Measures to address non-financial barriers such as skills, innovation and information are high-level and do not have a delivery timeline. 	
<p>Is it properly funded and/or does it contain sufficient incentives to drive the transition?</p> <ul style="list-style-type: none"> The Nature for Climate Fund is the main source of funding for measures in England. Funding schemes for woodland creation and restoring peatlands are available in the DAs, with recent increases in some cases, but short of what is needed. 	

- The main source of public funding for landscape-level changes beyond 2025 in England is the Landscape Recovery Scheme. Incentives and funding beyond 2025 are under development.
- The Sustainable Farming Incentive is the main source of funding to incentivise low-carbon actions and sequestration on-farm in England. Some funding for low-carbon farming is available across the DAs but gaps remain.
- Opportunities to leverage and increase private investment are being pursued, including through the Woodland Carbon Code, the Government's Woodland Carbon Guarantee and reforms to the Peatland Code. Longer-term pathways rely on a mix of public and private finances to deliver ambition.
- Risks remain over delivery of the scale of changes needed and the reliance on CAP replacement to deliver numerous environmental goals, including on climate. Risks remain that funding will not fully cover the scale of change needed in this sector.

Does the strategy support a balanced mix of solutions to minimise risk on the path to Net Zero?

- Plans largely rely on the willingness of farmers and landowners to undertake measures and future innovation in agriculture.
- The role of regulatory measures is limited and risk existing environmental standards.
- The role of consumers and the wider food supply chain is missing. How land is being used to deliver multiple objectives is unclear.
- There is a reliance on innovation and R&D to delivery emissions reduction on-farm.
- The potential for carbon pricing to play a role is being explored, but with no firm date or commitment.

What important areas remain to be resolved?

- A comprehensive Agriculture and Land use strategy is needed.
- Details of the CAP replacement schemes in England and the Devolved Administrations are being developed or consulted upon. Longer-term funding for this sector needs to be resolved.
- Ambition for restoring peatlands needs to be co-ordinated across the UK.
- Options to harness private sector investment need to be clarified and implemented.
- A Government Food Strategy is being planned, which needs to set out clear targets for the food system's impact on health, nature and climate. This should include the role of consumers and the wider food supply chain.
- All measures need to be scaled up rapidly to meet the levels of ambition set out.

Annex 2: Government statements of ambition

The Government identified several explicit commitments in the Net Zero Strategy against which it would track progress in future.

The following targets and ambitions will form part of the Government's annual update on progress towards net zero:

Power	<p>By 2035 all our electricity will come from low carbon sources subject to security of supply.</p> <p>40GW of offshore wind by 2030, including 1GW floating wind.</p>
Industry	<p>Ambition to deliver 6 MtCO₂ per year of industrial CCUS by 2030, and 9 MtCO₂ by 2035.</p>
Fuel supply and hydrogen	<p>5GW of low carbon hydrogen production capacity by 2030.</p> <p>Achieve a final decision on whether to enable blending up to 20% hydrogen by volume into the Great Britain gas network by 2023, subject to successful completion of safety trials.</p> <p>The offshore oil and gas sector to have an absolute reduction in production emissions of 10% by 2025, 25% by 2027, and 50% by 2030 on the pathway to net zero by 2050.³⁸</p>
Heat and buildings	<p>Aim to reduce direct emissions from public sector buildings by 75% by 2037 compared to 2017.</p> <p>Achieve a minimum market capacity of 600,000 heat pumps per year by 2028.</p> <p>As many homes to reach EPC Band C as possible by 2035, where practical, cost effective, and affordable.</p> <p>As many fuel poor homes as reasonably practicable to Band C by 2030.</p>
Transport	<p>Double cycling from 2013 to 2025.³⁹</p> <p>Increase walking activity by 2025.⁴⁰</p> <p>Deliver 4,000 new zero emission buses and the infrastructure needed to support them.</p> <p>25% of the government car fleet ultra low emission by December 2022 and 100% of the government car and van fleet zero emission by 2027.</p> <p>100% of new cars and vans sold are zero emission by 2035.</p> <p>100% of new HGV sold are zero emission.</p> <p>100% of new buses/coaches sold are zero emission.</p> <p>Maximise GHG savings from low carbon fuel use in transport by increasing the Renewable Transport Fuel Obligation main obligation from 9.6% in 2021 to 14.6% in 2032.</p>
Natural resources, waste, and F-gases	<p>Restore at least 35,000 ha of peatlands in England by 2025 and approximately 280,000 hectares of peat in England by 2050.</p> <p>Increase tree planting rates from 13,660 hectares across the UK in 2020 to 30,000 hectares each year by the end of this Parliament.</p> <p>Deliver the UN Sustainable Development Goal 12.3 to halve food waste by 2030.</p> <p>Explore policies to work towards the near elimination of biodegradable municipal waste to landfill by 2028.</p> <p>Meet the Kigali Amendment target of reducing HFC consumption by 85% by 2036, as well as the F-gas Regulation's target of a 79% reduction by 2030.</p>
Greenhouse gas removals	<p>At least 5 MtCO₂/yr of engineered removals by 2030.</p>

Source: Net Zero Strategy, p254.

The Annex of the Strategy sets out the Government's expectations for emissions by sector in their indicative pathway to meet the budgets.

Table 8: Sectoral emissions across the carbon budgets: MtCO₂e per year (using AR5 with feedback GWPs)

Sector	Current (2019)	CB4 (average 2023-27)	NDC (2030)	CB6 (average 2033-37)
Agriculture and LULUCF	63	51 to 57	44 to 52	38 to 48
Buildings	88	73 to 82	55 to 66	34 to 47
Domestic Transport	122	100 to 111	67 to 80	29 to 43
Fuel Supply	26	18 to 20	14 to 16	10 to 12
Industry	78	58 to 65	36 to 45	19 to 29
Power	68	28 to 31	14 to 17	9 to 11
Waste and F-gases	40	24 to 27	17 to 20	12 to 15
Greenhouse Gas Removals	0	0 to 0	-12 to -1	-33 to -11
Intl Aviation and Shipping*	45	(42 to 46)	(44 to 50)	39 to 46
Total (incl. IAS)	520			192
Total (excl. IAS)	476	371	262	

*Figures in parentheses indicate that IAS is not counted towards that target

Source: Net Zero Strategy, Annex 1, Table 8, p352.

The Annex also set out the deployment assumptions that would deliver the indicative emissions pathway. These are not formal targets, but provide a useful metric for tracking progress – other things equal, if deployment falls short in some of these areas then more will be needed elsewhere to compensate.

Table 10: Deployment assumptions underpinning pathway

Sector	Deployment assumptions	Unit	2019	2025	2030	2035
Power	Electricity generation	TWh	320	315	370	460*-510
	Low carbon GB generation as a percentage of total projected generation required in 2035	%	29%-33%*	38%-42%*	62%-69%*	99%
Industry	Low carbon fuel switching ^a	TWh	110	115	125	167
	Resource and energy efficiency savings	MtCO ₂ e	0	1	10	11
	Industry demand for Industrial CCUS (not including BECCS) ^b	MtCO ₂ e	0	2	6	7
Fuel Supply	Low carbon hydrogen production	TWh	0	10**	40	80-140*
	Electrical power demand from offshore oil and gas installations as a percentage of their total power demand	%	0%	0%	31%	43%
Heat and Buildings	Cumulative heat pumps installed domestically	Million installations	0.2	1.1	4*- 4.3	6.9* - 11.3
	Cumulative homes converted to 100% hydrogen for heat	Million homes	0	0	0-0.2*	0-4*
	Yearly homes treated by new domestic energy efficiency measures	Million homes	0	0.6	1	0.5
	Low carbon fuels ^a consumption as a percentage of total fuel consumption in commercial buildings (excluding heat networks)	%	62%	63%	67%	78%-81%*
	Yearly heat supplied via heat networks	TWh	14	16	22	29
	Yearly biomethane injected into the grid	TWh	3	8	12	12

Source: Net Zero Strategy, Annex 1, Table 10, p325.

Table 10, continued.

Sector	Deployment assumptions	Unit	2019	2025	2030	2035
Agriculture and LULUCF	Yearly area of peatland under restoration in England	Ha	2,000-5,000***	7,000	10,290	10,290
	Yearly area of afforestation in the UK	Ha	13,600	30,000	40,000	60,000
	Yearly area of perennial energy crop and short rotation forestry planted	Ha	0	7,440	21,275	26,360
	Farmers engaging with low carbon farming practices as a percentage of total farmers	%	60%	70%	75%	85%
Waste and F-gases	Level of HFC consumption relative to a 2016 baseline level	%	63%	31%	21%	15%
Greenhouse Gas Removals	BECCS and DACCS	MtCO ₂ e	0	0	6	23
Domestic transport	ZEVs as a percentage of total car fleet	%	0.3%	6%	24%	63%
	ZEVs as a percentage of total van fleet	%	0.2%	2%	14%	40%
	ZEVs as a percentage of total HGV fleet	%	0%	0%	9%	37%
	ZEVs as a percentage of total bus and coach fleet	%	0.3%	9%	25%	48%
	Single track kilometres electrified per year	Km	0	350	650	650
	Low carbon fuels ^a use in road transport as a percentage of total fuel use (in litres)	%	5%	7%	8%	8%
	Journeys in towns and cities that are cycled and walk as a percentage of total journeys in towns and cities	%	42%	46%	50%	55%
	SAF use in domestic aviation as a percentage of total fuel use (in tonnes)	%	0%	1%	3%	6%
	Low carbon fuels use ^a in domestic shipping as a percentage of total fuel use (in TWh)	%	0%	0%	1%	42%
	International Aviation and Shipping (IAS)	SAF use in international aviation as a percentage of total fuel use (in tonnes)	%	0%	1%	3%
Low carbon fuels*** use in international shipping as a percentage of total fuel use (in TWh)		%	0%	0%	1%	28%

Source: Net Zero Strategy, Annex 1, Table 10 continued, p326.

The Annex also identifies the expected additional investment required to deliver the indicative pathway.

Table 11: Estimates of additional investment requirements for Net Zero Strategy pathway (£bn pa, undiscounted, 2020 prices)

Sector	Carbon Budget 3 (average 2020-2022)	Carbon Budget 4 (average 2023-2027)	Carbon Budget 5 (average 2028-2032)	Carbon Budget 6 (average 2033-2037)
Power*	1	7-8	11-22	12-23
Fuel Supply	0.3	2.0	1.3-2.3	0.6-1.9
Industry	0.0	0.9	1.1	0.9
Heat and Buildings**	2	12	12	14
Transport	2	8	17	18
Natural Resources, Waste, and F-Gases ³⁷	0.6	1.2	1.7	2.6
Greenhouse Gas Removals	0.0	0.7	1.6	1.7
CCUS (T&S Infrastructure)	0.0	0.6	1.2-1.4	0.8-1.0
Total	5-6	32-33	48-59	52-61

*Figures exclude additional Transmission and Distribution Network investment requirements.

**Costs represent a scenario where heat is predominantly decarbonised via electrification through heat pumps.

Source: Net Zero Strategy, Annex 1, Table 8, p352.

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October 2021