NET ZERO

Commission recommendations and the net zero target

NATIONAL INFRASTRUCTURE COMMISSION

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Contents

The Commission

The Commission's remit

The Commission provides the government with impartial, expert advice on major long term infrastructure challenges. Its remit covers all sectors of economic infrastructure: energy, transport, water and wastewater (drainage and sewerage), waste, flood risk management and digital communications. While the Commission considers the potential interactions between its infrastructure recommendations and housing supply, housing itself is not in its remit. Also out of the scope of the Commission are social infrastructure, such as schools, hospitals or prisons, agriculture, and land use.

The Commission's objectives are to support sustainable economic growth across all regions of the UK, improve competitiveness, and improve quality of life.

The Commission delivers the following core pieces of work:

- a National Infrastructure Assessment once in every Parliament, setting out the Commission's assessment of long term infrastructure needs with recommendations to the government
- specific studies on pressing infrastructure challenges as set by the government, taking into account the views of the Commission and stakeholders, including recommendations to government
- an Annual Monitoring Report, taking stock of the government's progress in areas where it has committed to taking forward recommendations of the Commission.

While the Commission is required to carry out its work in accordance with the remit and the terms of reference for specific studies, in all other respects the Commission has complete discretion to determine independently its work programme, methodologies and recommendations, as well as the content of its reports and public statements.

The Commission's binding fiscal remit requires it to demonstrate that all its recommendations for economic infrastructure are consistent with, and set out how they can be accommodated within, gross public investment in economic infrastructure of between 1.0 per cent and 1.2 per cent of gross domestic product each year between 2020 and 2050. The Commission's reports must also include a transparent assessment of the impact on costs to businesses, consumers, government, public bodies and other end users of infrastructure that would arise from implementing the recommendations.

When making its recommendations, the Commission is required to take into account both the role of the economic regulators in regulating infrastructure providers, and the government's legal obligations, such as carbon emissions reduction targets or making assessments of environmental impacts. The Commission's remit letter also states that the Commission must ensure its recommendations do not reopen decision making processes where programmes and work have been decided by the government or will be decided in the immediate future.

The Commission's remit extends to economic infrastructure within the UK government's competence and will evolve in line with devolution settlements. This means the Commission has a role in relation to non devolved UK government infrastructure responsibilities in Scotland, Wales and Northern Ireland (and all sectors in England).

The Infrastructure and Projects Authority (IPA), a separate body, is responsible for ensuring the long term planning carried out by the Commission is translated into successful project delivery, once the plans have been endorsed by government.

The Commission's members

- **Sir John Armitt CBE (Chair)** published an independent review on long term infrastructure planning in the UK in September 2013, which resulted in the National Infrastructure Commission. Sir John is the Chair of National Express Group and the City & Guilds Group. He also sits on the boards of the Berkeley Group and Expo 2020.
- **Professor Sir Tim Besley CBE** is School Professor of Economics and Political Science and W. Arthur Lewis Professor of Development Economics at the LSE. He served as an external member of the Bank of England Monetary Policy Committee from 2006 to 2009.
- **Professor David Fisk CB** is the Director of the Laing O'Rourke Centre for Systems Engineering and Innovation Research at Imperial College London. He has served as Chief Scientist across several government departments including those for environment and transport, and as a member of the Gas and Electricity Markets Authority.
- **Andy Green CBE** holds several Chair, Non-Executive Director and advisory roles, linked by his passion for how technology transforms business and our daily lives. He chairs Lowell, a major European credit management company and has served as Chair of the Digital Catapult, an initiative to help grow the UK's digital economy.
- **Bridget Rosewell CBE** is a director, policy maker and economist. She served as Chief Economic Adviser to the Greater London Authority from 2002 to 2012 and worked extensively on infrastructure business cases. She is a Non-executive Director at Network Rail, Chair of the Atom Bank and Non-executive Chair of the Driver and Vehicle Standards Agency.
- **Professor Sadie Morgan OBE** is a founding director of the Stirling Prize winning architectural practice dRMM. She is also Chair of the Independent Design Panel for High Speed Two and one of the Mayor of London's Design Advocates. She sits on the boards of the Major Projects Association and Homes England.
- **Julia Prescot** is a co-founder and Chief Strategy Officer of Meridiam and sits on the Executive Committee of Meridiam SAS. She has been involved in long term infrastructure development and investment in the UK, Europe, North America and Africa. Since 2019 she has sat on the board of the Port of Tyne.

1. Commission recommendations and the net zero target

In June 2019 the government legislated for a net zero greenhouse gas emissions target for the whole economy by 2050.[1] The Commission has analysed its existing recommendations to check they are consistent with net zero and found that they are aligned with the new target, although some are now more urgent.

The Committee on Climate Change

The legislated net zero target was recommended by the Committee on Climate Change in its Net Zero report in May 2019.[2] The Committee's role is to advise the UK government and devolved administrations on emissions targets and report to Parliament on progress made in reducing greenhouse gas emissions and preparing for climate change.[3]

The Net Zero report also set out an illustrative roadmap for decarbonisation between now and 2050 to demonstrate that the net zero target is achievable with known technologies. The roadmap achieves a 96 per cent reduction in net greenhouse gas emissions from 1990 levels by 2050, leaving residual emissions of 33 to 45 MtCO2e (metric tons of carbon dioxide equivalent) in 2050. The full 100 per cent reduction can only be achieved through the Committee's range of 'speculative options', involving further efficiencies, new technologies, and deeper decarbonisation using existing techniques.

A 100 per cent reduction in net (rather than gross) greenhouse gas emissions from 1990 levels means that some sectors are still expected to emit a small amount of greenhouse gases in 2050, but these will be largely offset by greenhouse gas removals. The Committee anticipates that this will be achieved primarily through a combination of biomass with carbon capture and storage, direct air capture, afforestation and reforrestation, and peatland restoration. The Committee's illustrative roadmap identified indicative residual emissions for each sector in 2050.

While the Committee's target has been legislated for, the roadmap has not been. The Committee stated that "it is impossible to predict the exact mix of technologies and behaviours that will best meet the challenge of reaching net zero greenhouse gas emissions. The analysis ... is not intended to predict or prescribe the future technology mix, but it gives an understanding of what a sensible mix might look like".

The Commission's recommendations for decarbonisation

Commission recommendations are required to be consistent with the government's legislated obligations, including greenhouse gas emissions targets.[4] The Commission has therefore made recommendations to support decarbonisation in the National Infrastructure Assessment and other studies.[5] The Commission's approach to maintaining consistency with the government's targets has been to ensure its recommendations for each sector are consistent with the residual emissions in 2050 for that sector set out in the Committee's scenarios. Many of the Commission's existing recommendations are already consistent with the net zero target. However, the Committee on Climate Change's indicative residual emissions for each sector have been reduced since the *National Infrastructure Assessment* was published, in line with the new net zero target. This means some Commission recommendations are now more urgent, or will need to go further in future, to help achieve net zero.

The Commission makes recommendations for the UK's economic infrastructure over the next three decades, up to 2050. The timeframes of existing Commission recommendations vary. In some sectors, such as flood resilience and water, where lead in times for new infrastructure are long and the context is not developing rapidly, the Commission has set out recommendations for the next 30 years. However, in others, such as energy, where generation technologies are still evolving, and heat, where the best decarbonisation options are still unclear, the Commission has chosen to make shorter term recommendations that contribute to longer term objectives, to maintain flexibility as technologies develop.

Comparison with the Committee's 'further ambition' scenario

The table below compares the Committee's 'further ambition' scenario roadmap (in green), with our existing recommendations (in teal), and the long term objectives they contribute towards (in lighter teal).

It also includes predicted emissions in 2050 where available from the Commission's existing modelling, across the sectors covered by the Commission, compared to the residual emissions in 2050 for that sector set out in the Committee's scenarios. The final row summarises the most pressing infrastructure needs across the sectors.

The Committee's 'further ambition' scenario covered some other sectors not in the Commission's remit, such as agriculture, which are not included in the table.

The table below shows that the recommendations the Commission has made to date are broadly consistent with the Committee's roadmap, although some Commission recommendations are now more urgent, or will need to go further, to help achieve net zero. This is covered in more detail for each sector in Chapter 2.

The table also highlights several areas within the Commission's remit where it may make recommendations in the future to support decarbonisation, including passenger rail, wastewater, aviation, shipping, greenhouse gas removals and infrastructure required to decarbonise industry (such as hydrogen or infrastructure for carbon capture and storage).

Table 1.1 Comparison between the Committee on Climate Change's 'further ambition' scenario (in green) and the Commission's recommendations[6]

CCC Net Zero 'further ambition' scenario vs Commission recommendations to date 2020 to 2050 by sector

	2020s	2030s	2040s	2050 emissions ($MtCO_2$)
Electricity	Largely decarbonise electricity: renewables, flexibility, coal phase-out	Expand electricity system, decarbonise mid-merit/peak generation (e.g. using hydrogen), deploy bioenergy with CCS		2.9
	Reach 50% renewable energy generation by 2030, develop interconnection, storage and demand flexibility	Transition to a low carbon, highly renewable energy system by 2050, develop system flexibility (including use of electric vehicle batteries for storage)		8
Hydrogen	Start large-scale hydrogen production with CCS	Widespread deployment in industry, use in back-up electricity generation, heavier vehicles (e.g. HGVS, trains) and potentially heating on the coldest days		3.1
	Trial hydrogen production with CCS by 2023			
Heating buildings	Heat networks, heat pumps (new-build, off-gas, hybrids)	Widespread electrification, expand heat networks, gas grids potentially switch to hydrogen		4.1
	Evidence on heat pumps by 2021, hydrogen trials to 10,000 homes by 2023	Transition to low carbon heat by 2050 through either heat electrification or hydrogen-led heat		10
Energy efficiency	Insulation in residential buildings, energy management and efficiency in non-residential buildings	Further efficiency measures in all buildings, no new non-efficient buildings, insulation in smaller homes and heritage buildings, energy management in non-residential buildings		
	21,000 energy efficiency measures a week up to 2035 (or until a decision is made on heat), £3.8bn for energy efficiency in social housing, trial initiatives for owner occupiers, regulations in private rented sector			
Surface transport	Ramp up EV market, decisions on HGVs	Turn over fleets to zero-emission vehicles: cars & vans (by 2035) before HGVs, rail electrification (54% by 2040), hydrogen and hybrid trains, move to walking, cycling and public transport		2.4
	Close to 100% new car and van sales EVs by 2030; govt announcement by 2021 on banning sales of diesel HGVs by 2040; govt strategy by 2021 to decarbonise rail freight by 2050			
Waste	Reduce waste, increase recycling rates to 70% by 2025, landfill ban for biodegradable waste	Limit emissions from combustion of non-bio wastes (e.g. deploy measures to reduce emissions from waste water)		6.9
	Make recycling easier, separate food waste collection for biogas, restrictions on plastic packaging by 2025	Recycle 65% of municipal waste and 75% of plastic packaging by 2030	Transition to a more circular economy with a high recycling rate, and eliminate hard to recycle plastics. Reduce the need for further energy from waste plants (incinerators).	
Aviation	Operational measures, new plane efficiency, constrained demand growth, limited sustainable biofuels			31.5
Shipping	Operational measures, new ship fuel efficiency, use of ammonia			1.0
GHG removals	Develop options and policy framework	Deployment of BECCS in various forms, demonstrate direct air capture of CO2, other removals depending on progress		-53.0
Industry	Initial CCS clusters, energy & resource efficiency	Further CCS, widespread use of hydrogen, some electrification		9.6
Infrastructure	Industrial CCS clusters, decisions on gas grid & HGV infrastructure, expand EV charging & electricity grids	Hydrogen supply for industry and potentially buildings, roll-out of infrastructure for hydrogen/electric HGVs, more CCS infrastructure, electricity network expansion		
	EV charging infrastructure, assessment of HGV infrastructure needs, electricity grid flexibility and expansion	Further electricity grid expansion, interconnection, storage and system flexibility, HGV infrastructure. Potentially: hydrogen network for heat, further rail electrification or hydrogen infrastructure for trains.		

2. Sector by sector analysis

Power

In the *National Infrastructure Assessment*, the Commission recommended setting the UK on the path to a highly renewable system, in order to reduce emissions, keep costs low, and maintain optionality in a rapidly changing sector.[7] However, the original modelling allowed for 8 MtCO2e (metric tons of carbon dioxide equivalent) of residual greenhouse gas emissions from the power sector in 2050, compared to the 2.9 MtCO2e target used in the Committee on Climate Change's indicative net zero pathway.[8]

The Commission has since worked with Aurora Energy Research to model the total cost of the power system in a net zero economy. The modelling continues to show that a highly renewable system could be the cheapest way to decarbonise electricity. The recommendation to aim for at least 50 per cent renewable generation as part of a transition to a highly renewable mix and maintaining optionality still works to achieve net zero, but the new target makes delivering renewables even more urgent.[9]

Good progress has been made towards decarbonising the power sector so far. Sector emissions have fallen by around 53 per cent in the past decade[10] and government has played a central role in supporting this reduction. The government's ambition to deploy 40 gigawatts of offshore wind by 2030 is another welcome step,[11] and alone nearly reaches the 50 per cent renewable generation target.[12] This positive progress must continue.

Future system costs may even be lower if action is taken to test the feasibility of deploying hydrogen turbines, which could be a flexible complement to low cost renewables. More detail can be found in the Commission's paper *Net Zero: Opportunities for the power sector*.

Heating buildings and energy efficiency

To reach the target of reducing residual emissions from heating buildings to 4.1 MtCO2e, compared to the previous target of 10 MtCO2e, more heating systems will need to be upgraded, even in buildings that are hard to decarbonise. This will take more time, and will be more difficult to do, so this process may need to begin earlier.

The Commission's recommendation to carry out trials for heat pumps and hydrogen heating to inform this decision is still important to prove these technologies, so they can start to be installed in households across the UK. Some steps have been taken: the government is consulting on introducing a new grant scheme for investing in heat pumps and biomass boilers from April 2022,[13] while the Budget confirmed further funding for low carbon heat networks and heating systems.[14]

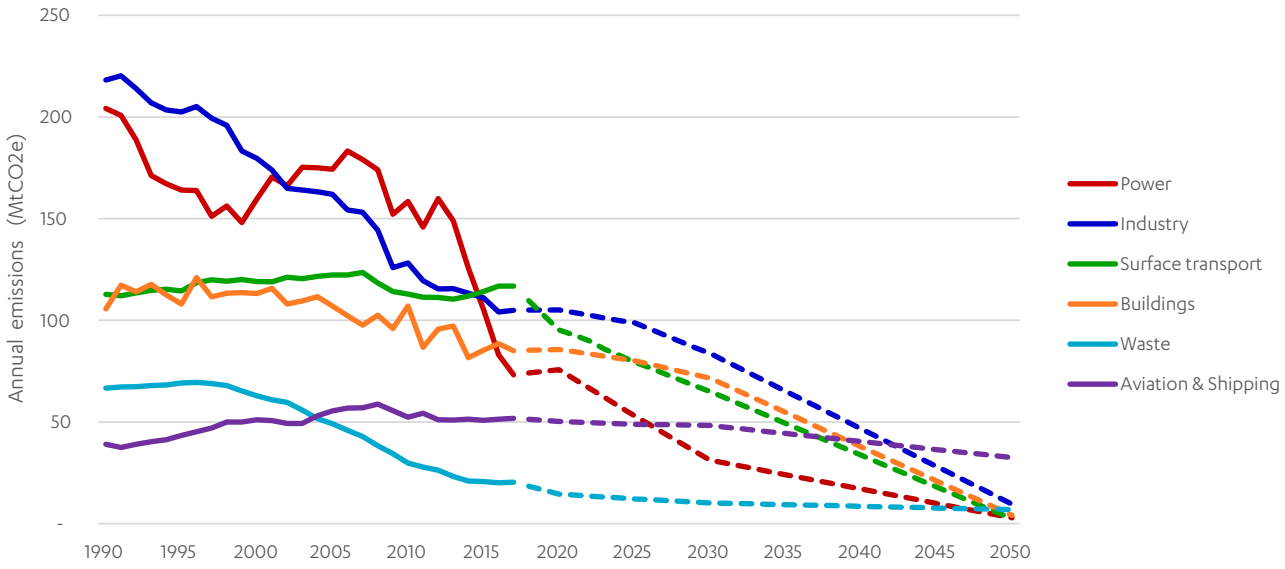
However, the increased volume of new heating systems that will need to be installed mean taking steps to trial heat pumps and hydrogen heating is even more urgent. Energy efficiency measures should be installed in the short term to reduce emissions from heat. Whichever approach the government chooses to take to decarbonise heat, energy efficiency measures will be be needed to reduce energy demand from heat. Energy efficiency measures will be particularly important if heat is electrified, as heat pumps work best in buildings with reasonably high insulation standards as they provide constant, but low level, heat.[15]

Surface transport

Achieving net zero supports the case for the Commission's recommendations on decarbonising cars, vans, heavy goods vehicles and rail freight. The Commission recommended that government should facilitate the fastest possible uptake of electric vehicles and prepare for 100 per cent new car and van sales to be electric by 2030, by supporting the delivery of charging infrastructure.[16] The Committee's 'further ambition' scenario reinforces this, saying that by 2035 at the very latest, all new cars and vans should be electric or low carbon alternatives, and that a switchover by 2030 would be preferable if possible.[17]

The government has made some welcome announcements in this area since the Commission published the *National Infrastructure Assessment*. At Budget 2020 the government announced that it would provide £500 million over the next five years to support the rollout of a rapid charging network for electric vehicles.[18] And the government is currently consulting on bringing forward the phase out date for petrol and diesel cars to 2035 or earlier if possible, which means the necessary infrastructure would need to be in place.[19] While these are reassuring steps, it remains to be seen if they will lead to action in the surface transport sector, which has so far seen little progress in reducing emissions.

Figure 2.1 Annual emissions by sector: outturn and Committee on Climate Change targets[20]



The government should also make progress on assessing the infrastructure needed for electric or hydrogen heavy goods vehicles and consider options for decarbonising rail freight, as recommended in the Commission's freight study.[21]

Waste

Getting to net zero will require emissions from the waste sector to be reduced. Key sources of waste emissions are: methane emissions from the decomposition of biodegradable waste in landfill sites; emissions produced from treatment of wastewater; and emissions from the biological treatment, composting and incineration of waste. Measures to lower emissions from waste include: reducing streams of biodegradable waste going to landfill; increasing recycling, particularly of plastic which is a key source of emissions when incinerated; and improving the efficiency of wastewater treatment plants.[22]

The *National Infrastructure Assessment* made a near term recommendation to support a recycling target of 65 per cent of municipal waste and 75 per cent of plastic packaging in England by 2030.[23] The Committee on Climate Change recommended a target of 70 per cent of municipal recycling throughout the UK by 2025 or earlier. Raising the current level of 45 per cent to 70 per cent by 2025 may not be realistic,[24] but measures to support this increase should be encouraged.

The Commission's current recommendations on waste will not change. The Commission will set out its next trajectory for waste in future reports, including recommendations to support meeting the more ambitious emissions target.

3. Next steps

The Commission hopes the government's forthcoming *National Infrastructure Strategy* will set out how the government plans to progress the recommendations set out above with the urgency demanded by the climate emergency and the new net zero target.

The Commission will continue to perform its unique role to advise government on the most cost effective way to decarbonise infrastructure whilst meeting the UK's long term infrastructure needs. It has set out several recommendations that will support the UK's ambition to achieve net zero greenhouse gas emissions by 2050.

The Committee on Climate Change's *Net Zero* report also highlights several areas within the Commission's remit where it has not yet carried out work related to decarbonisation, which may be given consideration in the future. This does not mean the Commission's recommendations are inconsistent with the net zero target. Where the Commisson has made recommendations, they are key to support the delivery of the net zero target. The Commission's forthcoming work will continue to be consistent with, and support the achievement of, the net zero greenhouse gas emissions target.

Endnotes

1 Gov.uk website (2019), **UK becomes first major economy to pass net zero emissions law**
2 Committee on Climate Change (2019), **Net Zero – The UK's contribution to stopping global warming**
3 Committee on Climate Change website, **About the Committee on Climate Change**
4 HM Treasury, National Infrastructure Commission (2017), **National Infrastructure Commission framework document**
5 National Infrastructure Commission (2018), **National Infrastructure Assessment**; National Infrastructure Commission (2016), **Smart Power**; National Infrastructure Commission (2019), **Better Delivery: the challenge for freight**
6 Table notes: the Commission's figure for residual emissions for energy assumes heat is electrified (eg heating uses heat pumps, with biomass boilers in hard to heat homes); residual emissions in our hydrogen and biomass scenario were lower. This energy modelling has since been updated, see above. The Commission's heat modelling for the National Infrastructure Assessment identified a range of five mixed heating scenarios which gave a potential range of residual emissions in 2050 between -3.1 and 13.1 MtCO2 (-3.1 assumes carbon capture and storage is used). The Commission did not recommend a specific pathway, just trials with the aim of reaching 10MtCO2 residual emissions, the constraint used in previous CCC reports aiming for an 80 per cent reduction in greenhouse gas emissions by 2050. Residual emissions for energy efficiency are included in this number.
Sources: Committee on Climate Change (2019), **Net Zero Technical Report**; National Infrastructure Commission (2018), **National Infrastructure Assessment**; National Infrastructure Commisison (2016), **Smart Power**; National Infrastructure Commission (2019), **Better Delivery: the challenge for freight**
7 National Infrastructure Commission (2018), **National Infrastructure Assessment**
8 Aurora Energy Research (2018), **Power sector modelling report**
9 National Infrastructure Commission (2020), **Net Zero: Opportunities for the power sector**
10 Department for Business, Energy and Industrial Strategy (2020), **Final UK greenhouse gas emissions national statistics: 1990 to 2018**
11 Prime Minister's Office (2019), **The Queen's Speech December 2019 - background briefing notes**
12 Commission calculations
13 Department for Business, Energy and Industrial Strategy (2020), **Future support for low carbon heat**
14 HM Treasury (2020), **Budget 2020**
15 National Infrastructure Commission (2018), **National Infrastructure Assessment**
16 Ibid
17 Committee on Climate Change (2019), **Net Zero Technical Report**
18 HM Treasury (2020), **Budget 2020**
19 Department for Transport, Office for Low Emission Vehicles (2020), **Consultation on ending the sale of new petrol, diesel and hybrid cars and vans**
20 Outturn: Committee on Climate Change (2019), **Net Zero – The UK's contribution to stopping global warming**; Committee on Climate Change targets 2020-2030: Committee on Climate Change (2015), **Sectoral scenarios for the fifth carbon budget**; Committee on Climate Change target 2050: Committee on Climate Change (2019), **Net Zero Technical Report** ('further ambition' scenario). 2015-2030 looks strange because the outturn data is from 2019, but the targets were set in 2015. In some cases, the targets are on track to be met earlier, or have already been met.
21 National Infrastructure Commission (2019), **Better Delivery: the challenge for freight**
22 Committee on Climate Change (2019), **Net Zero Technical Report**
23 National Infrastructure Commission (2018), **National Infrastructure Assessment**
24 Gov.uk website (2020),**UK statistics on waste**

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