National Infrastructure Strategy

Fairer, faster, greener

HM Treasury

Decarbonising the economy and adapting to climate change

At a glance

As set out in the Prime Minister's *Ten Point Plan for a Green Industrial Revolution,* **infrastructure investment is fundamental to delivering net zero emissions by 2050**. The government will unlock private sector investment to accelerate the deployment of existing technology, such as retrofitting the UK's building stock and electrification of vehicles, while advancing newer technologies such as carbon capture and low-carbon hydrogen. **The government's approach will create jobs to support the recovery from COVID-19, and support the government's levelling up agenda by ensuring key industrial areas are at the heart of the transition to net zero**. The UK is already decarbonising faster than any other G20 country.[24] As hosts of the UN Climate Change Conference COP 26 next year, the UK will go even further to promote the importance of low-carbon infrastructure and support its commitment to the Paris Agreement.

Key measures include:

- Making significant investment in offshore wind and modern ports and manufacturing infrastructure to expand the share of generation from renewables;
- Providing up to £525 million to bring forward both large-scale nuclear and invest in the development of advanced nuclear technologies;
- £1 billion to support the establishment of carbon capture and storage in four industrial clusters;
- Investing £1.3 billion in charging infrastructure to accelerate the mass adoption of electric vehicles (EVs) ahead of ending the sale of new petrol and diesel cars by 2030;
- Promoting private investment and setting an enduring regulatory environment to promote energy efficiency;
- Enabling heat decarbonisation by supporting the roll-out of existing technologies like heat pumps and development of emerging technologies like hydrogen;
- Funding to help England to meet its share of the Climate Change Committee's recommendations to plant 30,000 hectares of trees a year in the UK; and
- Investing £5.2 billion by 2027 to better protect 336,000 properties and boost resilience of communities to the increased risk of flooding and coastal erosion resulting from climate change

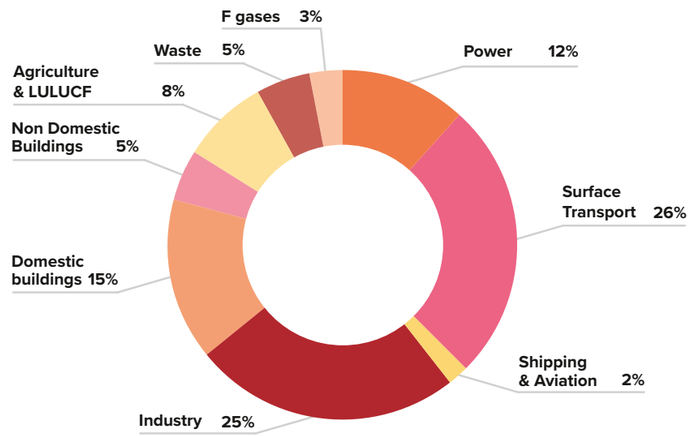
In June 2019 the UK became the first major economy in the world to legislate to end its contribution to global warming by 2050, in line with the UK's commitment to global climate action under the Paris Agreement.

The UK's commitment to achieving net zero emissions by 2050 will require profound changes that will provide huge opportunities for the UK to build back better from COVID-19. The UK will need strong, consistent and deliberate policy action to support the technologies that will reduce emissions.[25]

These changes will be economy-wide, and HM Treasury is currently undertaking a review into how the transition could be funded and where the costs could fall. An interim report will be published shortly and the final report in spring 2021.

The majority (over 80%) of the UK's emissions come from infrastructure sectors, and so action on infrastructure will be crucial for meeting the UK's Carbon Budgets and continuing progress towards the net zero target.[26]

UK production emissions by sector (2019)



Source: Department for Business, Energy & Industrial Strategy provisional UK emissions 2019, on a by source basis - mapped to Climate Change Committee sectors

The UK has already made considerable progress, reducing emissions by 45% since 1990 while growing the economy by almost 80% (as of 2019).[27] This has been achieved while minimising costs, causing a net reduction in household bills.[28]

The majority of contributions and investment so far has come from the power sector, where emissions have fallen almost 70% since 2008.[29] This has been driven through coordinated action by the private sector working closely with the government: regulated efficiency measures have reduced electricity consumption by 14%;[30] coal power generation has fallen from 30% to below 1% since 2014,[31] and the price of offshore wind has fallen by 55%.[32]

To go further, the UK will need to improve other aspects of its infrastructure in a way that more visibly alters people's lives, including how people heat their homes and travel around the country. **This Strategy sets out early actions that the government will take to build the infrastructure needed to achieve net zero, improve air quality, create a greener urban environment, and minimise the impact of flooding**. This includes significant progress on: carbon capture and storage, low-carbon hydrogen production, charging infrastructure for electric vehicles, offshore wind, and energy performance improvements in buildings.

In many cases the solutions needed are known and action needs to be taken immediately. Further progress will be made by accelerating the deployment of existing technology in the near-term, such as increasing wind generation or driving retrofit in the UK's building stock. These tasks will enable rapidly growing industries, creating jobs across the economy and boosting productivity.

For other areas, **new technologies and skills will need to be developed to continue decarbonising**. Since 2016, the government has made historic increases to public support for science. The UK's world-class institutions are already amplifying this scientific progress through curiosity-driven research and support for technologies. Looking ahead, the government will need to build on these strengths to drive both the development and deployment of new technologies, including:

- Low carbon hydrogen as a potential alternative to fossil fuel heating in industry and buildings, to store energy, a source of power, and for some modes of transport;
- Carbon Capture and Storage to remove up to 90% of the carbon dioxide emissions from gas-fired power stations and industrial factories, including those making hydrogen, as well as to support greenhouse gas removal technologies to offset some emissions from the hardest to decarbonise sectors;
- Technologies to remove carbon dioxide from the air, using 'direct air capture' or biomass, so that it can be used as an input to other processes, or stored; and
- Floating offshore wind to allow the harnessing of wind power across a greater proportion of the seabed.

Investment in these areas, where the UK has competitive advantage, can create the knowledge and skills needed for a green industrial revolution, driving leadership in the industries of the future, reducing national and global emissions, as well as providing the platform for significant economic growth. Where these investments are brought together to create place-based industrial clusters they can transform local economies, creating productive jobs, developing specialist skillsets, and attracting private investment. For example, the North East of England could become a home of choice for companies delivering carbon capture and storage; making hydrogen power a part of daily life; and designing, building and maintaining offshore wind turbines.

At the same time, **the country must adapt to the risks posed by climate change**. National infrastructure will be made resilient to future climate change by ensuring that its expected effects are fully considered at the design stage. This means addressing the likely impacts of higher temperatures, more extreme weather, and increased incidence of droughts, floods, and disease, and building in cost-effective mitigations over the whole life cycle of the asset now

The government's approach

Reducing emissions across whole sectors of the economy must be done in a sustainable way that minimises cost. The benefits, opportunities and costs need to be shared across society and the economy must grow to enable the transition to be sustained, particularly as it recovers from the COVID-19 pandemic. **In November 2020, the Prime Minister laid out his *Ten Point Plan for a Green Industrial Revolution*. This strategy sets out how it will be delivered.**

The government cannot tackle this challenge alone. **Instead, the government will look to work closely with investors, industry and households**. This strategy sets out clear objectives and ambitions, to provide policy and regulatory certainty for project sponsors and investors to harness the transformational benefits that can be delivered by long-term private capital investment. The energy transition will be underpinned by harnessing private investment and innovation as new technologies become available, new markets are established and opportunities are created across the economy.

However, the full suite of policy levers will need to be deployed to encourage this private sector investment and create the appropriate market incentives to encourage competition and drive down costs, and to ensure that decarbonisation is achieved at the best possible value for money, with the right distributional balance of costs across consumers, taxpayers and the private sector.

In the short-term, public financing will help to overcome barriers to investment in new technologies and ensure the costs are borne fairly across society, for example:

- By using the government's unique position to support those risks where the private sector simply cannot, including in the development of financing and delivery models for complex and novel major infrastructure;
- By supporting trade exposed industries at risk of offshoring due to higher operational costs associated with decarbonisation technologies;
- By investing in fuel poor households and social housing to reduce bills for the poorest in society and protect the less able to pay; and
- By supporting the transition from R&D to deployment, driving forward innovation and encouraging UK companies to stay at the cutting edge.

Now and in the longer term, creating the right regulation and tax measures will be imperative in driving competition and opening up new markets. This will influence behaviour to address market failures, with a view to any government subsidies reducing over time as risks which once could not be borne by the private sector are mitigated. The Net Zero Review will analyse the range of choices for how households, businesses and the taxpayer could contribute towards the transition and evaluate the trade-offs between cost, competitiveness, effects on consumers and impacts on the taxpayer.

This chapter sets out the government's progress on this vision to date, across low carbon energy, industry, transport, buildings, resilience to climate change, and developing new and innovative technologies, as well as the strategy for moving forward.

Power

The decarbonisation of the power sector is a major success story from the past decade. It accounted for just 12% of emissions in 2019, down from 27% in 2008, mainly due to the growth of renewables and reductions in the use of coal in power stations.[33] Throughout this period, private investment has also underpinned substantial progress in reducing the cost of clean electricity and maintaining secure supplies.

The steady increase in renewable investments has been driven through a number of successful subsidy schemes and market reforms. Competitive auctions through the Contracts for Difference scheme have led to a dramatic reduction in the costs of offshore wind from £120/MWh in the first auction in 2015 to just £40/MWh in 2019.

While the total cost to consumers from low carbon levies has been significant, rising to around £10 billion a year in 2020, these have secured significant reductions in the cost of clean electricity and also put downward pressure on wholesale prices. Further deployment of renewables can be done in a more sustainable fashion without significantly higher costs to consumers.

Progress on decarbonisation in the power sector has also been driven by a consistent carbon price signal that has reduced the UK's reliance on coal generation from 30% to below 1% since 2014.[34] **The UK has committed to ending coal electricity generation no later than 2025** and is encouraging other countries to follow suit. The carbon price remains one of several efficient tools in driving decarbonisation.

The government has also ensured that security of electricity supplies remains paramount as the country decarbonises. Since it was established in 2014, the Capacity Market has helped maintain sufficient supply of electricity generation, providing generators with competitively auctioned contracts to be available at periods of peak demand. The UK is also building the first nuclear power station in a generation, at Hinkley Point, which will provide reliable low carbon electricity to power the equivalent of around six million homes a year once it is operational later this decade.

The 2050 net zero goal provides the trajectory within which the government will continue to decarbonise the power sector, while ensuring that the right balance is struck between reducing power sector emissions, maintaining the security of the system and ensuring electricity remains affordable for households and businesses.

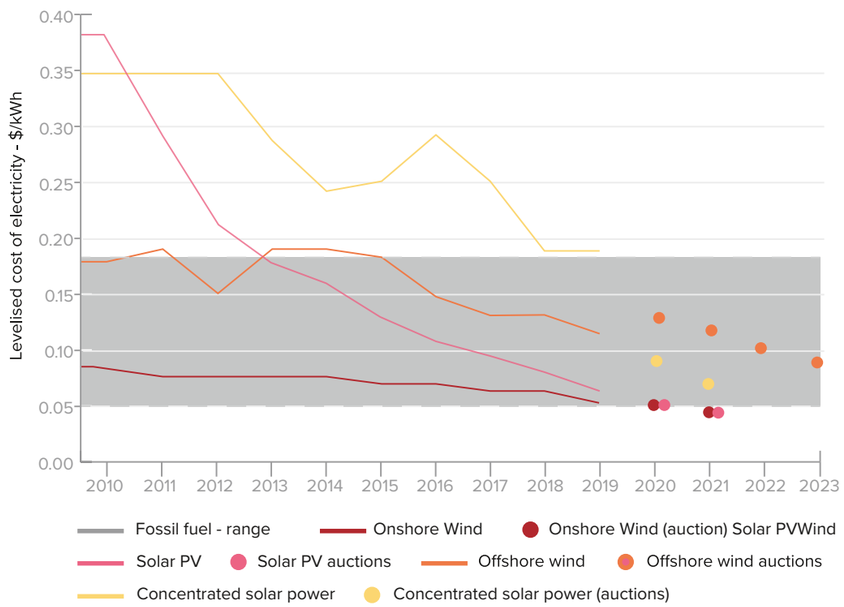
To achieve net zero by 2050, the power system will need to be virtually carbon free and significantly larger to cope with the additional demand from electrification in transport, heating and some industrial processes. This expanded system will require increased investments in network infrastructure, sources of flexibility, such as interconnection, demand response and storage and enough low carbon generation capacity to provide the vast majority of the UK's electricity needs.[35]

The bulk of this generation needed by 2050 will likely be provided by low cost renewables. However, given their intermittent nature there will also be a requirement for more reliable sources of power in the future energy provision of the UK. In particular, power generated from nuclear or power stations that burn hydrogen, or gas with carbon capture and storage. The government will therefore ensure private capital investment is able to continue to finance the energy transition and allow these technologies and network investments to come forward.

There will be decisions on how quickly capital-intensive energy infrastructure is deployed, where the government will ensure costs are minimised and distributed fairly across different groups. The Net Zero Review will look at these questions in more detail, and in spring 2021 will set out how the government will approach such distributional issues and ensure the UK benefits from the opportunities, as well as who bears the costs of the transition.

Price of renewables globally

Source: Climate Change Committee Progress Report 2020



Around £20 billion a year is invested in the energy sector,[36] and there continues to be strong appetite for investment in sustainable energy projects with good environmental, social and governance credentials. The government has played a critical role in bringing technologies to market and reducing the cost of capital through the Contracts for Difference scheme. This competitive support mechanism is now well established and will help support the deployment of renewables as well as other forms of low carbon power.

Other financing models will also be vital to power sector decarbonisation. The Regulated Asset Base (RAB) model has played an important role in encouraging investment into complex infrastructure projects and the government is considering its replicability for energy projects such as nuclear power and carbon dioxide transport and storage.

Renewables

To deliver net zero, the share of generation from renewables needs to dramatically increase. While the UK leads the world in the deployment of offshore wind, greater generation capacity will need to come from onshore wind and solar as well. As recommended by the National Infrastructure Commission (NIC**), the next auction round for Contracts for Difference in 2021 will include technologies such as onshore wind and solar PV.**

The government has also set out an increased ambition to achieve 40GW of offshore wind by 2030. To begin on this path and to increase the amount of renewable capacity needed to further decarbonise power, the government has announced an ambition for the 2021 Contracts for Difference Auction to support up to double the renewable capacity procured in the 2019 round, subject to maintaining competitive tension in the auction.

The government will continue to support the deployment of renewables through competitive Contracts for Difference auctions every two years, with the next due in 2021. Contracts for Difference have proven successful in reducing the cost of capital for renewable technologies, but this has insulated generators from price signals, potentially failing to incorporate the total system costs of intermittent renewables. As the NIC recommended, **the government will ensure that total system costs are considered in designing future Contracts for Difference rounds as far as possible and will publish a call for evidence on the evolution of the Contracts for Difference regime** to explore these issues further.

As renewables deploy at greater volumes it is likely that investors will look to the post-contract market revenues available and will wish to understand what the power market could look like with increasing zero marginal costs generation on the system. The government will continue to ensure that support mechanisms evolve to consider the total system benefits provided by competing generation technologies and flexibility solutions.

Building the sector has required considerable consumer-funded subsidies, which are forecast to reach over £10 billion annually by the end of the year. Following the 2019 auction, however, the latest offshore wind contracts are expected to deliver clean electricity at very low costs, and could even begin generating at below market prices when they start operating in the mid-2020s, meaning a better deal for consumers.

Consistent with the target of 40GW offshore wind by 2030, the government expects around 65% of electricity generated in Great Britain to come from renewable sources by 2030. However, the need to ensure that generation can be brought forward sustainably and at least cost to consumers, and that the sector contributes appropriately to the UK's overall climate goals, means that this is not a strict renewables target.

In partnership with industry, the government will enable the UK to harness more of the economic benefit from the accelerated deployment of renewables technologies, alongside the clean electricity it produces. The Offshore Wind Sector Deal with the renewables sector continues to support these efforts.

As a greater number of offshore wind farms are deployed off the British Isles, there will be many jobs created across the UK. To harness the potential of this new industry **the government has announced £160 million to upgrade UK ports and manufacturing facilities**. This infrastructure funding could help the sector support up to 60,000 direct and indirect jobs by 2030. The offshore wind industry has set a target in its Sector Deal, to secure 60% UK content for the offshore wind supply chain. The government will consult on the introduction of more stringent supply chain plan requirements in future Contract for Difference, including consequences for non-delivery.

The government has also committed to support the development of floating offshore wind, setting a target of 1GW deployment by 2030 to ensure the UK establishes a leadership position in the next generation of offshore wind technology.

Nuclear

Nuclear power has long played an important role in UK power generation and will continue to do so provided it can be delivered to time and budget. Hinkley Point C will be the UK's first new nuclear plant in a generation, and has continued construction throughout the pandemic by adapting to new working environments.

Nuclear is a proven, value-for-money source of reliable low carbon power which can complement renewables. **The government is pursuing large-scale nuclear projects**, subject to clear value for money for both consumers and taxpayers and all relevant approvals, with further details to follow in the *Energy White Paper*.

As outlined in the *Ten Point Plan for a Green Industrial Revolution*, **the government will provide up to £525 million to bring forward large-scale nuclear and invest in the development of advanced nuclear research and development** (R&D), including up to £385 million in an Advanced Nuclear Fund for small modular reactors and advanced modular reactors. This is alongside £220 million for nuclear fusion.

Last year, the government consulted on a nuclear Regulated Asset Base (RAB). The government is considering the responses to this consultation and expects to publish a response in due course. Alongside considering the RAB model the government will also continue to consider the potential role of government finance during construction, provided there is clear value for money for consumers and taxpayers.

Carbon capture and storage

Carbon capture and storage (CCS) will be essential for net zero. Power stations with CCS technologies could provide valuable low carbon electricity when renewables are not generating by capturing the emissions from biomass or gas-powered power generation. CCS will also be essential to decarbonising large parts of industry, producing low emissions hydrogen and in delivering greenhouse gas removal technologies, permanently locking away carbon dioxide.

However, the technology has not been delivered at scale and significant risks remain. Therefore, the government will play a central role in bringing forward this complex infrastructure in partnership with industry over the next decade. The CCS Action Plan sets out the ambition to deploy CCS at scale in the 2030s.[37]

To help deliver on the government's ambitions, Budget 2020 announced that the government will establish CCS in at least two UK sites, along with at least one CCS power station, using consumer subsidies.

The government is now increasing that ambition, and will:

- **Invest £1 billion to bring forward four CCS clusters by the end of the decade, with two to begin construction by the mid 2020s;**
- **Set an ambition to capture 10 megatons of carbon dioxide per year by 2030**; and
- **Outline further details in 2021 on a revenue mechanism to bring through private sector investment** into transport and storage, power and industry CCS and hydrogen projects via new business models to support these projects.