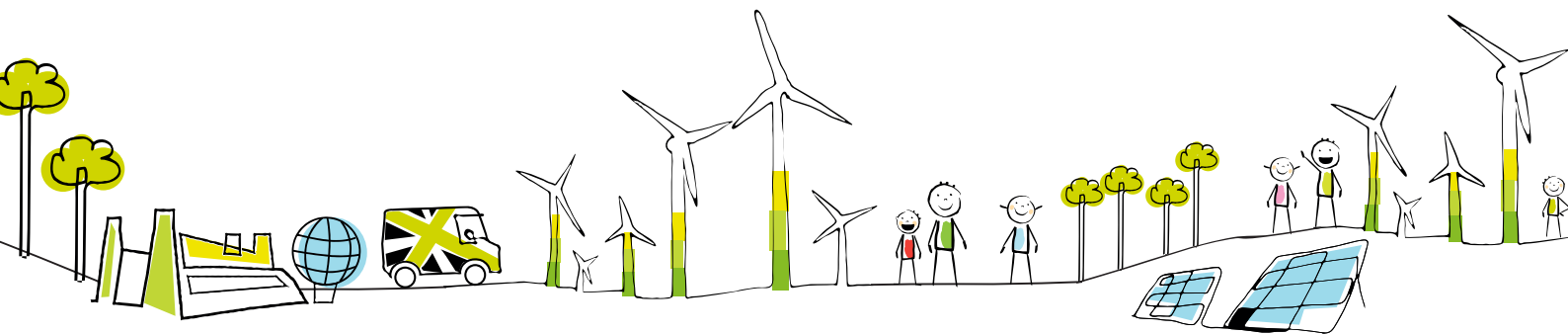


Ecotricity's 2030 Vision for a Green Britain

Where we should be, and how we get there



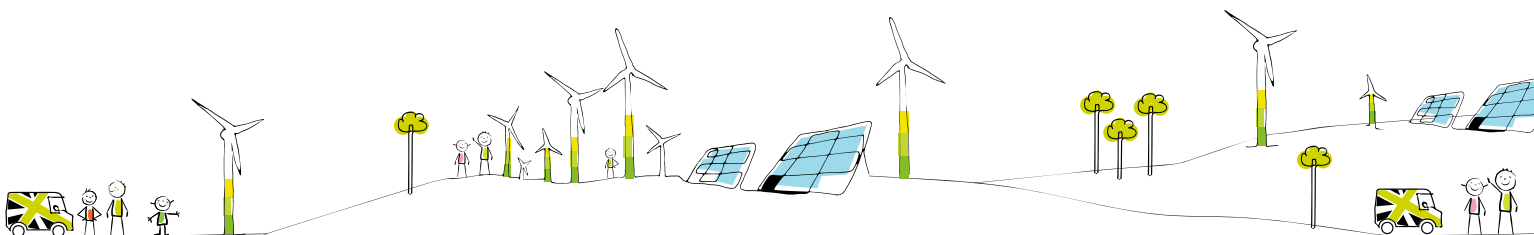
5 May 2015

ecotricity

Can you imagine a Britain in which... ?

- Renewable energy powers 80% of our country
- More than 2 million people work in the green economy
- There are no coal-fired power stations by 2025
- Subsidies for fossil fuels are phased out by 2025
- Every new car on the road is electric
- The UK has a Minister for Carbon and an annual carbon budget
- We change the way we measure energy to capture the true cost of oil
- There's a duty on meat to account for its true environmental impact
- Households save more than £1bn a year with electricity smart meters
- We ban the dumping of recyclable goods in landfill by 2025
- 'Quantitative Greening' is deployed by the Bank of England directly into renewables

We can.



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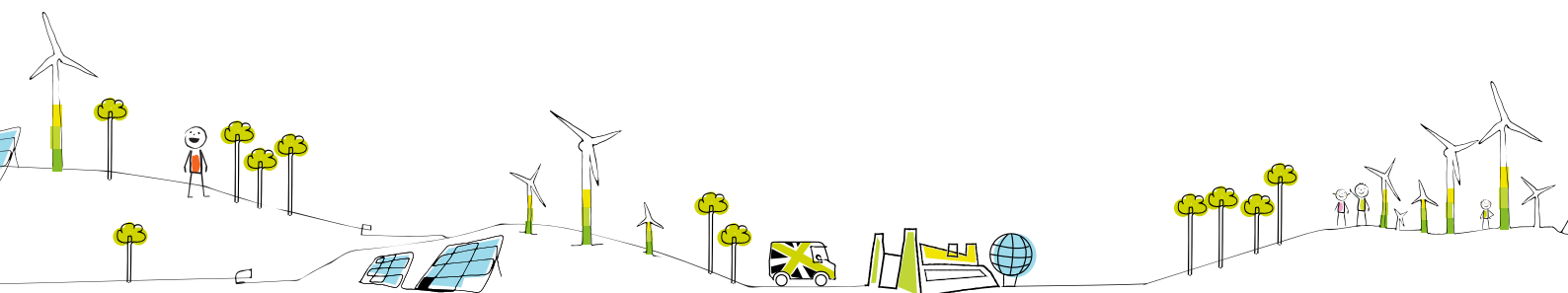
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The road to 2030



The politicians we put in power in 2015 will lead the UK through a period which will go a long way in deciding our low carbon future. The decisions they make – the decisions we make them make – will make all the difference to where we are in 2030. This election should be about our green future. The next government has to be.

Britain has made real progress in reducing its carbon footprint in the last two decades. We've started to generate energy in new ways. We've started to buy and think differently. Government has done some smart things. But we have to go much further and under the current government progress has slowed too much. We need to set some targets for where we want to be in 2030. And we need a roadmap to get there. It will mean tough decisions and it will mean accepting a change in how we do things.

We have to start with energy, transport and food. Together they make up 80% of each of our carbon footprints, and if we are serious about climate change, we are going to have to apply the best of British ingenuity to reduce our impact on the planet in each of these three areas.

There will come a time when people will laugh at the idea that instead of producing our own energy from free wind and sunshine, we used to pay someone else to do it. When they will be shocked that we used to send billions of pounds overseas every year to foreign governments just for the privilege of burning their natural resources and polluting our planet. When people will watch their carbon footprint like we watch our weight.

That time can be and has to be nearer than we think. It can be 2030, which in energy terms is just around the corner. This document is not a report and it is not a forecast – it is an attempt to imagine what it might be like to look back at these choices from one possible 2030. It is intended to be fun and to spur your imagination. It sets out some of the costs and benefits, and some of the changes we will have made. We crunched the numbers (which you can find online at www.ecotricity.co.uk/2030-vision) and thought about the big political decisions on the way.

The result is our take on where we think Britain should be in 2030 on those three big pillars of energy, transport and food, and some ideas on how we get there. Some of it is a stretch. Some of it is easier than we think. All of it is possible. Think about it, sign up to it; send us your own views on where we could be more ambitious, more ingenious or more practical.

Most importantly, in this election year and this parliament, make sure our politicians take the big decisions. To get to the place we describe in here, these are some of the biggest:

- We need to commit the UK to a carbon intensity target for power generation of 50gCO₂/kWh by 2030 as recommended by the Committee on Climate Change. This is the only way to squeeze dirty energy out of the mix.
- To reach this target we need to stop burning coal to generate electricity. The government thinks we can do this at some point in the next decade. We need a target of 2020.
- We need to set a target of 80% of UK power generation from renewables by 2030.
- The Overseas Development Institute estimates that we are giving away up to £750 million to the North Sea oil and gas producers a year, we need a complete phase out of subsidies and tax breaks for fossil fuels in the UK by 2025.
- We need to set a target of no new diesel or petrol car sales in the UK by 2030.
- We need to commit the UK to the circular economy targets postponed by the EU in 2015: an increase in packaging recycling to 80% by 2030; a 30% reduction in food waste by 2025 and a ban on sending any recyclable material to landfill by 2025.

At Ecotricity we can imagine this. Can you?

Dale Vince OBE

There will come a time when people will laugh at the idea that instead of producing our own energy from free wind and sunshine, we used to pay someone else to do it.

Green Britain

Looking back from 2030

In 2030 Britain is a decarbonised country. By no means completely carbon free, but to an extent that many in 2015 would have found hard to believe. The cars we drive and the trains we ride in are overwhelmingly powered by electricity, over 80% of which comes from renewable sources. We are much more energy independent – both as a country from overseas suppliers and as individuals from large monolithic energy companies. We have dramatically changed the way we recycle and the way we deal with waste.

We got there through a combination of personal commitment and political will. It started in the first decade of the 2000s with British support for tough European limits on greenhouse gas emissions, transitional support for renewables and even a bit of old-fashioned industrial policy to encourage research and investment. But it was the 2016 Green Britain and Circular Economy Britain legislative packages put in place by the government that proved the real turning point. They first put an intense squeeze on hydrocarbon-based energy and gave a fresh boost to renewables and the rollout of electric vehicles. The second picked up circular economy waste targets which the EU had dropped and implemented them unilaterally. From these tough frameworks flowed a decade of public and private sector innovation to find the technological, business and political solutions required to deliver Britain's ambitious targets.

Needless to say, there were critics and sceptics. The biggest argument was about cost. Cost to businesses and consumers who were still recovering from the long downturn that followed the 2008 banking crisis. But in the end the issue turned out to be a lot less acute than many thought. The amount it cost for every kilowatt hour of electricity rose as the costs of supporting the transition to renewables filtered through to consumers. But the impact was offset because overall usage fell for almost everyone as smart metering and other forms of energy efficiency took off¹. Perhaps most important politically was the bold decision in 2016 to move renewables levies from bills and fund them from general taxation, which took some of the heat out of the debate, even if it meant some fiscal squeeze. By the early 2020s the net cost/benefit of the transition were in any case moving strongly into the positive, both economically and environmentally.

In 2030 Britain is a decarbonised country. This is how we got there.

Energy

By 2030 the way in which Britain powers itself had undergone a revolution that spread all the way down from the Big 6 to British families. Even though new renewables installation was outpacing fossil fuels as early as 2013, the swiftness of the transition to a low carbon power sector, accelerated by the government's 2016 Green Britain Package, took many by surprise. Remnants of the old system remain – some of Britain's old gas fired power plants are still providing back-up generation – but Britain's energy system is now cleaner and more decentralised than ever before.

As a result, Britain's power sector successfully met the government's tough 2016 target that required it to be virtually emissions-free by 2030 (Figure 1).

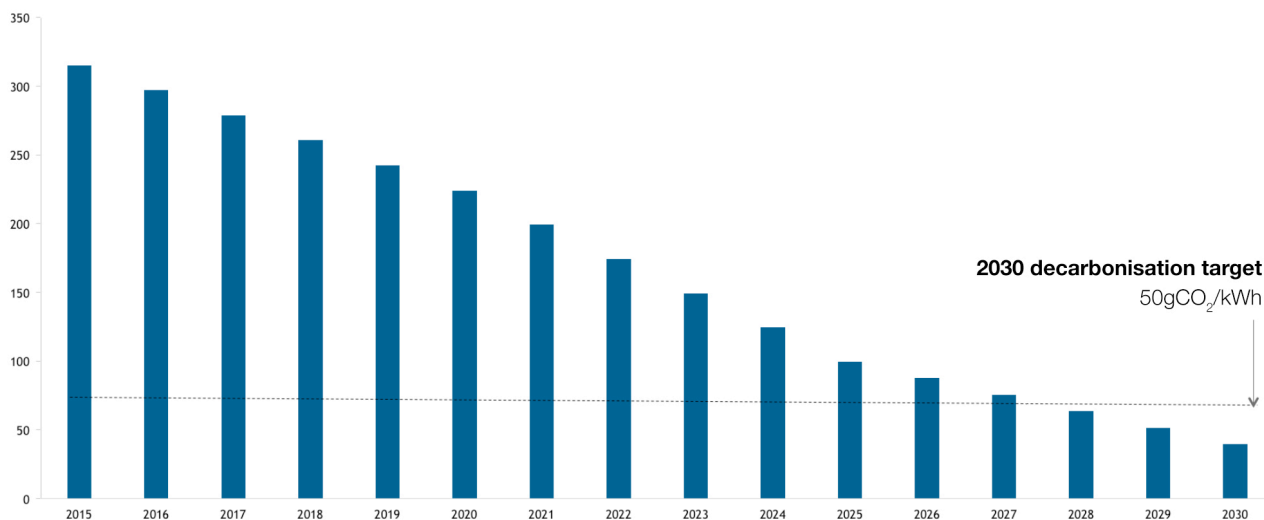


Figure 1. Carbon intensity of Britain's power sector (gCO₂/kWh)

Renewable Britain

In 2030 Britain is producing over 85% of all its electricity from renewable energy sources (Fig 2). Almost half of all electricity in Britain comes from offshore wind, harnessing our high wind speeds and taking advantage of our shallow seas. The installation of the fleet was slow at first, but picked up quickly after 2016 and by 2020 continued government support and a clear commitment to the technology had helped bring down costs by 25% compared to 2014. It was a sign of the times when the oil price crash of 2014-2016 led technical experts from the declining North Sea offshore oil and gas industry to ‘see which way the wind was blowing’ and move to apply their technical skills and expertise in the rapidly expanding offshore wind industry.

Offshore wind really came into its own in the 2020s. Following the government decision to fund centres of engineering excellence in conjunction with industry at selected British universities, the technology advanced rapidly, raising efficiency and cutting costs as turbines reached up to 10MW ratings – with each blade as long as a football pitch. The industry began to reap the scale benefits of Britain’s expanding fleet of turbines, standardising the design of offshore foundations and reducing the operations and maintenance hours required for each turbine which brought costs down further.

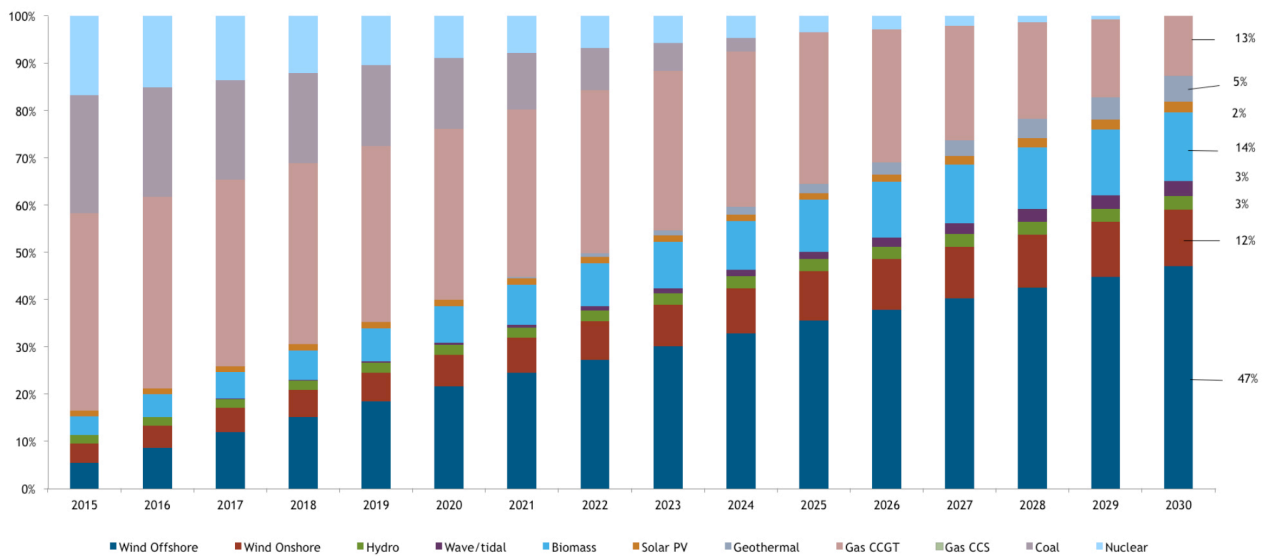


Figure 2. Britain's electricity generation mix

The industry also brought European partners together. In the 2020s the entire North Sea region saw new offshore grid solutions put in place by the North Sea Countries' Offshore Grid Initiative². This brought together ten European countries to finance and construct efficient grid systems which could send power back and forth between each country depending on where and when the wind was blowing, reducing volatility of supply and lowering costs. Looking back from 2030, the British government's forecast – which looked overly optimistic when it was made in 2013 - that offshore wind installed capacity could reach up to 39GW far undershoots where we are today (Figure 3).

Britain in 2030 has significant onshore wind too, with installation expanding after 2019 when

it became competitive without any government support, and particularly after it became acknowledged as the cheapest form of electricity under the new Integrated Net Cost of Energy (INCOE) measure, brought in from 2025 (see Box 1)⁴. British companies led the build-out of wind farms as more energy companies followed the ‘bills to mills’ business model pioneered by Ecotricity. The public responded enthusiastically to the idea of seeing their energy bills channelled into more clean renewable energy installation rather than into the pockets of foreign shareholders. As a result the nascent professions of wind energy engineer and technician boomed – at the peak in 2028 the onshore and offshore wind industries were directly responsible for 35,000 jobs in the construction, operation and maintenance of wind farms with another 45,000 indirect jobs created.

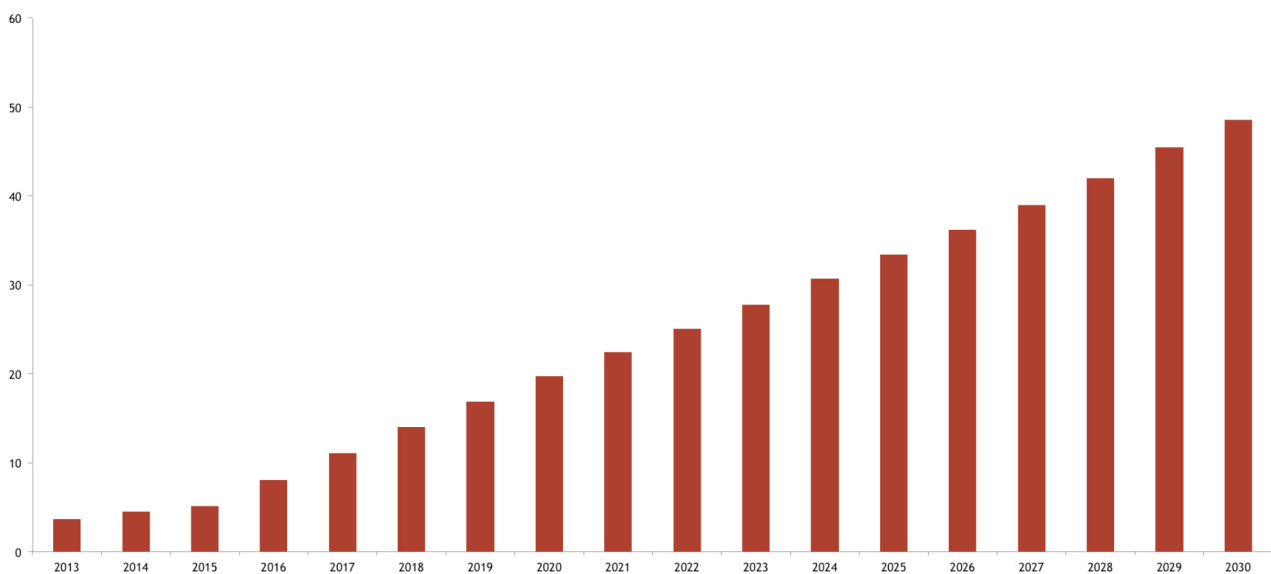


Figure 3. Britain's offshore wind installed capacity

Solar too is doing its bit in 2030, although Britain hasn't got any sunnier and people still complain about the weather. There are some larger scale solar PV parks in parts of Britain, but the most important impact of solar has been the increasingly large number of people who have put solar panels on their roofs. For some this means solar panels providing electricity to their homes. But the most notable success has been solar heating, which is now providing hot water to millions of homes in Britain.

By 2030 the seas around Britain host world-leading wave and tidal power technologies. After the successful but expensive 320MW tidal lagoon pilot project in Swansea began generating in 2018, the industry began to bring down the cost at subsequent sites in Cardiff and the Severn Estuary, which at 2000MW are approximately seven times larger than the pilot⁵. In 2030 wave and tidal technologies are only providing 3% of Britain's electricity, but the developers believe they are on track to ultimately meet their initial 2015 estimate that the technology could provide up to 8%. The government has also chosen to take the longer view, recognising that despite the large upfront cost for tidal lagoon projects, they can keep powering British homes over an estimated 120 year lifespan. Scientists and engineers are continuing to develop the technology with Heriot Watt and Swansea University, Universities of Edinburgh, Aberdeen, Strathclyde, the Highlands and Islands, and the National Oceanography Centre and Marine Scotland Science all working together to advance both wave and tidal projects⁶.

Carbon-free electricity is not the only form of renewables. In 2030 the UK has made significant strides in replacing gas which is drilled – or fracked – out of the earth with gas produced from household, agricultural and commercial waste. This process of anaerobic digestion takes place at Green Gasmills around the country, fuelled by a number of different waste types. Particularly successful has been the use of certain grass varieties which produce good quality Green Gas when they decompose. The grasses are now widely grown on marginal land which is too poor quality to be cultivated, supporting British farmers with a new source of income without impacting on food production⁷.

Arguably the biggest political developments on renewables have been in the debate on cost. Although it was controversial, in 2016 the government decided to move levies for both social policies like the Warm Home Discount and environmental policies including renewables support off energy bills and into general taxation. The move caused some uproar, but was welcomed by both industry, who were glad to see bills for their customers go down, as well as those who thought that it was fairer than keeping levies ‘on bill’ which was regressive as it meant that the poorest and the richest were paying the same. In any case, by 2020 neither onshore wind nor solar PV needed government support to be competitive with coal and nuclear. But the real change came as thinking moved to a more holistic understanding of the costs and benefits. Once the government had officially moved to the Integrated Net Cost of Electricity as its key metric for assessing Britain’s energy choices in 2025, the prospects for renewables were transformed.

1. Integrated Net Cost of Energy (INCOE)

Introduced in 2025, after rigorous testing by the Department of Energy and Climate Change and scrutiny in parliament, the new Integrated Net Cost of Electricity (INCOE) measure revolutionised the way in which Britain understands the cost, and benefit, of its energy choices to our economy and society. It wasn’t popular with the oil, gas and coal industries because it revealed the true cost of burning fossil fuels. But fortunately the government stuck with it.

The need to develop new ways of measuring the overall costs and benefits of different energy choices was recognised early in the 2000s as a necessary antidote to the sort of short term thinking which argued that we should just burn dirty coal for our power because it was ‘cheap’. The first step was the launch of the European carbon market in 2005 which tried to make dirty sources of energy pay for their pollution. But once people noticed that the price of energy didn’t include the cost of its pollution, companies, academics and civil servants began to think about what else wasn’t being included. As more research was done, people began to realise that a whole raft of costs were not being considered, making it impossible to make the right decisions on how Britain should be powering itself.

People pointed out that Britain was exposed to political threats to its oil and gas supply, but the cost of insuring against this risk wasn’t included in their price. Britain was paying for the need to back-up renewables for when the wind isn’t blowing or the sun isn’t shining, but this wasn’t included in their price. Britain was paying to dispose of nuclear waste, but this wasn’t included in the price of nuclear power. Even though we had the European carbon market, it wasn’t working properly and the real impact of carbon on our environment wasn’t included in anything’s price.

But just as important as the costs which were not being paid for, the benefits of different energy types were not being accounted for either. Most importantly this included the massive economic opportunity for Britain of building out a renewable energy industry. When we looked at the costs and benefits of renewables we weren’t measuring the new jobs and new businesses, the rejuvenation of the communities who would build parts for wind turbines and solar plants. We were looking at the picture with one eye closed.

And when all of these costs and benefits were taken into account, it showed something remarkable. In 2025 when all of the impacts on the environment and people’s health were taken into account for coal, and all the benefits of the jobs, new businesses and tax revenues were taken into account for the offshore wind industry, coal was shown overall to cost Britain the most, and offshore wind the least! After that Britain’s energy choices were made while firmly focussed on the bigger picture.

Renewable policy as industrial policy

The revolution in British electricity generation has in 2030 been matched by a revolution in the way politicians think and talk about renewable policy. One important step was the appointment of Britain's first Minister for Carbon (Box 2). Although the main aim is still tackling climate change, the economic opportunity of renewable energy is now clear and a driver of policy. What really set off the change was the realisation by the incoming government after the 2015 election that the rest of the world was developing, producing and installing renewable energy technology not just for its climate benefits, but for the economic benefits. China, Germany, Japan, the US were all seeking to establish their own national champions and first mover advantages in the field of renewables – companies which would be global leaders in the technologies necessary for the world to decarbonise. The British government started looking at where the money was flowing. The previous year in 2014 Europe had installed more wind power capacity than gas and coal combined, and China had added 50GW of new renewables in one year – equivalent to over half of all of Britain's power plants⁸.

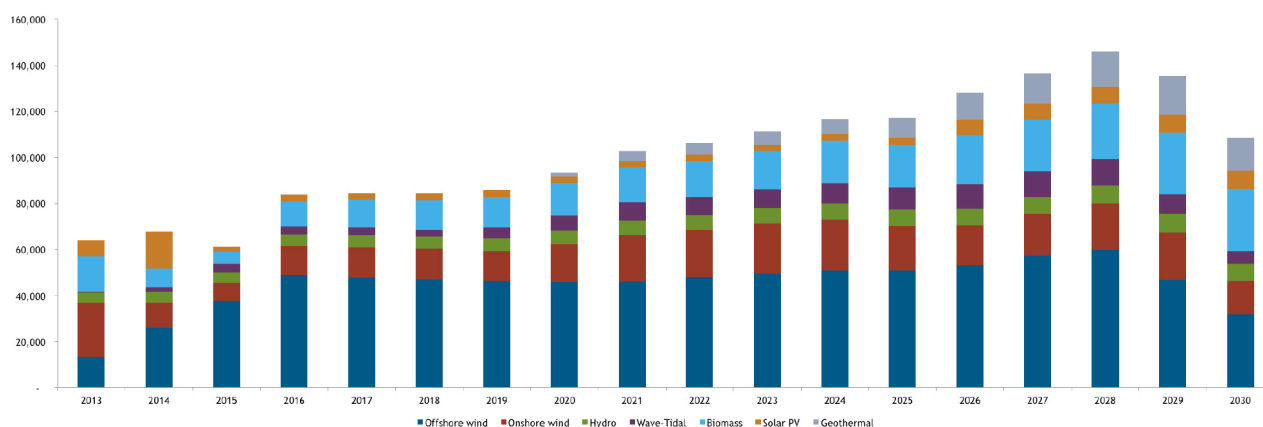


Figure 4. Direct and indirect employment in renewables sector

Motivated by this, the UK government, led by the new Minister for Carbon, set about building the partnerships and capacities that Britain would need to compete with the best companies in the world. The starting point was the £310 million investment by Siemens and Associated British Ports in what became a world-leading offshore wind production hub - Green Port Hull at Alexandra Dock – which initially brought 1000 jobs to the area when it became operational in 2017⁹. Over the course of the next decade government-backed industry R&D partnerships with the Universities of Keele, Sheffield and Manchester, and in Scotland with University of Dundee, Aberdeen and Robert Gordon University focused on commercial renewables technology. As the opportunity in the sector become clearer investment flowed in. Competition for apprenticeships in the industry have now become the greatest prize in British engineering for young engineers. By 2030 the total contribution to British GDP of the offshore wind industry was over £14 billion with deep and job-rich supply chains being developed across the north-east in particular¹⁰ (Figure 4). Most importantly, the complexity and scale of the turbines meant that components could not just be shipped in from abroad and assembled like the previous coal, gas and nuclear fleets. They were made in Britain.

Building on this strong base British based offshore wind companies began competing fiercely

in other markets, exporting their manufactured components, technology, and expertise to markets within reach like Belgium, Netherlands, Denmark, France and to Europe's second largest offshore wind market, Germany. British offshore companies also developed consultancy businesses which spread their expertise as far as the US Atlantic coast and Gulf of Mexico, China and South Korea.

While some of the most obvious impacts were felt in renewables, Britain's green economy continued to broaden and grow. At its peak the whole green economy was estimated to have provided over 2 million jobs in Britain as companies got to work on the national roll out of smart meters, massive energy efficiency programmes to upgrade Britain's housing, and transforming the national grid into a smart grid. Off the back of this Britain's traditional strengths in design, creativity, and tech came through as the British car industry turned its skills to electric vehicles, British design houses turned to the green agenda for inspiration, and software companies delivered disruptive new apps for energy services businesses.

'Quantitative greening' and the role of The City

The 2016 Green Britain package was backed up by the government's legislation requiring the Bank of England to begin what the press quickly labelled 'quantitative greening'. This programme of buying up large volumes of bonds issued by the Green Investment Bank was the result of a considered judgement that financing investment in new green infrastructure, bringing jobs and long term benefit to the real economy, was a better way of boosting growth than simply funnelling more money to the banks in the hope they would lend it. The result was an enormous victory for what was a long-running campaign led by Green MP Caroline Lucas which had begun back in 2011¹¹.

2. Britain's Minister for Carbon

One of the landmark moments in the journey to 2030 was the Prime Minister's decision to appoint the world's first Minister for Carbon in 2016. The minister, operating close to the Prime Minister out of the Cabinet Office, now has a wide-ranging brief to ensure the government is doing all it can across the country to make sure that Britain will meet its 2050 target of an 80% reduction in CO₂ emissions compared to 1990. Once a year the minister now makes their 'Carbon Budget' statement to parliament on Britain's progress in cutting emissions for which they are personally accountable.

One of the most important functions of the minister has been to bring together all of the strands of Britain's low carbon strategy. The Department of Energy and Climate Change (DECC) had been doing a good job, but it didn't have the mandate or the resources to look at all the areas where Britain could cut carbon. And once the minister began putting together her strategy, it became clear just how wide the scope was. DECC was the obvious place to start, but under her remit came aspects of the work of a whole range of departments: Transport; Environment, Food and Rural Affairs; Health; Business, Industry and Skills; Foreign Affairs; Defence; and of course the Treasury.

Since the first appointment there have been good ministers for carbon, and less good ministers for carbon. But overall British climate action policy is now more joined up, strategic and effective than it ever has been. Promises to be the "greenest government ever" are no longer being followed by demands "to cut the green crap". Whenever departments are working at cross-purposes, they are brought together by the minister's team to thrash out a solution rather than working at loggerheads. Although it didn't go down well with the Chancellor of the Exchequer, every time the Treasury decided to undermine support schemes for renewables they had to justify it to the minister for carbon.

The position of the minister has proved popular with businesses – both green businesses and carbon intensives – as a source of certainty and predictability for future policy, allowing them to plan for the long term. And the British model has proved influential elsewhere too. The minister now has a colleague in every European capital and they meet together twice a year to discuss best practice and the progress being made towards Europe's 2050 target of an 80-95% reduction in carbon emissions compared to 1990. The EU appointed its first Carbon Commissioner in 2020.

The solution was technical, and really stretched the economic orthodoxy of the time, but provided billions of pounds for critical infrastructure upgrades. The first step was to get the relevant government bodies such as local authorities, NHS trusts and above all the Green Investment Bank – which was granted its own borrowing powers after the 2015 election - to issue more debt. For European legal reasons this had to be bought by private banks first, but the government passed a law which required the Bank of England to purchase it immediately after that using the money that it continued to print. So instead of using this new money to buy the debt of private banks, the Bank of England was giving it to local authorities to build new energy efficient housing stock and upgrade old draughty houses, to NHS Trusts to improve energy efficiency in hospitals and cut energy costs for the NHS, and most of all to the Green Investment Bank to finance renewable energy projects and grid upgrades for the country.

This boost to the economy reached up to £50 billion a year initially, and was increasingly matched by private finance from pension funds insurance companies. One of the most transformative impacts was on the Green Investment Bank itself, which was transformed from a hobbled niche player into a ground-breaking policy intervention taking on the risk of developing new ways of financing green energy which were swiftly followed by commercial money. It was, and still is, one of the hottest jobs in British finance for socially-minded financiers.

As the boost to the economy became clear, and the economy approached full capacity, the programme was wound down to mitigate the risk of inflation. But the City of London had been quick to see the opportunity. The City evolved into a global centre of expertise in project financing for renewable technologies across Europe and North Africa. Capital flowing out of fossil fuels flowed into project finance for renewables, equity in renewables technologies and services and ‘green bonds’ explicitly aimed at financing sustainable projects such as smart grid development, offshore wind farms, and large-scale energy efficiency programmes. Worldwide, green bonds took off in 2014, with just under \$40 billion offered to investors, doubling the size of the market in a single year, but still small change compared to the global Green Bonds market in 2030 which is worth over \$18 trillion. This remains far short of the \$53 trillion the International Energy Agency in 2014 projected we will need by 2035 to fund the global energy transformation, but represents a huge shift in investment priorities nonetheless¹².

The fate of fossil fuels and nuclear

When the government announced in 2019 that it was going to focus on phasing out unnecessary subsidies, most people thought that they were talking about support schemes for renewables. Certainly, the government reflected the falling costs for renewable technologies by ratcheting down the level of support. But what surprised people was the government’s focus on removing subsidies for fossil fuels, a move long overdue considering that the G20, including the UK, had originally committed to doing so back in 2009. The axe fell on subsidies for oil and gas – which some estimates had totalling as much as £750 million a year – as the government decided to stop subsidising climate change, and began the process of completely phasing out tax breaks for oil and gas extraction by 2025¹³. It also

didn't hurt that the continuing low oil price meant it was making far less back in royalties and taxes than it had done previously. The government also phased out subsidies on consumption of fossil fuels, with the government raising VAT on domestic use of gas, heating oil and coal from 5% in stages up to the standard rate of 20%.

Despite the rapid progress, some gas-fired electricity generation remains in the mix in 2030 as backup for the variability of renewable generation. That notwithstanding, Britain's power sector managed to meet the government's 2030 decarbonisation target of 50gCO₂/kWh a year early. The government's commitment to ban new coal-fired power generation from 2020 – announced alongside its decarbonisation target in 2016 - actually turned out to have less impact than people had thought it would. The large-scale switch from coal to gas-fired power plants had already begun in 2016 as the doubling of the British carbon price floor in 2015 from £9.54/tCO₂ to £18.08/tCO₂ saw coal plants switching off and mothballing, particularly as gas prices stayed low¹⁴.

Britain's last nuclear power plant was switched off in 2025, after a heavily contested (and much lobbied) decision by the British government. One of the major turning points was the successful challenge at the European Court of Justice of the British government's decision to subsidise the new plant at Hinkley Point C which was led by the Austrian government and supported by a number of green groups and companies – including Ecotricity!¹⁵ Once it became clear that Britain wouldn't be able to build new nuclear plants, the launch of the Green Britain package in 2016 brought into question why we couldn't eventually take the old ones offline. From there the 'No Nuke Britain' campaign's momentum simply took off.

For some time British governments hesitated on the development of Britain's shale gas resources. Fierce local opposition which focused on fears of water contamination, stresses

3. Beyond the Big Six

Energy companies in 2030 have come a long way from the 'glory days' of the Big 6 - pumping out gigawatts of coal and gas-fired electricity in massive power plants before sending it miles across the country to our homes. Those of the big players that have survived have had to adapt to big changes since then, including the surge in renewables, as well as being able to deal with the millions of households and businesses which now generate their own power. When E.ON decided at the end of 2014 to split its business in two – with one company taking the 'new' businesses of renewables, distribution and customer services and the other taking the 'old' businesses of oil and gas production, nuclear and coal and gas-fired electricity generation - it was really just a matter of time before the others realised that their way of doing things had to change.

The new models for energy companies were led by the smaller, nimbler businesses which emerged around 2014. They realised that the future lay in enabling people to make their own energy choices, not just treating them as passive customers. They knew that in future people would be both buyers and sellers of electricity – homes would generate power, and couldn't just be treated as places where electricity goes in and money comes out.

This meant rolling out new technological solutions using the smart meters in combination with phone apps which allow people to measure and control their energy use at home, from wherever they are in the world. It meant new services which helped people use their energy-intensive utilities when it was cheapest, the electricity equivalent of only ever going shopping in the sales. It meant helping people become energy entrepreneurs, producing power from their own solar or wind sources and storing it and selling it back to the grid when the price is highest. While Britain's renewables were moving the country towards energy independence, British households up and down the country were achieving their own energy independence.

What really excited people was the idea that you could have one energy company to power your house and your car. Electric vehicles opened up a whole new market for energy companies who knew they could provide a single answer to the question of how to heat and light our homes and get where we need to be sustainably. People also like the control it gave them over the use of their car. Smart data allowed people to see easily and quickly on their phones how much they were using their cars, and how much it was costing them. They also knew that unlike the price of petrol, events on the other side of the world were not going to cost them at the pump.

on infrastructure and the impact on local communities remained a huge obstacle. As the energy companies battled on against regulators, political opposition and local activists, the downturn in the price of gas from 2014/15 was embedded as gas supplies came on-stream around the world in Qatar, the US, Australia and East Africa between 2017 and 2025¹⁶. Given the bottom line costs of fracking in the UK and the political opposition, companies simply decided it was not commercially worth the headache, and began to realise that Green Gas could take up the slack¹⁷.

People power

One of the biggest changes for energy in Britain in 2030 has been how people interact with their own energy usage and energy companies. This has moved way beyond the dreaded thud of the energy bill on the doormat every quarter. Despite some delays in the rollout, shortly after 2020 coverage for smart electricity and gas meters in Britain reached over 80% across Britain’s 30 million households and businesses. After a widespread education campaign led by the government-backed Smart Energy GB¹⁸, energy companies and consumer groups, the spreading use of smart meters started to pile up consumer savings – reaching more than £1 billion pounds annually in 2030 (Figure 5). If you include savings from overall energy efficiency, benefits for energy companies, and benefits in air quality the policy notched up £17 billion in savings in total¹⁹.

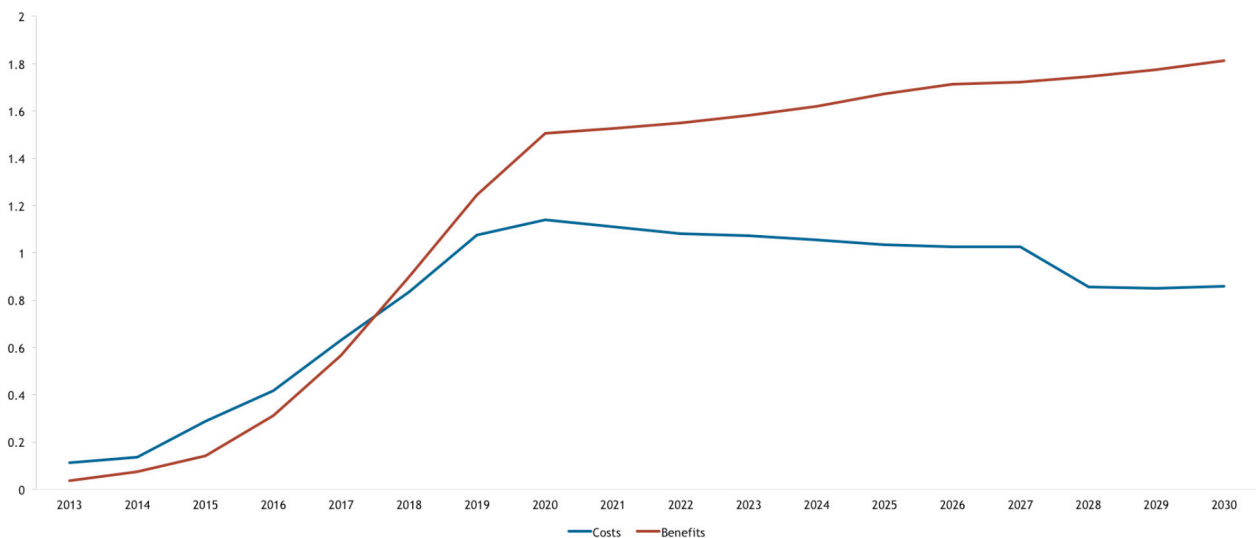


Figure 5. Smart Meter cost/benefits to household (£bn)

Smart meters which ‘talk’ back to supply companies have also been one of the crucial elements in the widespread rollout of small-scale decentralised generation on a household basis. Many households are now both selling and buying electricity from the grid, contributing to Britain’s sustainable supply, as well as shrinking bills. Investment in upgrading to a national ‘Smart Grid’ has allowed us to build a decentralised ‘intelligent power’ model with house generation and storage integrated into the grid as part of an interdependent and symbiotic relationship between the national grid, and people’s homes. A key component of this is decentralised storage, including small scale storage devices like Ecotricity’s ‘Black Box’ – batteries which fit in the cupboard under the stairs - allow families to store the solar and small

scale wind power they generate, selling their surplus back to the grid when prices are high, saving them money and provide stored energy for nights and sunless and windless days. And of course enabling homes to be powered off-grid during times of peak energy demand.

This new two-way relationship between people and energy companies has had a major impact on how energy companies in Britain work (Box 3).

In 2030 when people talk about energy independence they are mostly talking about households, not the country. One of the developments which has made that easier to achieve, in combination with smart meters and decentralised generation, is that British houses are simply using less energy. In part that is because appliances like our boilers, fridge freezers, and washing machines have become ever more efficient. But the biggest change has been in the heating and cooling of our homes which previously accounted for around two thirds of our home energy demand. Early bumps in the road for the Green Deal energy efficiency scheme were overcome when it was re-launched as the Green Deal Home Improvement Fund in June 2014. It proved enormously popular, with one of the first tranches of funding for households worth £30 million being claimed within 48 hours back in December 2014. This proved something of a turning point for British attitudes towards energy efficiency and overall the combination of more efficient appliances, better insulated housing stock, smart meters, and the ban on selling incandescent bulbs in major retailers have added up to significant savings on our bills. As consumers got the message that the cheapest energy is the energy you don't use, Britain kept improving efficiency including a total ban on incandescent and halogen bulbs in 2018.

TRANSPORT

By 2030 the contribution of domestic transport to Britain's carbon footprint has fallen by around 40% from the 2007 high point of over 130 million tonnes CO₂ equivalent. Amazingly this includes a halving of carbon emissions from passenger cars and vans (Figure 8). These reductions have mainly been delivered through introduction of new technology, above all the massive expansion of cars powered by Britain's clean electricity. People have also changed how they travel, walking and cycling more, but also using an upgraded public transport network. Much of the innovation began in British cities, spreading to the rest of the country. Overall change has left us with a Britain which is less dependent on foreign oil, less congested, and less polluted.

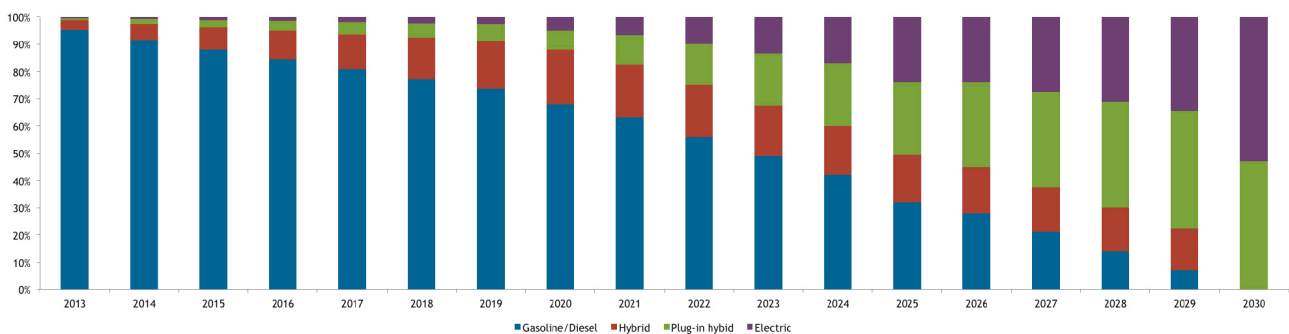


Figure 6. New car sales in Britain by type

Overhauling the British motor

The biggest development in transport in 2030 has been the change in the cars we drive. In 2030 there are over five million fully electric vehicles (EVs) in Britain, as well as over 11 million hybrid (HEV) or plug-in hybrid vehicles (PHEV) – together outnumbering the 12 million petrol and diesel cars still on the road. And the balance continues to shift, from 2030 all new cars are now either electric or plug-in hybrids (Figure 6 & 7). As a result charging facilities are a normal sight in Britain's garages, driveways and motorway services. Looking back, the uptake of electricity powered cars really began to accelerate from 2014 which saw a 300% increase of plug-in vehicles. This was from a very low base, but numbers continued to expand rapidly as people became used to seeing their friends, neighbours and colleagues driving EVs. Formula E racing was launched the same year, which brought some of the glamour of Formula 1 to electric cars, and helped to tackle the tired stereotypes²⁰.

It was always going to be a long road, and in 2020 Britain was still below its target of having 1.55 million electric and plug-in hybrid vehicles in the fleet. But the government was, and still is, committed to addressing emissions from cars if Britain is going to meet its CO₂ reduction targets, and a cross party consensus helped reduce the temptation to scale back ambition. The various incentives for EVs were consolidated in 2016 when the government removed the old schemes, and simply scrapped VAT on electric vehicles cutting the price by 20% and closing the gap between them and conventional vehicles.

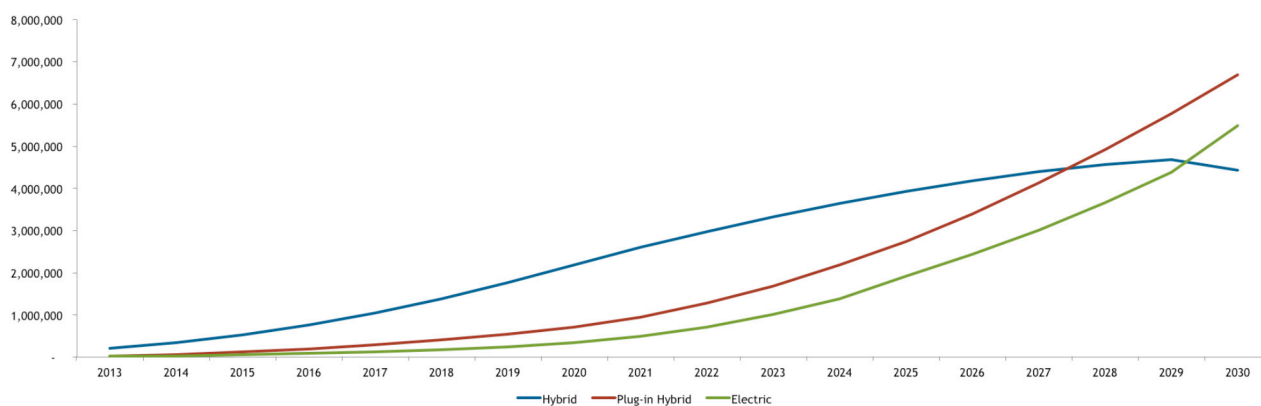


Figure 7. Number of hybrid, plug-in hybrid and electric vehicles on the road

There were other benefits too. Drivers appreciated both the low cost and price stability of electricity compared to the continuing fluctuations in the price of petrol. The efficiency benefits also became much more widely known. Including fuel production, only 15-20% of the energy put into a petrol or diesel powered internal combustion engine is used to move the car, with two thirds of this lost in just running the motor. Electric vehicles' motors lose only 4% of the original energy input and as there are negligible losses in power generation (as the wind and sun power is free!) overall 80% of the original energy input into an electrical vehicle is useful. That figure rises further to 86% for cars plugged in at source – those homes with their own power generation – which is over four times as efficient as a conventional vehicle²¹. Across Britain a number of cities followed London's lead, introducing congestion charges for

access to the centres of towns to improve air quality but with exemptions for EVs and lower emission vehicles. Local governments also began to use both procurement and licensing to ensure that government vehicles, taxis and buses all met carbon emission targets, increasingly through electrification. As the costs of EVs fell, the government began to cut back subsidies. In 2024, an RAC study suggested that the lifetime cost of owning an electric car, including the fuel costs, had become lower than for petrol cars.

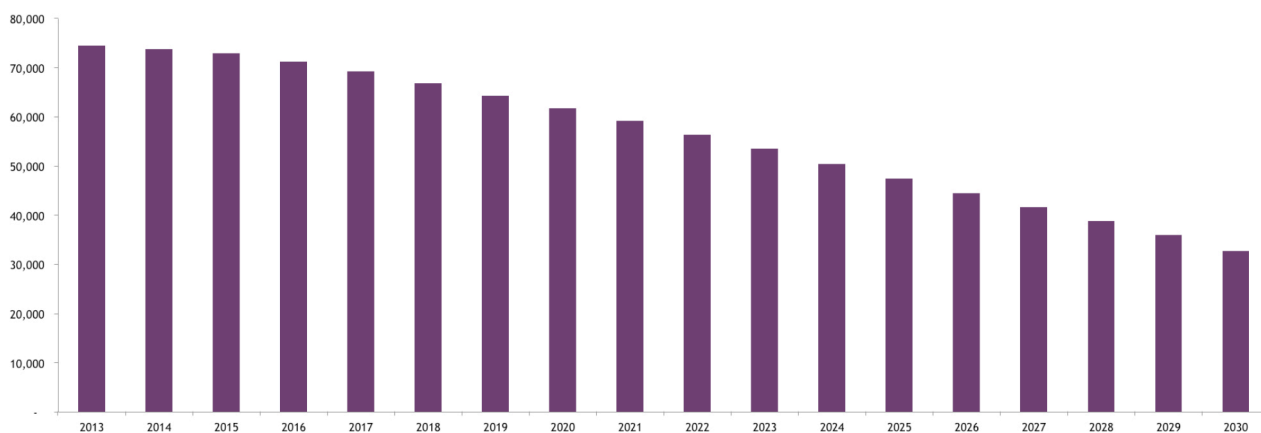


Figure 8. CO₂ emissions from British car and small van fleet (MtCO₂)

Arguably one of the most important developments was the widespread campaign from the manufacturers of EVs, NGOs and government to promote public awareness of the EV charging infrastructure which was much more extensive than many Britons realised. This helped tackle ‘range anxiety’ – the fear that EVs would run out of power out of reach for a charging station. The development of the Ecotricity Electric Highway – the first national network of electricity pumps - was instrumental in giving people ‘range confidence’²². Already by the end of 2014 a majority of motorway services had a rapid charger onsite which could power up an EV in less than half an hour. Brussels also helped out when in 2017 it restarted an original 2013 EU plan for mandatory rollout of public charging stations which was co-funded with the industry²³. British cities also took the lead from models pioneered in Germany, where partnerships between energy companies, car companies and local governments undertook city-wide rollouts of charging points to where they were most needed. What is an added bonus is that the electric car fleet in Britain helps with the smoothing of intermittent renewables like wind energy, acting like vast distributed energy storage system, able to take power when the wind blows and able to give it back when the car is parked or at night.

While the direction of travel to phase out petrol and diesel cars was clear, purchases continued for years. But even in a fleet which was on its way out, efficiency improvements were significant: fuel consumption of new petrol and diesel cars in 2025 was half of what it had been in 2015. Nevertheless, ultimately we are looking forward to the day when the last fossil fuel powered car comes off the road.

Overall the benefits of improvements in technology for conventional cars, the move to hybrid and particularly the move to electric vehicles have been huge, with carbon emissions from cars and vans in 2030 half what they were in 2014. There have been further benefits from air-quality improvements, with an 80% reduction in NOx and a 90% reduction in particulates

generating an estimated £1.2 billion saving to the economy in health benefits. Even London's air quality now meets European standards! But there have also been economic benefits, including a net £5 billion boost to GDP – even after the cost of building out the new infrastructure. Britain in 2030 is also far less vulnerable to external shocks, and it is estimated that Britain's annual oil import bill is now almost £9 billion lower than it would have been if no progress had been made after 2015 – cutting the bill in half. Not only is the country saving money, but so are individual British drivers. Compared to the average spend on fuel of £1190 in 2014, electric vehicle owners in 2030 pay on average just £254 for a year's travel²⁴.

Electric Railways: getting on the right track

The electrification of the British railways has been a massive undertaking and is still on-going. Big progress has been made by Network Rail in electrifying the Great Western Main Line, the North West Triangle between Liverpool and Manchester and beyond. By 2020 three quarters of all miles travelled by British rail passengers were on electrified lines²⁵. Carbon emissions fell initially by a third per passenger but have fallen even lower as the electricity which our trains run on has become cleaner. Electrifying the railways has also increased the capacity of trains, made them cheaper to operate and reduced the amount of maintenance they need compared to the old diesel fleet. Despite some outcry at the time, in retrospect there have been few complaints about the scrapping of HS2 in favour of funding further electrification.

Cities in 2030: more mobile, smarter, cleaner

Some of the most important work on making our travel more sustainable is happening in Britain's cities. Greater access to data, from mobile phones to GPS, from taxi companies to London Tube journeys, has allowed city planners and local governments to design more efficient and effective public transport systems. Buses have been rerouted more in line with daily travel patterns, rail services have been expanded where they are most needed, and mobile phone apps have allowed us to cut the number of car journeys by encouraging lift-sharing. More accurate models of how we move about have meant that in new housing developments public transport is now a better substitute for people's cars than it ever has been. In addition, the numbers of people working from home have continued to increase, gradually bringing down daily passenger journeys²⁶. Even for those who continue to use their cars, cities are getting smarter. Information from GPS is allowing smart traffic light systems to better funnel traffic through central areas, cutting the time spent stuck in traffic jams producing carbon emissions - at least for those not driving electric vehicles.

City authorities are also making cycling easier, safer and more attractive as a way of getting around. Every major city in Britain now has a planned out 'cycle grid' based on the approach which was pioneered in London in 2016²⁷. These grids consist of both Cycle Superhighways, which segregate cyclists from other traffic on major routes into the city, as well as a series of Quietways which carve out routes through safer backroads around the city centre. All major British railway stations also now have significant cycle storage capacity so commuters can bike to the train. London's Cycle Hire Scheme, where people can rent bikes from docking stations around the city has been exported at scale to other cities in Britain including

Birmingham, Edinburgh, Liverpool and Manchester. As a result almost 30% of all trips in major British cities are now undertaken on bicycles compared to a tiny 2% in 2010²⁸.

Moving things

It is not just the way we get around which has changed, but how we move the billions of tonnes of freight which circulate around Britain every year. Partly we have cut the impact of our HGVs through moving part of the fleet from diesel to less polluting gas, but we have also changed the way they deliver. Computerised routing and scheduling systems have made us smarter about how we move goods around, distribution centres are better located and the vehicles we use to transport things are simply fuller when they leave the depot.

But we have also undertaken ‘modal shifting’ – a technical way of saying ‘getting trucks off the road’. The expanded British rail system now takes an extra 18 billion tonne-kms every year compared to 2012²⁹, and longer operational hours and longer and heavier trains have increased efficiency. We have also made it easier to connect between rail and other transport. Britain’s waterways even have seen something of a return to favour too, with their significant economies of scale cutting both costs and carbon emissions³⁰.

As we expected aviation has proven to be one of the trickiest areas to cut carbon, both for flying people and goods. Not least because of the amount of power you have to provide to get a plane in the air. We continue to fly a lot, but some progress has been made. The government has made some incremental increases to the duties on aviation fuel which has driven further improvements in energy efficiency, and the new Aviation Transport Fuel Obligation (ATFO) has been recently introduced requiring all suppliers of aviation fuel sold in Britain to be able to show that a percentage of their product comes from renewable sources, mostly meaning ‘biojet fuel’ produced by algae-based biofuels³¹.

FOOD

Looking back from 2030, changing the way Britain feeds itself and the waste it generates in doing so has proved to be one of the most difficult challenges. The potential reduction of Britain's carbon footprint were and are huge – agriculture accounted for about a tenth of the UK's greenhouse gas emissions in 2014. This has fallen steadily, but change has been gradual as entrenched attitudes and habits are strong. Successive governments proved – understandably - more reluctant to intervene in individual choices in this area than in any other. But as Britain made more progress on decarbonising energy, the parallel challenge of decarbonising farming and our diet inevitably came into focus. Greater education about the impact of people's diets on their carbon footprint has made a real impact and the 'carbon-sensitive shopper' has turned out to be a real enough feature of the British high street³².

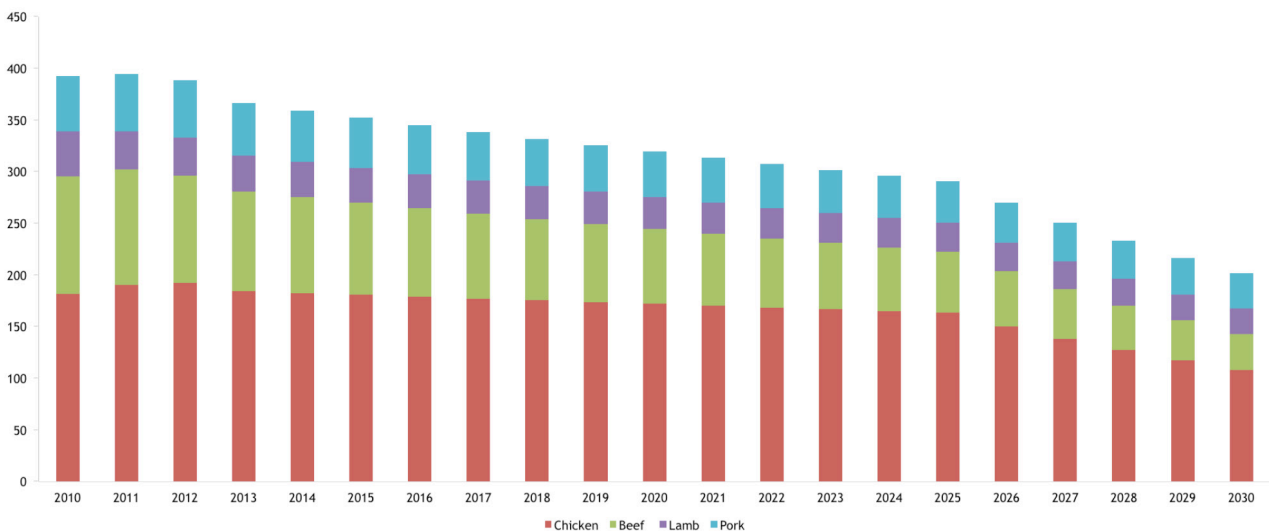


Figure 9. British meat consumption (grams per household weekly)

Dietary carbon footprints

One of the most important climate campaigns in Britain has been to highlight that arguably the most significant change any individual can make to their carbon footprint – and additionally their health – is a reduction in their meat consumption. This is particularly true of beef, which requires 28 times more land to produce than pork or chicken, 11 times more water and ultimately generates five times the carbon emissions – to produce 1kg of beef it takes 10kg of vegetable protein! Britain remains omnivorous in 2030, but as the climate impacts have become clearer more and more consumers are choosing to reduce their meat consumption³³.

In 2030 carbon labelling is allowing people to drive change in the way their food is produced through their shopping habits. Although providing detailed carbon emissions information for all products proved simply too expensive, simpler carbon labelling – highlighting products where the producers are certified as driving down their carbon footprints – have made it easier for people to make informed choices about what they eat. Around 2019 kitemarks started to emerge to certify that the producers were measuring and reducing their overall carbon footprint. Marketing companies are now targeting the ‘carbon-sensitive shopper’ just as they have done for decades with free trade and ethically sourced products. Large organisations, such as big businesses and the government are also using their buying power to make the choice for more sustainable food products.

Shoppers are not the only ones driving change. In the ground-breaking 2025 Budget – despite vocal protests from the Irish government and others – the British government decided to impose a duty on all meat and dairy goods to reflect the emissions costs of the lifetime of the animal in both its feed and the emissions it produced. This has had the benefit of revealing the dramatic divergence in environmental impact of beef over other types of meat and appears to have had a marked impact on beef consumption. British meat consumption has followed a long-term downward trend since 2010 – falling from between 350-400g per week per household in 2010 to between 200-250g per week in 2030 – most of that fall following the 2025 ‘Cow Tax’, which reduced beef consumption by a third (Figure 9) (Box 4).

4. The Cow Tax

One of the most contentious decisions of the last two decades has been the British government’s decision in 2025 to establish a range of duties on both British and imported meat and dairy products based on their carbon footprint. The decision was part of the government’s focus on reducing emissions from agriculture by between a quarter and a fifth by 2030. After it became widely known that 40% of agricultural emissions came directly from (the rear end) of cattle and sheep, and another 54% from fertilisers widely used on the grasslands they eat, it was acknowledged that something had to be done. ‘The Cow Tax’ was simply a carbon tax by another name.

The solution was to ensure that the real cost of meat and dairy production – including the environmental impacts – were being accounted for in their price. The first step was to rate each product by the level of its greenhouse gas emissions. Farmers complained that the scheme disproportionately hit cattle farmers – those producing beef and milk. And they were right, but only because the production of beef generates five times the greenhouse gas emissions of either pork or chicken production. The duty is now applied on the product at the point of sale, like the tobacco duty.

The result is that beef has become more expensive than other meats, and meat has simply become more expensive. The change in people’s diets took some time for people to get used to. But the government made sure that the move was backed up by a widespread education campaign, focussing on not only the positive impact on Britain’s climate action, but on people’s health too. As a result British meat consumption is among the lowest in Europe, and the knock-on impacts in reducing the rates of heart disease and bowel cancer are already being felt.

The British government's commitment also spread to Europe, where its concerted campaign to have beef subsidies scrapped on environmental grounds during the 2023 reform of the EU Common Agricultural Policy only failed after last ditch French resistance.

Minimising food waste

One of the areas where Britain has been able to make progress is in reducing food waste. In 2013 households produced around 7.4 million tonnes of food waste, the prevention of which could have saved £700 a year for an average family of four³⁴. By 2030 we have managed to halve this, despite a growing population, although there is further to go until we get down to the estimated 1.9 million tonnes per year of unavoidable waste (Figure 10). Attitudes have changed too. Much of the progress has simply been in getting shoppers to be less literal about use-by dates and to cook up leftovers, and to encourage businesses to stop demanding the standardisation and 'food perfection' for fruit and veg that drove huge amounts of waste. Online shopping too has reduced the carbon footprint of getting food from the shelves to our front door as fewer people have to jump in their car to do the shop, and delivery trucks drive well-designed and efficient routes which serve multiple houses in a minimum of trips.

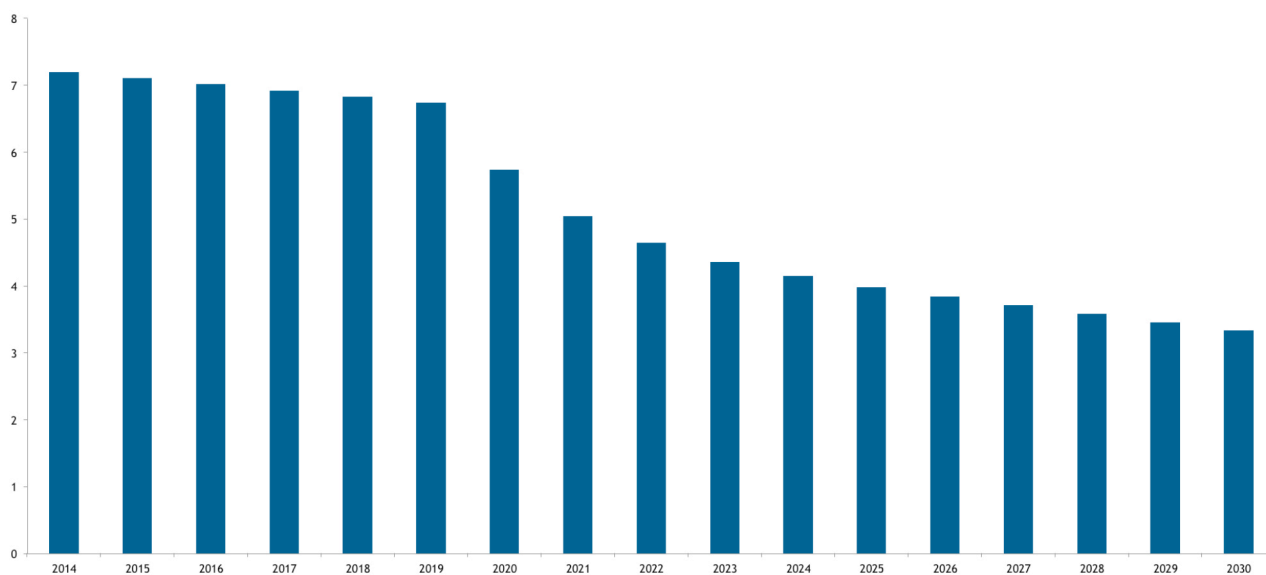


Figure 10. Total food waste in Britain (mn tonnes)

We have also made progress beyond the family kitchen. The successful Courtauld 2025 process which was launched in 2016 marked a big shift in the way retail and hospitality businesses looked at waste, and it had a surprisingly strong impact on cutting down packaging and food waste³⁵. There has also been a move to loosen requirements on cafes and restaurants which has made it easier for them to donate leftovers to charities and other people who can use it. Technology is also helping reduce waste, improved refrigeration and delivery services have meant both that less food is wasted, as well as less energy being used to keep it fresh between the field and the shelf.

Britain's circular economy

After a concerted campaign the British government eventually decided to take a lead on issues of waste and recycling, particularly after the European Commission postponed its own flagship programme on recycling and the circular economy in 2015³⁶. Alongside the Green Britain package of 2016 Britain adopted the proposed EU targets unilaterally as part of its Circular Economy Britain package and subsequently met what were going to be the EU's three big targets: increasing packaging recycling to 80% by 2030; a ban on sending anything recyclable to landfill by 2025; and a reduction in food waste of 30% by 2025. The government also extended the producer responsibility regime for packaging, setting targets for what percentage of all packaging has to be recyclable across a range of materials: glass, paper, steel, wood, and aluminium. This included requiring 100% of all plastic packaging to be recyclable by 2025³⁷.

Inadvertently the UK found itself a leader in implementing circular economy measures across all parts of the economy, and the innovations that this prompted were felt across the public and private sector. Waste pricing was initially unpopular but worked well (Box 5) – driving down waste levels sharply after it was implemented in 2020, with local governments promised rebates on the savings they were able to secure in landfill and waste collection costs. In-house biological disposal also took off after a number of the big water companies started offering the service and subsidised installation of macerators. Food – and general - packaging technology changed quickly and continuously, and the packaging recycling target was in fact met in 2028.

5. Pay-as-you-throw: waste pricing in Britain

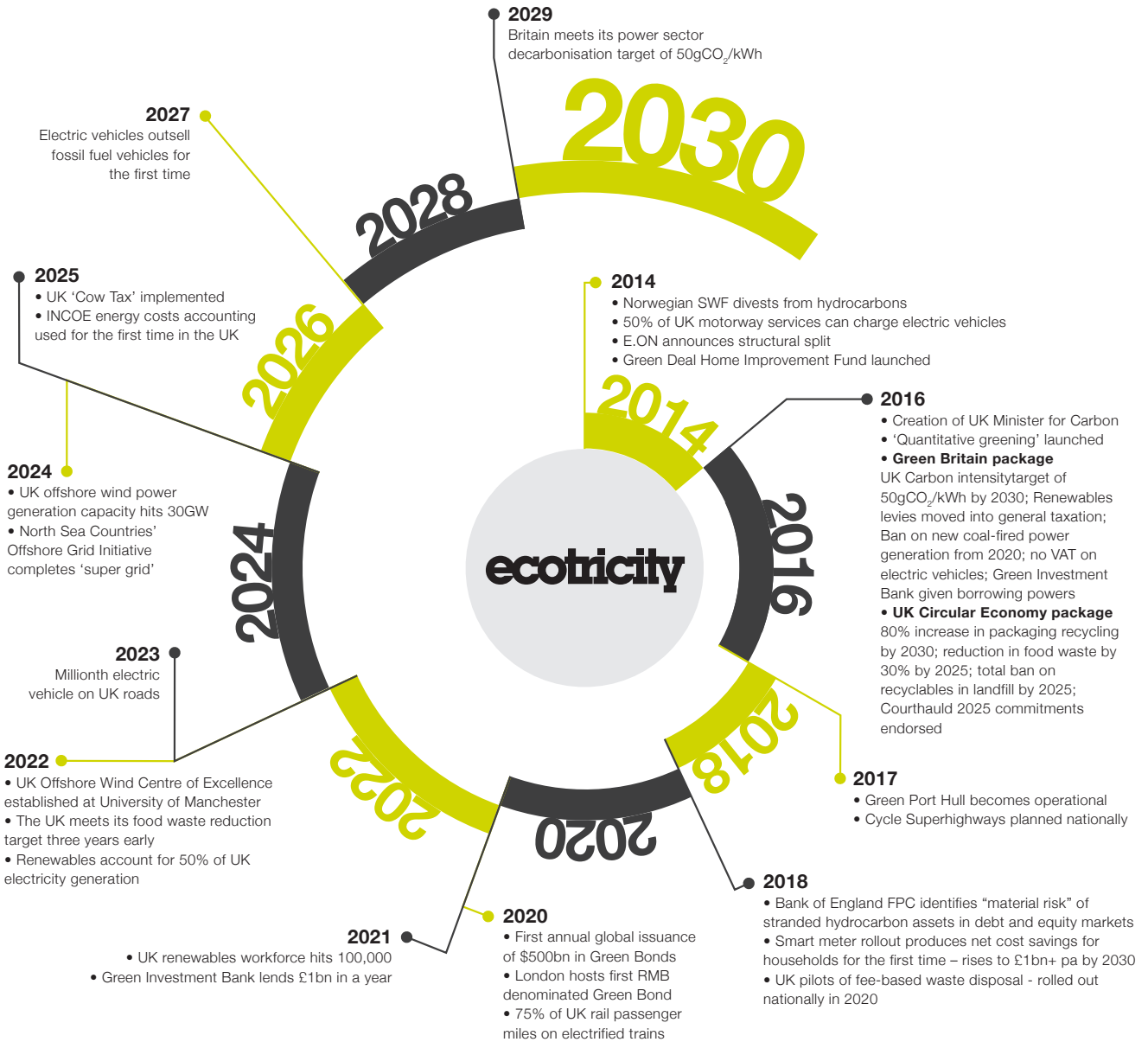
Having decided to pick up where the EU had backed out, Britain realised that a new approach was required if the UK was to hit its targets of increasing packaging recycling to 80% by 2030, implementing a ban on sending anything recyclable to landfill by 2025 and reducing food waste by 30% by 2025. What was needed was not only an upgrade in how we dealt with waste, but a rethink about what we were generating.

In 2018 Britain picked up a relatively simple idea piloted across Asia which requires people to dispose of their waste in pre-paid bags – the more waste you generate, the more bags you need, and the more you pay. But the important part is that recycling is free, so people ensure that everything which can be recycled, is recycled. As a result the amount of waste generated by households and small businesses in South Korea had halved in a decade³⁸.

Seven boroughs in London and five more across Britain initially took up the scheme in pilots in 2018, Local governments removed the cost of waste disposal from council tax, and moved to the new 'pay-as-you-throw' system. They allowed councils to keep any savings they made from the new system and the results suggested that Britain could achieve similar reductions to those seen in South Korea and Taiwan.

The 'pay-as-you-throw' model was subsequently rolled out across the UK in 2020. The scheme was bolstered by more investment in recycling facilities and a tightening up of the rules on excess food and product packaging, requiring businesses to look more closely at how much unneeded waste they were foisting on people. Shoppers too have responded to the scheme, choosing products with less packaging to sort, and crucially less waste to throw away. Britain mimicked the success rates in waste reduction seen in South Korea, with Britain meeting its 2025 target three years early and by 2030 reducing general waste by more than 40% and food waste by more than half in a decade.

Timeline of Ecotricity's 2030 Vision for a Green Britain



Annex 1

Power sector intensity (g CO₂/Kwh)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
High ambition	315.25	297.13	278.97	260.76	242.51	224.22	199.31	174.39	149.48	124.56	99.65	87.65	75.66	63.66	51.67	39.68
No change	351.07	351.07	351.07	351.07	351.07	351.07	351.07	351.07	351.07	351.07	351.07	351.07	351.07	351.07	351.07	351.07
Baseline policies	353.58	281.28	272.48	267.84	254.31	250.85	236.99	230.09	227.06	232.03	239.93	237.69	231.50	228.40	231.63	210.24

Annex 2

Average levelised cost of electricity generation

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
High ambition	89.8	91.8	93.7	95.2	96.3	97.0	98.5	99.8	101.0	102.1	105.1	107.0	108.8	110.6	112.4	112.1
No change	87.5	87.4	87.5	87.6	87.7	87.8	87.8	87.8	87.8	87.8	87.7	87.4	87.2	86.9	86.6	86.5
Baseline policies	90.7	88.6	88.9	88.9	88.9	89.1	89.3	89.5	89.7	90.0	90.5	90.7	91.2	91.2	91.3	90.9

Annex 3

Energy mix in 2020

	Wind Offshore	Wind Onshore	Hydro	Wave/tidal	Biomass	Solar PV	Geothermal	Gas CCGT	Gas CCS	Coal	Nuclear
High ambition	22%	7%	2%	0%	8%	1%	0%	36%	0%	15%	9%
No change	2%	3%	1%	0%	4%	0%	0%	41%	0%	30%	18%
Baseline policies	7%	6%	1%	0%	5%	1%	0%	54%	0%	11%	14%

Energy mix in 2030

	Wind Offshore	Wind Onshore	Hydro	Wave/tidal	Biomass	Solar PV	Geothermal	Gas CCGT	Gas CCS	Coal	Nuclear
High ambition	47%	12%	3%	3%	14%	2%	5%	13%	0%	0%	0%
No change	2%	3%	1%	0%	4%	0%	0%	41%	0%	30%	18%
Baseline policies	16%	6%	1%	0%	3%	1%	0%	66%	0%	1%	6%

Annex 4

High Renewables Scenario (Based on Garrad Hassan Scenario C1)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Offshore wind	37,825	48,791	47,842	47,137	46,325	45,810	46,066	48,138	49,538	50,783	50,829	53,119	57,222	59,848	46,951	31,962
Onshore wind	7,740	12,809	13,324	13,216	12,958	16,604	20,193	20,471	21,878	22,327	19,589	17,446	18,226	20,116	20,498	14,265
Hydro	4,414	5,005	5,256	5,378	5,452	5,799	6,190	6,376	6,753	7,017	7,074	7,225	7,482	7,924	8,192	7,690
Wave-Tidal	3,919	3,443	3,110	2,908	4,853	6,680	8,073	7,923	7,821	8,727	9,571	10,608	11,035	11,313	8,407	5,416
Biomass	5,209	10,892	11,925	12,765	13,243	13,876	15,138	15,663	16,709	18,396	18,533	21,203	22,302	24,140	26,629	26,948
Solar PV	2,253	2,794	2,992	3,057	2,975	2,983	2,838	2,740	2,820	3,056	2,850	6,701	6,922	7,337	7,922	7,911
Geothermal	-	-	-	-	-	1,827	4,340	5,052	5,842	6,600	8,844	11,795	13,388	15,272	17,008	14,418

No Change Scenario

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Offshore wind	1,068	969	909	866	895	887	919	956	955	1,063	1,079	1,229	1,327	1,354	1,181	931
Onshore wind	2,520	2,462	2,424	2,392	2,351	2,565	2,643	2,542	2,875	2,839	2,973	3,387	3,492	3,915	3,887	3,012
Hydro	3,476	3,427	3,403	3,384	3,348	3,374	3,418	3,402	3,504	3,533	3,581	3,739	3,812	3,980	4,053	3,872
Wave-Tidal	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Biomass	4,297	4,259	4,251	4,246	4,218	4,186	4,460	4,334	4,438	4,759	4,494	5,015	5,040	5,280	5,667	5,437
Solar PV	661	648	639	631	621	611	658	630	645	698	643	707	682	695	729	668
Geothermal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Baseline Policies

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Offshore wind	8,424	9,693	7,852	6,969	11,303	13,333	17,098	19,010	21,841	22,886	20,886	18,672	17,098	14,552	11,342	8,075
Onshore wind	8,228	8,541	5,195	4,211	3,962	4,782	5,110	5,416	5,132	4,767	12,552	12,209	13,863	7,200	6,913	5,707
Hydro	4,059	3,668	3,552	3,239	3,028	2,819	2,629	2,629	2,643	2,667	3,322	3,265	3,544	2,756	2,719	2,686
Wave-Tidal	7	5	5	6	146	268	368	356	354	352	426	401	400	320	245	166
Biomass	7,606	7,248	6,174	5,637	6,629	6,861	5,262	5,055	4,822	4,590	4,399	4,183	7,752	4,394	4,242	4,099
Solar PV	2,332	4,875	3,965	2,833	2,623	2,562	2,548	2,805	2,592	2,527	2,515	2,392	2,258	2,121	2,318	2,047
Geothermal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

No Change Scenario

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
High ambition	61,361	83,733	84,449	84,461	85,806	93,578	102,838	106,363	111,362	116,906	117,290	128,097	136,577	145,949	135,606	108,610
No change	12,025	11,766	11,628	11,520	11,435	11,625	12,099	11,865	12,419	12,893	12,771	14,078	14,355	15,225	15,518	13,921
Baseline policies	30,656	34,031	26,743	22,896	27,691	30,624	33,015	35,273	37,385	37,789	44,100	41,121	44,915	31,342	27,779	22,780

Annex 5

Composition of new cars, high ambition scenario

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Gasoline/Diesel	2,015,177	1,932,694	1,850,211	1,767,728	1,685,245	1,556,969	1,442,486	1,282,210	1,121,933	961,657	732,691	641,105	480,829	320,552	160,276	-
Hybrid	188,621	242,483	296,345	350,207	404,070	457,932	446,484	435,035	423,587	412,139	400,690	389,242	377,794	366,346	354,897	-
Plug-in hybrid	60,104	80,138	100,173	120,207	140,242	160,276	251,863	343,449	435,035	526,622	606,760	709,795	801,381	892,967	984,554	1,076,140
Electric	25,759	34,345	42,931	51,517	60,104	114,483	148,828	228,966	309,104	389,242	549,518	549,518	629,656	709,795	789,933	1,213,520

Annex 6

Expenditure on fossil fuels for generation (£m)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
High ambition	5,863	5,780	5,465	5,124	4,885	4,804	4,753	4,668	4,586	4,526	4,419	4,161	3,879	3,586	3,304	2,969
No change	5,507	5,619	5,496	5,339	5,285	5,407	5,607	5,779	5,968	6,200	6,386	6,569	6,749	6,948	7,222	7,453
Baseline policies	10,544	5,737	5,560	5,362	5,328	5,446	5,727	5,895	6,062	6,545	7,050	7,206	7,188	7,442	7,888	8,422

Sources

Our 2030 Vision is a work of imagination, and we have not allowed ourselves to be bound by what seems politically likely in 2015. But we have ensured that the 2030 Vision is rooted in the politically possible. All the political and policy choices described here have a basis in current thinking and initiatives on how Britain can build a more sustainable future, and through the document we have included links to where those who want to know more, can find out more.

1. The Committee on Climate Change has done some interesting work on the impact of policy costs on energy bills and how energy efficiency can offset much of the impact. [You can find it here.](#)
2. Here can find out more about how northern European countries are working together on the [North Sea 'Supergrid'](#).
3. The coalition government made the projection back in their [2013 UK Renewable Energy Roadmap](#).
4. There have been a number of attempts to build out a more holistic picture of the costs and benefits of our energy choices. Our thinking on this owes a lot to [a great piece of work by Siemens Wind Power in 2014](#), which among other things shows offshore wind being cheaper than coal on their 'Society's Cost of Electricity' measure.
5. [The Swansea Bay Tidal Lagoon](#) is a really interesting project. Early days, but the long term potential for tidal lagoon technology in Britain is significant. What is particularly interesting is the long life times of the projects – they cost a lot to build, but after 120 years the price per kWh could be pretty small!
6. If you are interested in knowing more about wave and tidal power in Britain, [Renewable UK](#) can point you in the right direction.
7. We are developing our own [Green Gas!](#)
8. The smart guys at Bloomberg New Energy Finance track levels of clean energy investment all over the world. Then they compile it into one handy guide which you can find [here](#).
9. Details of this exciting new development can be found [here](#).
10. Predicting the impact of new technologies on jobs and GDP is not easy. So we asked the guys at Cambridge Econometrics – who do this kind of thing for a living – to have a crack. The answers they came up with inform a lot of our 2030 Vision, and you can read the full report at www.ecotricity.co.uk/2030-vision.
11. Caroline Lucas and her allies have been talking about this since the first round of QE back in 2011 and they continue [to campaign in its favour](#). The details of how the

programme would work are quite technical, but are laid out clearly [here](#) by Richard Murphy, one of the idea's leading proponents.

12. The bankers are already beginning to wake up to the opportunities. HSBC have done a lot of work on the subject and their [2014 review of the global market](#) is actually their third annual report!
13. That's right, our government with the rest of the G20 agreed to phase out subsidies for fossil fuels "in the medium term" [back in 2009](#). Sadly there has been little progress since then, as [this report](#) from think tank the Overseas Development Institute sets out. They reckon the annual subsidy for the extraction of oil and gas in the UK could add up to as much as \$1.1 billion (around £750 million).
14. Britain has actually been pretty innovative on carbon pricing. Recognising that the EU Emissions Trading Scheme (the 'carbon market') wasn't up to the job, Britain went ahead and put in place [a floor on the price of carbon](#), giving it a minimum regardless of the cost in the European market. The price was meant to go up over time, but disappointingly Chancellor Osborne decided to stifle Britain's climate ambition by freezing the price at £18/tonne CO₂ – despite it being a nice little earner for the Treasury! Nevertheless [the market is now suggesting](#) that the carbon price floor could see coal-fired power being replaced by gas-fired power from 2016.
15. We have been thinking about [this](#) for a while now.
16. This [Timera blog post](#) sets out the new wave of global gas developments expected to come on-stream in the next five years.
17. If you are interested in more about how the changing price of oil and gas is threatening fracking [Greenpeace](#) have written a good piece examining the potential impact.
18. [Smart Energy GB](#) have loads of information about Smart Meters, including what they do and how to get one.
19. We've taken these figures from the government's own cost benefit analysis. You can read the whole thing [here](#).
20. For those of you who love fast cars but hate the pollution [Formula E](#) is coming to London on 27 and 28 June 2015. See you there!
21. Seriously, only about a fifth of the energy in the oil which is required to move your car is useful in actually moving it – think about that when you are next filling up! This analysis from Cambridge Econometrics has the details in a nice diagram on page 73 of [this report](#).
22. Find out more about our Electric Highway and how far you could go [here](#).
23. The European Commission's proposed plan is detailed [here](#).
24. This figure is taken from the Cambridge Econometrics' report '[Fuelling Britain's Future](#)' which has more on the impact of the switch to electric for British motorists on page 7.
25. Network Rail's strategy for electrifying our railways is set out [here](#).

26. Record numbers of us are in fact working from home. Although it is only gradual, since 2010 there has been a steady increase in those of us avoiding the commute.
27. The central London cycle grid looks like a serious effort to get Londoners on their bikes, by making it safer to cycle the busy streets. We hope to see more cities taking this approach in the future.
28. This is a pretty heavy report from the Stockholm Environment Institute, but on page 2 it gives some examples of places in Germany and the Netherlands which have managed to hit this amazing 30% figure for share of city journeys undertaken by bike.
29. Network Rail have been putting together their strategy to cope with a serious upturn in the amount of freight moved on their networks.
30. Crazy old-fashioned as it sounds, moving goods by boat can be among the least energy and carbon-intensive ways of moving freight. It is not going to be a 'gamechanger' but there are people thinking about how we can get more of our freight off the roads and onto our canals!
31. Biofuels from algae are an interesting development, there is a long way to go on the R&D side to make the technologies widely commercial, but they have the potential to produce powerful enough fuel for transport, including airplanes, with the added bonus that they don't take up land required for food production. You can find a brief overview here, and note that the first commercial flight to use algal jet fuel in its fuel blend actually took off in 2011.
32. The Carbon Trust are trying to get carbon labelling more widely distributed. You can find out more about this excellent idea here.
33. The DEFRA food consumption statistics are a fascinating insight how our eating habits have changed over the last four decades. It is interesting to note that our consumption of carcass meat, ie. unprocessed, has already almost halved since the 1970s.
34. WRAP have been really active on this, trying to get people to understand that food waste – even leaving the impact on our carbon footprints aside – is effectively just throwing money in the bin!
35. The next round of the Courtauld process is currently being negotiated, but details of the three previous rounds and some of its ambitions are on the website.
36. The European Commission's original plan can be found on the website here. The Commission has stated that it intends to come back with a more ambitious proposal, we will have to wait and see...
37. In fact such targets have been in place since the 2012 Budget and are set out to 2017.
38. If you want to find out more about the pilot programmes in Asia all the information is in this Hong Kong government report.

