

NewStatesman

Spotlight

ENERGY AND CLIMATE CHANGE: SUSTAINABLE POLITICS

Kwasi Kwarteng / Danielle Rowley / Wera Hobhouse / Tim Yeo





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Green politics at the ballot box



At the 2017 general election, the environment was not a top priority for most Britons. Just 8 per cent placed it among the top three issues that would decide the result, according to YouGov. This year, that figure is 25 per cent, the pollster says. Another survey, by Opinium, found that 54 per cent say climate change would affect how they vote. For under-25s that was 74 per cent. The data points to a shift. This year, there were mass climate protests in the UK and across the world. The sights of millions of school students striking, deforestation in the Amazon, and bush fires in Australia seem to have swayed public consciousness.

In the 2019 campaigns, the environment, no longer the purview of the Green Party, has been touted as a priority by major parties. But as they compete over who has the most ambitious emissions reduction target, paying lip service to investment in renewables, energy efficiency, and the infrastructure for generating clean power, they are overlooking key policies that could save the planet.

Aviation is a major contributor to UK emissions. The UK contributes 4 per cent of global aviation CO₂ emissions, according to the International Council on Clean Transportation. Only the US and China produce more. Support for greening aviation could play a significant part in reducing the UK's carbon footprint.

In the meantime, other measures could help. The Lib Dems' manifesto includes a pledge to reform taxation of flights to penalise frequent flyers, placing a moratorium on runway development and opposing airport expansion, as well as a zero-carbon fuels blend requirement for domestic flights. Labour's manifesto promises that, under a Labour government, "expansion of airports must pass our tests on air quality, noise pollution, climate change obligations and countrywide benefits." The Conservative manifesto had not been launched when *Spotlight* went to press.

The Greens, meanwhile, call for a carbon tax on fossil fuels and an end to VAT exemption for aviation fuel. In 2018, Theresa May froze fuel duty for the ninth year in a row. Making travel more expensive would hardly be a vote winner. But if the UK is serious about solving this crisis, whoever wins this election must be prepared to make tough choices.

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Danielle Rowley, Labour's Shadow Minister for Climate Justice and Green Jobs is the party's youngest MP. She talks to Alona Ferber

Campaigning in a climate crisis



You might be forgiven for thinking that the creation of Danielle Rowley's job in June 2019 – the year of Greta Thunberg, student climate strikes, and Extinction Rebellion – was a cynical ploy to woo young voters. But, as the first person to occupy the position of Shadow Minister for Climate Justice and Green Jobs, the Scottish Labour MP for Midlothian insists there is nothing cynical about it.

"It's easy to say we are going to take this seriously and say climate is a key issue and not do the background work," says the party's youngest MP, "but we know we want to be really serious about it."

Rowley does admit, though, that the creation of the position is "yes, 100 per cent" a way of signalling to younger voters that theirs is a party to support. With the environment making headlines throughout 2019, the climate is a major issue ahead of the 12 December poll. According to YouGov, 25 per cent of British voters place the environment among the top three issues facing the country. In 2017 that figure was 8 per cent.

Knocking on doors in the Scottish

constituency where she grew up on a council estate, Rowley says people respond with curiosity to the phrase "climate justice" in her job title. "It's that conversation, often people say 'oh you are talking about climate justice not climate change'." Despite battling a cold, and coughing throughout our phone call, Rowley is excited to be out campaigning. But she is relieved that the timeframe is so tight. "People do want change but they want it to be done quite quickly."

Politics is something that runs in the 29-year-old's family. She grew up with her mother and grandparents, Labour activists and trade unionists. Her father, Alex Rowley MSP, was deputy leader of the Scottish Labour Party from 2015 to 2017. They usually meet every Sunday, comparing notes on her week in Westminster and his in Holyrood. "Growing up in Midlothian on a council estate and seeing the injustices that were happening around me is what made me passionate about wanting to help people," she says, "And then having those sort of views and being able to pair that up with the Labour Party, which I knew about

because of my family."

But Rowley, Midlothian's first woman MP, "never really" planned on going into politics. When the 2017 snap election happened, she was working at the housing charity Shelter and campaigning for Labour. The party asked if she would stand, but she wasn't sure at first. "Then I thought well if you get elected not only can you help people within a system, but you can really change the system."

Labour's answer to the climate crisis is its Green Industrial Revolution, a programme of sustainable growth and infrastructure modelled after US Democratic Congresswoman Alexandria Ocasio-Cortez's Green New Deal. Under Labour's manifesto, the party has pledged to invest £250bn through a Green Transformation Fund "dedicated to renewable and low-carbon energy and transport, biodiversity and environmental restoration." It also committed to delivering "nearly 90 per cent of electricity and 50 per cent of heat from renewable and low-carbon sources by 2030." Labour's manifesto says the party would build, "7,000 offshore wind



turbines, 2,000 onshore wind turbines, enough solar panels to cover 22,000 football pitches, and new nuclear power needed for energy security.”

In June, the UK enshrined a target of net zero emissions by 2050 in law. At Labour’s conference in September, the party approved a motion committing it to working “towards a path to net zero carbon emissions by 2030”. As had been rumoured, the party watered down that pledge in its manifesto, which commits to “achieve the substantial majority of our emissions reductions by 2030 in a way that is evidence-based, just and that

Labour has pledged 1m green jobs in its manifesto

delivers an economy that serves the interests of the many, not the few”. It also says it will “put the UK on track for a net-zero-carbon energy system within the 2030s.”

The original target was “ambitious”, says Rowley. However, a report commissioned by Labour and released last month, which details four “transformative goals – delivered in 30 recommendations” to decarbonise the energy system by 2030, is “another example of how are working with others to make sure that’s something we [can] achieve.”

Announcing the Green Industrial Revolution policy earlier this year, Shadow Business, Energy and Industrial Strategy Secretary Rebecca Long-Bailey said the party would build 37 offshore windfarms with a majority public stake under a People’s Power Plan. Public ownership in energy infrastructure is a major plank of the party’s policy. “I think that’s quite important because when we have seen companies run solely for profit before they’ve not always been worked in the best interests of the environment or of workers,” says Rowley, adding that Labour is “really focused on changing” this.

Rowley’s portfolio includes ensuring that high-skilled and unionised green jobs are an integral part of a future low-carbon UK. Under the 30 *by 2030* recommendations, the party estimates it will create 850,000 green jobs through its energy plans. More broadly, the manifesto pledges one million. This can be a difficult idea to explain to voters, however. “When I speak to people about that it’s trying to break down that number, because it’s a big number,” Rowley says “When people think about green jobs they just think about engineers at a wind farm.” Ahead of the manifesto launch, Labour also pledged to create 320,000 “climate apprenticeships” in England during its first term in government to close the skills gap for green jobs.

Having worked for Shelter, Rowley says Labour’s plans to retrofit UK homes so they are more energy efficient resonates for her. “One of the biggest

issues I’ve had as an MP with people coming into my office has been housing and lack of quality housing,” she says. “It’s helping people particularly in council housing, but it’s helping with health, it will help with well-being, it will create jobs and it will bring people’s bills down, so that’s one of the things I’m really quite excited about.”

Climate protesters have kept the climate in the headlines throughout the year, and liaising with movements such as the youth climate strikers is another key part of Rowley’s portfolio. As chair of the All-Party Parliamentary Group on Votes at 16, she is adamant about the need to listen to young people. “I think no politician can ignore those voices because they are so articulate, they are so loud, and they are so well organised.”

And when it comes to Extinction Rebellion, whose disruption of public transport in London this year sparked furious responses from commuters, while Rowley says some of their actions have not been “as well judged” they should be “commended on the work they have done to bring climate up the agenda in politics and the media.” Rowley is “glad that we’ve had quite meaningful conversations with them in looking at how we can work with activists and make sure that their views are heard in parliament.”

On the doorstep, Labour’s anti-Semitism saga has not been an issue, she says, and neither has a second referendum on Scottish independence, which Labour has said it would not grant in the “early years” of a government. “The issues that people come to my surgeries about – housing, education, the NHS – they are all issues that are devolved in Scotland to the Scottish government, and I think people just want the Scottish government to really be focusing on those.”

But does Rowley, a Remainer, think Labour can deliver one million green jobs with Brexit on the horizon? “Everything we have been planning for, we have been ensuring that we will be able to do it no matter what,” she says. “When you speak to people they will say they are fed up with Brexit, whichever way it goes.”

The Internet of Tanks

Pete Armstrong,
CEO and
co-founder of
Mixergy, discusses
his company's
new partnership
with Centrica

With unprecedented levels of renewable power in the UK, and tough decarbonisation targets ahead, Mixergy, a clean-tech spin-out from the University of Oxford, has received investment from Centrica as part of a significant partnership that will see the roll-out of smart hot water tanks. Centrica, which owns British Gas, will provide thousands of customers with the opportunity to have an Internet of Things-enabled, smart hot water tank as part of an upgrade of their existing system. This will create huge energy surplus potential and as a result, greater flexibility to support the National Grid.

The tech behind the tank

The Mixergy tank is a smart product with a difference. The tank heats efficiently when there is surplus renewable energy. It does this in two ways. First, a novel arrangement floats hot water on cold by exploiting thermal stratification; this allows the tank to only heat the amount of water required, reducing energy consumption while providing more headroom for surplus renewables.

Second, a sensor measures the level of hot water in the system, allowing the user to see how much hot water there is while eliminating the possibility of having to endure a cold shower. The same technology enables the tank to decide when to heat and whether to use gas or electricity depending on real-time prices in the energy market. Energy consumption is reduced by more than 10 per cent, reducing energy

bills while British Gas is able to assist the power sector to absorb low-carbon electricity.

In September, Mixergy became the first domestic hot water product certified by the National Grid to provide grid flexibility services – an important first step in realising its Internet of Tanks vision to decarbonise the energy networks and become the UK's biggest virtual battery.

The technology has been developed in response to two key trends:

The transition from fossil fuels

The UK's electricity system has been transformed over the past decade. For the first time since the 1800s, coal power stations have idled on days where renewables have taken up the demand.

Overall, coal power production plummeted from 20 per cent to 5 per cent in the last seven years as the cost of off-shore wind has been slashed by two-thirds over the same period. In the last three months, renewable power production has surpassed all fossil fuels for the first time in the history of the power grid. This means that for each unit of electricity consumed, CO₂ emissions have fallen considerably. In July, levels dipped below 100 grams of CO₂/kWh, 45 per cent lower than the equivalent carbon intensity associated with burning natural gas.

Increasing demand for energy storage

In March, a combination of strong sunshine and low demand culminated in an oversupply of electricity for six hours. If electricity production rises too far above demand, voltages rise while power stations speed up to dangerous levels. In response, electricity markets encourage industry to consume energy and prevent the system becoming unstable. These events are leading to growing demands for energy storage to soak up excess energy when it is cheap, and to deliver it back to the grid when power would otherwise have to be generated using fossil fuels.

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Supporting the electric revolution

Helen Lees, head of electric vehicles and connected services at Groupe PSA, discusses the key considerations for policymakers and the public as they move away from petrol and diesel-powered cars

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How do we reduce people's reliance on the internal combustion engine?

Convincing customers to join us on the journey to a more sustainable future is one of the hardest challenges we face. We must be able to present an argument for electric vehicles (EVs) in such a way that does not compromise on convenience or performance. Infrastructure is a key consideration – the argument for EVs is too often undermined by anxieties about their battery life, range, and the ready availability of charging points – alongside cost.

We need to work with the government to use the fiscal tools that are available to people to encourage them to make the right choice. Looking at the government's annual taxation tools such as Vehicle Excise Duty and Company Car Tax, these should encourage customers to purchase low-emission vehicles.



For more information, please visit: www.citroen.co.uk

As the upfront purchase prices of EVs tend to be higher, we have to ensure that there are longer-term savings to incentivise people to make the switch. We need to see long-term certainty in the government's plug-in car and plug-in van grant and request the incentive of a zero per cent VAT rate for both battery electric vehicles and plug-in hybrids that emit under 50g/km CO₂.

Broadly speaking, the success and uptake of EVs depends on them having good range, being competitively priced and adjusting urban and rural environments to support them. The Peugeot e-208, Vauxhall, Corsa-e, and DS 3 Crossback E-Tense are proof of what is already possible in this space, with a range of over 200 miles based on the EU's Worldwide Harmonised Light Vehicle Test Procedure, and with 100kW fast charging capability.

Should we just encourage all customers to drive battery electric vehicles?

Policymakers should reflect technology neutrality. For example, plug-in hybrid EVs such as the Vauxhall Grandland X Hybrid4, Peugeot 3008 HYBRID4, or

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DS 7 Crossback E-Tense, have a really important role to play in the transition to lower CO₂ vehicles – getting customers used to new technologies while having the need for a longer range.

In the future hydrogen fuel cell vehicles, being developed and tested by Groupe PSA, will have a big role to play alongside the battery electric vehicles we see today like the Vauxhall Vivaro-e commercial vehicle. We are concerned that with the government having withdrawn grant support for plug-in hybrid EVs, the transition to new technologies will be even harder for customers. That is why it is important to ensure that we see VAT reductions for such vehicles that are below 50g/km CO₂.

Furthermore, studies have shown that a plug-in hybrid EV, if charged appropriately, can accumulate more electric miles than pure battery electric cars. This is because over 80 per cent of all daily car journeys cover less than 50km and can be accomplished by driving the plug-in hybrid only from the battery.

As a manufacturer, we work hard to get our customers the right vehicles for them. A battery electric vehicle might

not be the right solution for customers who regularly need to drive longer distances. For these customers a plug-in hybrid would be more suitable.

Should manufacturers pay towards new EV-supporting infrastructure?

While we think that building public charging points is not part of Groupe PSA’s core business, we encourage all growth initiatives of the public charging network and support the continuation of charging grants. It’s important that access to charging is as wide as possible for customers.

When it comes to the charging infrastructure for all forms of electric vehicles the aim must be to make it as easy as possible for all customers. To help with this part of the journey, we have developed a partnership with a charging provider so that we can offer our customers access to home and workplace charging solutions, as well as access to a public charging networks to give those customers without off-street charging the chance to drive an EV.

We are also building charging infrastructure for our employees. For example, at our joint Opel/Vauxhall/PSA engineering centre in Rüsselsheim,

Germany, we are installing over 1,000 charging points in co-operation with regional authorities and energy providers, a project that is co-funded by the German government.

Is the government’s target of every new car on the road being zero-emission by 2050 achievable?

In a perfect world, with long-term consumer incentives, continuation of grants, zero per cent VAT, infrastructure issues addressed, and with an integrated approach from charging providers, governments, energy companies, and distributors, it may be possible. It is certainly something that we at Groupe PSA are working towards.

In 2020, Groupe PSA will have half of its model range offered with an electrified version. By 2025, we have committed to having a battery electric or plug-in hybrid version of every single car and van that we offer. These all have amazing range and we are really excited about how the market will respond to these sector-leading products.

Groupe PSA encompasses the Peugeot, Citroën, DS, Free2Move, and Vauxhall brands in the UK.

The National Health Service is a major contributor to UK emissions. Rohan Banerjee looks at how the organisation can reduce its carbon footprint

Decarbonising our NHS



The National Health Service is the fifth-largest employer in the world. With 1.7 million members of staff, only the US Department of Defense, the Chinese People's Liberation Army, Walmart, and McDonald's have more. Given the sheer size of its workforce, the number of large buildings under its authority, and the various energy-intensive technologies it uses, the organisation's carbon footprint represents a pressing challenge, especially within the context of the UK's commitment to net zero emissions by 2050. Across its operations, the NHS produces approximately 20 million tonnes of CO₂ a year – around 5 per cent of the UK's annual total.

Healthcare professionals have a “moral obligation”, says James Dixon, head of sustainability at the Newcastle upon Tyne Hospitals NHS Foundation Trust (NUHT), to reduce the “effects of carbon emissions and pollution from our activities.” In June, NUHT became

the first NHS trust in the UK to declare a “climate emergency”, with its board setting a target of reaching carbon-neutral status by 2040. Dixon hopes other trusts follow suit, committing to using renewable energy sources and improving waste management and recycling where possible.

Chris Naylor, a senior policy fellow at The King's Fund, a think tank, says that the best way to reduce the NHS's carbon footprint is to switch the focus of healthcare delivery from “cure to prevention”. A healthier society, “with better investment in the things that help to keep us well”, would ease the pressure on public services. While Naylor says healthcare is still necessary “in the case of an emergency”, ensuring that people make more health-conscious lifestyle choices will reduce the regularity of hospital visits.

In the meantime, Naylor says the NHS needs to get “smarter” about its procurement processes for products,

medicines, and equipment. Too often, he suggests, “short-term” thinking about “upfront costs” wins out over “life cycle” analysis when it comes to what the NHS invests in. He says: “The NHS needs to think about the environmental costs associated with manufacturing a product and how it can eventually be disposed [of].”

Surgical equipment is one area, Naylor notes, in which the NHS could improve. “Over the last 20 years, there's been a big shift towards using disposable instruments and a lot of that is to do with infection control. But perhaps it's time to re-evaluate the commitment to that direction.” More advanced sterilisation processes and technologies, Naylor says, could “reduce hospitals' unnecessary contributions to landfills”.

In a hospital setting, particularly as an emergency unfolds, awareness of the use of lighting and other appliances can often take a backseat. Technology, says Dr Cathy Lawson, a fellow at the Centre for



The NHS produces 20m tonnes of CO₂ a year

Sustainable Healthcare, could help to take the pressure off humans to remember to switch things off. “The introduction of low-energy lighting, such as LED lights, and the use of occupancy sensor-activated lighting where appropriate would help to reduce emissions. [Hospitals] could also potentially introduce an automatic shutdown of computers in non-clinical areas when they’re not in use.”

Just under half of the NHS workforce, according to a report from The Nuffield Trust, a healthcare charity, is made up of non-clinical roles. On-site shops, canteens and cafes, James Dixon points out, should be viewed as “very much part” of the organisation’s mission to decarbonise. NUHT, as part of its climate emergency response, has moved to ditch single-use plastic cutlery and trays in our in-house catering outlets. “It is a small change that can make a big difference.”

Transport – of patients and medical supplies and in terms of staff commutes

– is another significant contributor to the NHS’s net carbon emissions. By its own estimates, the NHS accounts for around 10bn road journeys each year – 3.5 per cent of the total made in the UK. In a bid to cut back on this, some NHS trusts, such as Oxford University Hospitals NHS Foundation Trust, have introduced free shuttle buses between sites, or subsidised discounted bus and rail passes.

Travelling to work, though, does not produce anywhere near as many carbon emissions as an ambulance responding to an emergency call at high speed. The electrification of more trusts’ fleets, argues Peter Allum, lecturer in paramedic science at the University of Plymouth, is a must for any government. “Nobody would argue against ambulances needing to drive quickly in an emergency,” he says, “but, as fossil fuel prices rise, the logical step is to reduce the consumption, adapt to alternative fuel sources for vehicles, or supplement fuel use with recycled energy.”

Allum adds that the development of “eco-driving skills”, namely driving techniques that reduce a vehicle’s carbon output, could also help ambulances produce fewer emissions. These include driving at a “constant speed, rather than stopping or accelerating suddenly” and “proper vehicle maintenance”. He notes that “even something as simple as tyre pressure” will have an impact on how much fuel a vehicle uses. While many trusts are rolling out this sort of training to ambulance crews, he says, “it’s still not everywhere”, and introducing “standards” is crucial to making sure that energy-efficient driving and vehicle care becomes “second nature”.

Decarbonising the NHS, according to Chris Naylor, should represent a rare point of consensus for politicians and the public. “When it comes to climate change,” he says, “there is a tendency to fixate on the more obvious culprits... like coal-fired power stations and unnecessary short-haul flights. But the tricky thing we have to get our head round is that something hugely positive and necessary for society, like healthcare, can also have some negative side effects.”

A net-zero plan that leaves no one behind

Delivering cleaner and greener industries and infrastructure requires a collective effort, writes **John Pettigrew**, chief executive of National Grid

Imagine a United Kingdom that leads the world in driving a clean economy. A vibrant future that is clean, green, and thrives with nobody left behind. It is a future we believe in at National Grid, but one that requires significant change and immediate action. The UK is already a world leader on climate change – exporting technology, transformational engineering, and know-how globally. But to cement this position, and reach the government’s target of net zero, a shift is needed in the way we think, plan, and deliver for the future.

There are five key areas where we believe major change and progress is needed to reach the decarbonisation goal, and it will take major change and commitment from government, from the regulator, and from our industry to get there.

First, electrification needs to happen at scale. The net-zero report from the Committee on Climate Change (CCC)

suggests we will need twice as much electricity tomorrow as we do today, as our electricity network not only keeps the lights on, but also keeps transport running, industry producing, and people’s homes warm.

To meet that demand, we need to increase the amount of clean electricity we produce. That requires strategic thinking about infrastructure. Take offshore wind as an example. We have 8GW of offshore wind today, but that needs to jump to 75GW under net zero. Historically we have connected wind farms to the grid one by one, like the spokes on a wheel. But now we need to plan not just for the next wind farm, but for the next 50, developing long-term solutions to ensure we do not create bottlenecks and that we minimise disruption for coastal communities. Our engineers are working up potential solutions but, to succeed, we need both government and the regulator focused on what the energy system of



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Government, industry and society must work together

tomorrow looks like, rather than the system of today.

Second, we need to address the challenge of decarbonising heat, which accounts for more than a third of UK emissions. Technologies include electrification through heat pumps, hydrogen solutions, and biogas. But all are expected to be costly and disruptive in isolation, and this is where industry innovation and transformational engineering will be needed to reach the right solution.

We believe a mosaic of these will provide the answer as different home environments will lead to different heating solutions. While hydrogen may be an option, heat pumps would be more appropriate and cost effective for well-insulated homes and new housing stock. But poorly insulated homes account for the majority of current UK housing stock. For these homes, a hybrid solution of a heat pump alongside an existing gas boiler would enable immediate change, while avoiding the considerable additional cost and disruption to consumers of having to retrofit their homes today.

Third, we need to consider how to capture emissions. There is still a role for gas to play in the wider system – the CCC expects gas consumption under net zero to still be 68 per cent of current levels. So carbon capture usage and storage (CCUS) will be a crucial technology, particularly for industry. At National Grid, we're exploring this in partnership with Equinor and Drax to create a net-zero industrial cluster in the Humber region. It is a groundbreaking project with the capacity to protect 55,000 jobs and save local industry a potential £27.5bn in carbon taxes by 2040. The Humber region could capture 15 per cent of the UK's current annual carbon emissions.

But this is a pilot project, and is just one of six industrial clusters that we believe will be needed if the UK is to grasp this opportunity at scale. For this to become a reality, government commitment and a clear policy framework are urgently needed.

Fourth, we need to think about transport, which currently contributes more than any other sector to UK carbon emissions. This is where we need answers from within our industry. Could hydrogen power HGVs? Could ammonia help decarbonise long-distance shipping? But we also need commitment from government once again on infrastructure. Removing diesel and petrol vehicles from our roads and replacing them with electric vehicles is a critical part of transport decarbonisation and will improve air quality. For that to happen at scale, a strategic charging backbone is needed across the whole of the UK to ensure drivers are always within 50 miles in any direction of an ultra-rapid charging hub.

Finally, to reach net zero, we will need a highly skilled workforce. The UK faces a significant skills gap, with an additional 59,000 engineering graduates and technicians needed each year to fill core engineering roles. At National Grid, we call it the job that can't wait and we are recruiting at all levels to ensure we can deliver on our ambitions.

Consumer behaviour will need to change – the way we heat our homes, travel to work, the jobs we do, and the way we use energy will be different. But it's down to industry and government to work together to make those changes easy for consumers to adopt and, above all, to ensure the benefits of moving to a net-zero future are felt by everyone.

For the government, this means embedding net zero across all government departments and at all levels of government. For the regulator, this means making net zero an explicit and central pillar of its statutory duties.

It is easy to feel daunted by the scale of the challenge, but there is no time for that. To achieve net zero, we all need to think and plan differently. With all eyes on us as the UK prepares to host COP26 next year, we need to ensure industry, government, and the regulator are working in partnership to solve the challenges that lie ahead and to cement our position as a global leader on climate change.

Environmentalism doesn't have to mean compromising on the economy, writes **Kwasi Kwarteng**, Minister of State for Business, Energy and Clean Growth

The road to carbon neutrality



Tackling climate change is one of the most important challenges we face. That is why under the Conservative Party the UK was the first major economy to legislate to reach net zero by 2050. And we have delivered, too. Since 2010, the proportion of electricity coming from renewable energy sources increased from 7 per cent to 33 per cent – and last quarter, for the first time ever, more of our electricity came from renewable sources than from fossil fuels. And in our response to the Committee on Climate Change last month, we committed to go further and faster than ever.

We know that prosperity and environmentalism are not antithetical; rather, they go hand in hand. Since 1990 we have cut carbon emissions by 42 per cent while growing the economy by more than two-thirds. That is clean growth in action. It is by working with

business and industry that we will make the investments, create the infrastructure, and develop the technologies to eliminate our carbon emissions – while simultaneously creating the high-skilled green jobs of the future.

Take offshore wind. In 2012, prices were over £140/MWh and the Carbon Reduction Task Force wrote that “based on the evidence gathered and assuming our recommendations are followed, the CRTF concludes offshore wind can reach £100/MWh by 2020.” In 2015, the price was £119/MWh. But in September, our latest Contracts for Difference Auction delivered 5.5GW of offshore wind – enough to power 12 million homes – for the record low price of £39/MWh. Wind is now cheaper than gas.

The International Energy Agency has described this as a “game changer”. But it is important to recognise that this



transformation has not happened by itself. A series of targeted policy interventions by the Conservative government have supported the industry, allowing business to develop the technology to the point where it can now be deployed at scale to offer real benefits to both greenhouse gas reduction and consumer prices.

We will be adopting a similar approach to deploying other emerging technologies at scale, from carbon capture, usage, and storage to electric

Electric car ownership is on the rise

vehicles. We have backed the latter with hundreds of millions of pounds of support to install chargers – and in the Queen’s Speech announced a further £1bn of investment in clean car technology. The market is responding: the number of electric cars has increased ten-fold since 2012. And when we leave the EU, there may be opportunities to do even more, such as reducing the rates of VAT on solar panels and batteries.

This is the heart of the Conservatives’ policy for delivering net zero. We are championing targeted intervention measures to guide and shape the market, steering a careful course between the Scylla of a purist laissez-faire doctrine and the Charybdis of nationalisation and state control. Contrast this with Labour’s policy. Their heavy-handed approach is rooted in the failed statist economics of the 1970s. It will not just fail to deliver; it will actively set back attempts to tackle

climate change. Over the next 30 years we need to mobilise £700bn of capital above business as usual – and we will not do it by government decree.

We have to be realistic. The Committee on Climate Change, the UK’s leading source of independent scientific advice on this subject, has said: “Achieving net zero significantly before 2050 does not currently appear credible.” The plans by Labour and the Green Party to deliver zero carbon emissions by 2030 simply are not possible.

Labour’s recent report calls for a 60 per cent decrease in car usage and more than £40bn of increased government spending every year. Citizens will have to make changes, certainly, but it is more likely to involve buying an electric car or upgrading their home heating system than to mean giving up meat or cancelling the family holiday abroad. And the Conservative Party will make sure that people have the support and financing they need to make these investments.

A Conservative government will support our economy to transition to the low-carbon vision of the future. Through the Industrial Energy Transformation Fund we are investing £315m to help our energy-intensive industries cut their emissions, boost their efficiency, and increase their competitive edge. And as Minister of State for Business, Energy and Clean Growth, I’ve visited our new offshore wind farms and seen how they are creating new, high-skilled manufacturing jobs in Hull, Grimsby and Great Yarmouth. The UK is leading the world in low-carbon industries.

Delivering net zero is my top priority. It will require an evidence-led approach, including a balanced programme for generation, an electrified vehicle network, and major action to make our heating green. To get there, government will need to shape the market and provide the framework to support business and individual actions. The government, industry, and citizens must all work together to transform our economy and society.

The power for change lies with us all

Responding to the challenge of transitioning to a low-carbon economy requires a joint effort from government, industry and society, writes **Gabrielle Ginér**, head of environmental sustainability at BT Group



The stark environmental challenges the world faces are becoming more apparent with each passing week. Encouragingly, the UK government sent a positive signal by setting a net zero target earlier this year. Targets like these can serve to focus stakeholders to come together to share that sense of ambition, creating a snowball effect, and inspiring others to act and scale up their own ambitions. From there, we can create “ambition loops” – from businesses to cities to governments and round again – that will not only deliver environmental benefits, but create jobs and economic growth as well.

At BT, we have long recognised the importance of setting ambitious carbon emissions targets as a way of motivating our organisation and inspiring others. It is part of the reason we were able to

achieve our 2020 goal – to reduce the carbon emissions intensity of our business by 80 per cent – four years ahead of schedule.

This spurred us to set a target in line with a 1.5-degree trajectory in September 2017. This target will see us reduce our carbon emissions intensity at a rate of 87 per cent.

By setting targets, we not only send a signal internally to transform our business, but also externally to indicate to the wider market and policymakers that we are looking for a supply of innovative low-carbon solutions. These demand signals are incredibly important, but they cannot achieve the kind of climate action needed in isolation.

One of BT’s biggest challenges in achieving our net-zero carbon emissions by the 2045 target, is

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decarbonising our fleet of around 30,000 vehicles that service the UK's digital networks across the country, including its most remote areas. We need further action to ensure long-term stability that will provide innovation and investment in low-emission vehicle technology and infrastructure.

Government and industry have embarked on significant activity to promote electric vehicles, but further action is required to provide the long-term certainty that will promote innovation and investment.

From conversations with our suppliers and our own pilot schemes, including the installation of charging points in some exchange centres and homes in Birmingham, we see a number of points that need to be tackled. We need a clear plan to create a national charging infrastructure that

effectively serves everyone. We need a commitment to prioritise and increase R&D funding and also a provision of incentives to send even stronger signals to industry.

Introduction of upfront purchase grants, clarification on future carbon emission standards, and further incentives could accelerate the uptake of zero emissions vehicles. Setting further incremental, long-term targets, produced in conjunction with consumer groups and manufacturers, to reduce the sales of non-electric vehicles, could be one such option.

We also need to encourage innovation in non-conventional low-emission vehicles, such as heavy-load vans, and in more complex areas of the transport sector where zero-emission technology is not yet deployable at scale.

Additionally, we should be trialling various technologies such as hydrogen and biofuels. Getting those points right will lead to commercially viable vehicles for both individuals and businesses alike.

So, what can be done to realise the massive potential of electric vehicles? Looking at one facet of our environment strategy – renewables – we can see important parallels. Adopting a light-touch regulatory regime – which allows industry to develop and deploy emission-reducing technologies – has supercharged the renewables market and can do the same for low emission vehicles and other sectors ripe for decarbonisation.

This isn't a hypothetical position. BT is one of the UK's biggest consumers of electricity, using nearly one per cent of the UK's electricity to power our national networks, data centres, and offices. To meet our energy needs in a sustainable way, BT has long been a pioneer in purchasing renewable electricity.

All of the electricity we directly purchase from energy suppliers in the UK comes from renewable sources, with 16 per cent coming from power purchase agreements. Even our

world-leading research and innovation hub at Adastral Park in Suffolk is powered by a solar farm the size of 40 football pitches.

Looking at the bottom line, through our energy efficiency programmes, we've saved enough energy to boil 10.5bn kettles and nearly £300m over the past decade, giving us the chance to re-invest those savings elsewhere. This was only possible as there was wide policy support for the generation of renewables that complemented and supplemented the demand in the market. It's a powerful message that we share with both our customers and suppliers, climate action isn't only the right thing to do – it makes business sense too.

We have been able to take some dramatic steps towards tackling one of society's biggest challenges, but more needs to be done. Information and communications technology (ICT) solutions are an important part of the answer, with studies showing that they have the potential to enable a 20 per cent reduction of global carbon emissions by 2030. We are already seeing this at BT.

Last year, our products and services, such as video conferencing and vehicle telematics, helped our customers save on 11.7 million tonnes of carbon – that's the equivalent of the carbon emissions of nearly three million UK households. And let's not forget supply chains. BT has around 16,000 direct suppliers and a global spend of £13.4bn. We are working with our suppliers to drive innovation on sustainability and also to introduce a contract clause for suppliers to reduce their carbon emissions over the term of their contract.

BT is up for the challenge and we hope that others will join us in setting their own science-based net-zero targets, thereby driving themselves, industry, and policymakers to develop the right conditions for quicker, more impactful climate action.

For more information, please visit:
www.btplc.com

Swansea Bay's renewable energy project has stalled. Jonny Ball investigates the politics behind it

The rise and fall of the tidal lagoon

In a year of mass, global climate change activism, a recent Opinium poll found that 54 per cent of Britons say environmental issues will affect the way they vote in the coming election. And with a legally binding target for the UK to achieve net-zero emissions by 2050, the major parties have been setting out their stalls on clean, renewable energy.

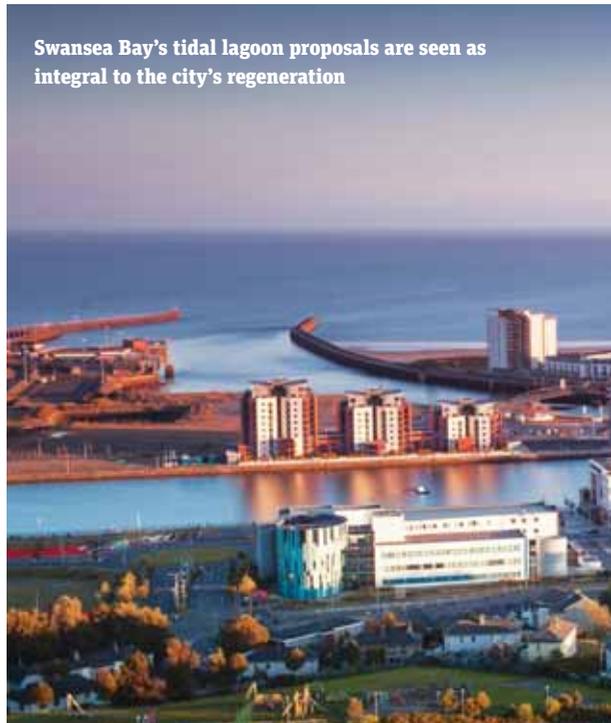
Early in the election campaign, the Conservatives announced a moratorium on fracking, though the promise seemed to have been contradicted by documents released just days later. The party also promised a £500m investment in electric vehicle charging points. The Liberal Democrats say they will aim for 80 per cent of energy to be generated by renewables by 2030. Labour, meanwhile, are promoting their Green Industrial Revolution programme, with major investment in wind, solar power, and electric vehicle infrastructure. In their manifestos, both the Lib Dems and the Greens mention tidal energy in a list of

alternative sources of power, but Labour's plan includes a commitment to a tidal power project with a history. Swansea Bay tidal lagoon will "be at the forefront of the green revolution," Geraint Davies, MP for Swansea West, told *Spotlight*.

Tidal energy is harnessed by building artificial barriers around areas of water and allowing incoming and outgoing tides to turn underwater turbines, generating electricity. In South Wales, the Swansea Bay proposals are seen not just as a low-carbon energy opportunity, but as key to local regeneration.

So far, the path to the scheme has not been smooth. Designated as part of the national infrastructure plan in 2014, and granted planning permission in 2015, in June last year the Welsh government offered to contribute £200m to the £1.5bn project. That same month, however, then business secretary, Greg Clark, shelved the plans. He cited concerns over the future price of energy that the project would generate. The business case had "not demonstrated that

Swansea Bay's tidal lagoon proposals are seen as integral to the city's regeneration



it could be value for money," Clark told parliament. In response, Carolyn Harris, Labour member for Swansea East, told the business secretary that he "would never understand the frustration and anger felt in my city today." Leading Liberal Democrats also expressed frustration at the decision.

Tidal Lagoon Power (TLP), the company behind the proposals, had asked for a guaranteed £168 per megawatt hour (MWh) for electricity generated for a period of 35 years. That price was described by Citizens' Advice as "appalling value for money" that would be "against the interests of consumers". It is over three times the cost of the UK's current wholesale electricity price (£50/MWh), twice the cost of energy from Hinkley point (a project described by the National Audit Office as "risky and expensive"), and four times the cost of offshore wind energy, which has fallen dramatically in recent years.

So why is Swansea's tidal lagoon featuring in Labour's flagship green



“Solar and wind will not fill the gap alone”

growth policy four years later? Proponents contend that the high initial 35-year cost is misleading because tidal barrages can last for over 100 years, and that the electricity would actually work out cheaper over time. Modelling the costs of tidal power over shorter periods makes it appear far more expensive. Those who support the Swansea project also argue it would give a major boost to the South Wales economy and that it would act as a pilot. If successful, other lagoons could be explored, with the eventual cost falling once the technology is scaled.

“It doesn’t follow, what the Tories say, that if it’s more expensive than the cheapest source then it isn’t worthwhile,” says Davies. “Clearly we should be looking at the economics over a 120-year lifespan, not over the 30-year comparison with Hinkley.”

For Labour, Swansea’s tidal lagoon represents a new model of state-led, publicly developed and British-owned energy projects. In the same month that the plans were rejected, Jeremy Corbyn tweeted that “Swansea tidal lagoon would harness Wales’ natural resources, reduce reliance on fossil fuels and create thousands of jobs.” An accompanying Labour Party video criticised the UK’s current model for investment in renewables, with infrastructure owned by the private sector and foreign state-owned energy companies.

The problem for Labour is that TLP, the main driver of Swansea’s lagoon project, is not a state-owned or municipal firm, but a private limited company. In 2018, questions were raised about information its founder, Mark Shorrock, gave a parliamentary select committee. The former set location manager and film producer has consistently denied misleading them. The previous year, an alleged £4m worth of transactions between entities involving Shorrock and a firm founded by his wife, Juliet Davenport, were described as being on “unjustifiable” terms by a rival renewable energy executive, who said they had led to “a significant loss of shareholder value”. Davenport’s firm, Good Energy,

denied allegations and said dealings with her husband’s companies represented a “great deal for shareholders”.

Charles Hendry’s 2016 report into the role of tidal lagoons, which was generally positive about the prospects of the technology, recommended that TLP “secure a delivery partner with a track record in building major energy or infrastructure projects,” implying the firm had little track record. The final report also questioned whether “government energy policy [should] be led by a developer who comes forward with a particular concept,” such as TLP, or whether it “should be managed in a more strategic way, with government taking the lead”. Hendry recommended that the government not discourage private initiative and entrepreneurialism, but said they “must consider whether a more strategic approach... would be most beneficial.” Following the rejection of its proposals last year, TLP has attempted to revive the project using private money.

“I don’t think it’s going to be anything to do with Mark Shorrock,” Davies suggested, following confirmation that plans for the Swansea Bay lagoon would be included in the Labour manifesto. He mentions the possibility of a government bond issue to finance the project. “The previous model that was done by Shorrock was assuming very high rates of return for investors that the public would then have to pay through energy prices... We shouldn’t have to be playing the private marketplace with risk-based venture capitalists.” The TLP did not respond to requests for comment as we went to press.

If the UK is to meet its net-zero emissions target, massive investment in renewable infrastructure will be required. For Labour, tidal power and the Swansea Bay scheme will be integral to that, says Davies. “Our plan is to reduce some of the UK’s energy need with energy efficient homes, but we’ve still got to fill a big gap for when we don’t have fossil fuels,” says Davies. “Not all of that gap will be filled with solar and wind, and tidal has got to have its place.”

How the oceans can save the world

Wind and wave technologies are leading the fight against climate change, writes **Deborah Greaves**, professor of ocean engineering at the University of Plymouth and director of the Supergen Offshore Renewable Energy Hub

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As an island nation, the sea is part of our very being. It has shaped our coastline over millennia and we continue to rely on it for much of our day-to-day existence. Harnessing that power in a way that can benefit us now and in the future is a constant, but crucial, challenge. One of the key things we need to do is change the way we use and deliver energy. Over generations, we have become used to relying on fossil fuels to power how we live, work, and play. And while the demand for clean and sustainable sources of energy is now recognised, making it a reality will require a seismic cultural shift.

As we build towards that, offshore renewables are becoming the subject of increased focus. Offshore wind is already making significant contributions to the national energy mix, and we hope that marine energy – wave and tidal – will one day do the same.

Offshore wind has made dramatic progress in price reduction and ambition in the last year. Its development has the advantage of a similarly scalable design to its onshore counterpart, and offshore wind farms have sprung up around the UK. However, the harsh environments into which wave and tidal energy systems would need to operate have arguably hindered their technological development.

Offshore wind, wave, and tidal face common challenges, such as surviving environmental action placed on them and managing potential

impacts on marine ecosystems. But that should not detract from their potential and there is little doubt that we need to, and can, exploit this resource within the coming decades.

The UK's target for net-zero greenhouse gas emissions by 2050 puts this into context, with a clear imperative to develop our future energy system to be resilient and diverse. It is the combination of offshore renewables that can help to achieve this goal.

The tidal sector is already more advanced than wave and the TIGER project, in which the University of Plymouth is a key partner, is a really exciting development. It will see turbines submerged offshore to harness the energy of tidal currents, which will then be converted into electricity. This could prove a real game changer in terms of converting the UK's research excellence into practical benefits. Such projects could in effect smooth the path for wave energy to attain a similar stage of development, and I believe the main challenges there include resolving reliability and survivability.

Whenever we talk about offshore renewables, we need to appreciate that investment does not just represent a financial cost. With human impacts on the planet in ever starker focus, and increasingly strict targets around addressing climate change, there is a wider value to the planet.

When it comes to offshore renewables, we at the University of Plymouth are at the forefront of turning this aspiration into reality. Our leadership of the £9m Supergen ORE Hub, funded by the Engineering and Physical Sciences Research Council, and other high-profile projects, means we are setting the agenda when it comes to innovation and industry collaboration across the sector. And working with colleagues across the UK, we possess the expertise with which to meet this global challenge head on.

For more information, please visit www.plymouth.ac.uk

Helping power perform under pressure

The roll-out of renewables will only be as effective as our ability to modernise energy grids, explains **Mark Howitt**, founding director and CTO of Storelectric

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Intermittent renewables do not always generate energy when we want. This results in a huge need for storage, demand side response (DSR) and interconnectors to turn intermittent generation into dispatchable on-demand output. All are required, but a cost-effective grid needs each one to do their most appropriate roles.

Interconnectors

By 2040 most of Europe's energy transition plans will rely on imports during "times of system stress". But these are largely concurrent for neighbouring grids, for example after sunset on a windless winter evening. Interconnectors also have no inertia, so cannot support many aspects of grid stability. Each grid needs to have sufficient dispatchable power, and the interconnectors' roles are to limit the cost of electricity.

Demand side response

DSR displaces short-duration demand mostly on distribution grids, limited in scale and duration (other than vehicle-to-grid, V2G) to 5-10 per cent of demand. V2G will add no more than around 25 per cent of their nameplate capacity. DSR units cannot be used multiple times in any period, so they must be subdivided to do so.

Batteries

Batteries are optimally up to 20MW, for 20-60 minutes, though some have greater capacity. Doubling their scale or duration increases capital cost by

70-80 per cent. They have outstanding responsiveness, but no inertia. Day one efficiency is 42-62 per cent grid-to-grid, the reduction from claimed 85-92 per cent efficiencies being principally cooling and AC/DC/AC power conversion. As cells deteriorate in five to 10 years, their cooling requirement roughly triples, reducing their average lifetime efficiency further still.

Large-scale, long-duration storage

This is mostly pumped hydroelectric storage (PHES) and compressed air energy storage (CAES), suited to large scales and multi-hour to multi-day durations. Generation is inertial, providing grid stability. Their levelised costs of storage are much lower than batteries; PHES has few potential growth locations, mainly remote from both supply and demand. Traditional CAES burns lots of gas; similarly-priced adiabatic CAES burns none.

Storelectric's CAES

Storelectric is developing innovative forms of CAES using existing technologies for 40MW to multi-GW installations, with durations of less than four hours, zero or low emissions, 68-70 per cent grid-to-grid efficiency and levelised costs cheaper than gas-fired power stations. The €/MW price is a third of pumped hydro and 1/75th per MWh. Levelised cost is already what batteries aspire to be by 2035 and their €/MWh is vastly cheaper. Most countries could store up to a fortnight's worth of energy.

Storelectric is seeking funds to build a 40MW, 200MWh first-of-a-kind plant with more than 62 per cent efficiency (grid-to-grid) in three years; a 500MW plant will take longer. Storelectric's second technology, CCGT CAES, is retrofittable to a suitably located gas-fired power station. It is cheaper, can almost halve emissions, and add storage-related revenue streams, re-living stranded assets.

For more information, please visit:
www.storelectric.com

Tim Yeo, chair of The New Nuclear Watch Institute, on the non-renewable, clean and reliable energy solution

The nuclear option



The United Kingdom is a global leader in its response to climate change. In the last century our scientists helped raise public understanding of the issue. More recently initiatives like emissions trading and legally binding carbon budgets were pioneered here. Since 1990 UK carbon emissions have fallen faster than any other developed country. In the last decade generous subsidies have made our offshore wind industry the biggest in the world.

Despite these achievements the UK must raise its game to maintain this leadership. Setting a net-zero emissions target is easy. The real task is to find a credible pathway for achieving it.

An essential element of this must be total decarbonisation of the electricity generation industry. Despite the growth of renewables almost 45 per cent of UK electricity was generated by coal and gas last year. No form of cost-effective carbon capture and storage yet exists anywhere

in the world. It would be recklessly irresponsible to base climate policy on the assumption it will be available soon. Fossil fuel use must therefore end completely by 2050 at the latest.

The challenge this poses is significantly increased by the switch to electric vehicles, the replacement of gas by electricity for heating, and the very rapid expansion of electricity-intensive data processing technologies. Together these factors mean that, regardless of better energy efficiency and demand-side management, demand for electricity will increase substantially by 2050.

In addition, the planned closure of all our existing nuclear power stations, which still generate over a third of the UK's low-carbon electricity, makes reaching our carbon-reduction targets even harder.

Even after the wholly welcome expansion of renewable energy it would have to more than quadruple from its present level to replace both fossil fuels



Renewables cannot fix climate change on their own

and nuclear by 2050. Nearly all this increase in new renewable capacity would have to come from intermittent sources such as wind and solar.

Large-scale, flexible, low-cost, long-term electricity storage, does not yet exist. Any country planning to rely mainly on wind and solar to maintain the uninterrupted supply of electricity which all modern economies require will therefore have to invest in very substantial amounts of back-up generation capacity.

The OECD has already warned of how the extra system costs of intermittent renewables will sharply rise as reliance on them in any country approaches 50 per cent and could be penal at penetration levels above three-quarters.

Historically, only two countries – France and Sweden – have ever cut carbon emissions from electricity generation as fast as the UK must now do to reach net zero by 2050. Both did so, in the wake of the 1970s oil crisis by investing massively in new nuclear plants.

Against this backdrop it is strange that anyone purporting to be concerned about climate change should oppose the use of nuclear energy, the only sustainable source of large-scale dispatchable power that also enhances energy security. The low-carbon credentials of nuclear energy are impeccable. Its safety record is outstanding. Nuclear waste does not threaten the health of the public, unlike fossil fuels which shorten the lives of hundreds of millions of urban dwellers worldwide, including many in the UK, on a daily basis.

Claims by enthusiastic supporters of renewables that new nuclear plants are no longer cost-competitive following the impressive reduction in the price of wind and solar power fail on two grounds. First, they ignore the fact that in addressing the climate emergency we do not have the luxury of time. Without action in the 2020s the world will exceed the level of greenhouse gas concentrations in the atmosphere which make a rise in global average surface temperature of more than 2°C unavoidable. Within five years, debate

about energy policy will stop being about how much decarbonisation costs. Instead it will be about whether and how to do it quickly enough to prevent large parts of our planet from becoming uninhabitable by humans.

Second, the cost comparisons between intermittent renewables and nuclear are rarely made on a like-for-like basis. Phase one of the world's largest offshore wind farm, Hornsea, began generating in UK waters earlier this year. The price of its electricity is a whopping £155/MWh, and that does not include the system costs referred to above.

The huge subsidy which forces UK consumers to pay makes the allegedly high cost of Hinkley Point C, the nuclear plant now being built in Somerset, look like a bargain. The public, however, is soothed by reports of the latest contracts for offshore wind turbines being let at £40/MWh, ignoring the fact that it will be years before these come onstream.

Once the UK moves from building a first-of-a-kind nuclear plant to developing a series of identical plants the cost of nuclear will fall sharply. There are enough sites already licensed for nuclear installations to allow a swift roll-out of such plants if the political will existed. Furthermore the potential for capturing economies of scale is likely to increase as a new generation of small modular reactors becomes available. These advanced reactors also offer the UK a chance to compete once more on the world stage.

Over 60 years ago the world's first civil nuclear plant opened in the UK. Until a Conservative government abandoned nuclear energy in favour of gas towards the end of the last century we remained an international competitor in the nuclear industry.

Today, by throwing our weight behind the development of advanced modular reactors, we could both help avoid dangerous irreversible climate change and also reap an economic reward by taking part in the growth of a new industry. What better Christmas present could a government starting its term of office next month give to the global environment and the British people?

Neighbourhood warmth

Heat produced by energy from waste plants can provide the basis for district heating programmes, explains **Mike Reynolds**, managing director at Vattenfall UK

If the United Kingdom is serious about delivering a more sustainable, circular economy, then it would do well to explore the opportunities presented by the burgeoning energy from waste (EfW) market. EfW refers to a type of incineration that involves burning rubbish, which would otherwise be destined for a landfill, at high temperatures in order to produce electricity.

The introduction of landfill diversion targets in the 1990s has helped give rise to a new generation of EfW plants in the UK. The consultancy firm Tolvik predicts that the UK will have the capacity to treat almost 17 million tonnes of residual waste through EfW plants within four years. This could help to manage and process waste locally, rather than spending huge sums on shipping it abroad.

Culturally, meanwhile, the public consciousness around climate change has increased, and people are gradually



taking more steps to prevent, reuse, and recycle their waste. But even if residual waste decreases, it can't be eliminated entirely, which is why it is important for the UK to be more responsible and economical in how it deals with its rubbish.

And this rubbish represents a further opportunity in terms of its application as a heat source. Rather than being released into the atmosphere, any heat produced from EfW can be captured and channelled in insulated pipes to places where people need warmth. If managed and distributed properly, our research has found, this could help to supply heat for around six million UK households (roughly 15 million people), and go some way towards supporting the government's target to stop using gas-fired boilers in new-build homes from 2025.

District heating projects that comprise pipes, pumps, and centralised heating technology are becoming more common

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Vattenfall has managed a district heating network in Berlin, supplying heat to 1.3m properties

on the continent. These projects are usually managed in partnership between local authorities and private-sector energy providers, and include some real success stories. For example, Westpoort Warmte, a joint venture between Amsterdam's Waste and Energy Company and Vattenfall, started the construction of district heating networks in 1994. By 2013, the use of district heating from waste incineration had reduced CO₂ emissions by 24,000 tonnes a year.

In the UK, individual households tend to have their own boilers, and there is work to be done to raise consumer awareness of the benefits of heat networks. In Europe, many neighbourhoods have their hot water and heat piped straight into their houses from one larger, and more efficient, centralised tank. The excess heat created by electricity generating plants, factories, and public transport is fed into the network, reducing waste and carbon

emissions, all the while cutting fuel consumption and saving people money on their bills. As nearly half of the energy in the UK is used for heating purposes, and a third of UK emissions comes from heating, the need to decarbonise this process has taken on a greater significance in the fight against climate change, and indeed the battle against fuel poverty.

Waste should be viewed as an asset on local authorities' doorsteps. The average UK household pays £200 a year to cover its waste collection and recycling, but is it really cost-effective to pay someone to move waste from one place to another, which in itself incurs transport costs? Is it cost-effective to ship recycling to another country, to be treated and repurposed, only to be shipped back to the UK and reused as another product a year later, only to be thrown away. As a matter of social responsibility, we need to think holistically and get better at managing our own waste, rather than

relying on others. District heating projects offer the chance to take ownership of waste and turn it into something useful. It would help to close the loop that exists with waste production and recycling cycles.

So, what can the government do to help? First, from an infrastructure perspective, the construction of new EfW plants should be more strategic. And legislation should ensure that plants are located in places where they can meet the local heat demand. A lot of EfW developers are focused on solving the waste problem, without appreciating the potential role they could play in solving the wider heat problem or cutting emissions.

If national government can recognise the utility of waste, it could help local authorities to work with EfW developers on a long-term basis. EfW should be located not simply on one side of a big city, but on sites that are able to serve as many households as possible, and with good transport links nearby.

In the UK, Vattenfall is not looking to enter the EfW market itself, but rather we view ourselves as a non-competitive partner for the industry, to help it integrate with local authorities' heating needs. We intend to procure heat from EfW developers and then help to distribute that heat across towns and cities, as we have already done with our previous third-party projects in Berlin, Amsterdam, and Uppsala. Where EfW developers may be experts in waste disposal, Vattenfall is a specialist in customer service and designing, building, operating, and managing a heat network. Equipped with decades of experience, we feel that we can act as a bridge between the private and public sector.

Sustainable development, ultimately, means meeting the needs of this generation without compromising on the needs of those to come. EfW represents a chance to address two key challenges – power and heat – without compromising on quality or performance.

For more information, please visit group.vattenfall.com

The UK should target frequent flyers to reduce carbon emissions, argues Wera Hobhouse, Liberal Democrat spokesperson for climate change

Why we need a flight tax



Personally, I dislike aeroplanes and haven't flown since August 2018. Still, I understand the thrill and convenience flying represents: zipping across the planet to new places, sometimes to be united with loved ones. But jet fuel emissions threaten our very existence. It is high time for a new national conversation around flying, which faces the hard environmental facts.

Jet contrails that streak across our skies are not a romantic feature of our modern landscape. They are toxic vapour trails high up in the atmosphere made up of carbon and non-carbon compounds, that contribute significantly to global warming. Per passenger, one long-haul flight contributes as much CO₂ as the entire yearly carbon footprint of people in 56 countries. Even relatively short return flights carry a carbon footprint per passenger that is more than the average produced by citizens of 17 countries annually.

And demand for flights continues to

soar – it is up 300 per cent from 1990 and is expected to double or triple again in the next three decades. By 2050, aviation is expected to make up at least 25 per cent of the UK's total carbon emissions as we successfully phase out other sources. This is a frightening prospect – a danger to our planet so great, we risk sleepwalking into a catastrophe.

The good news? We can tackle aviation demand and emissions now and there is no need to punish the majority. Indeed, reform has the potential to benefit everyone in the UK while achieving crucial climate action. Just 15 per cent of people here in the UK take a staggering 70 per cent of all flights, according to Transport for Quality of Life, which advises the Department for Transport. Aviation is also exempt from fuel duty and plane tickets are zero-rated for VAT. In other words, flying benefits from huge public subsidies that no other form of transport enjoys.

The Liberal Democrats' policy on



Just 15% of people in the UK take 70% of UK flights

reducing aviation emissions includes plans to oppose any further expansion of London airports to ensure there is no net increase in runways across the UK and to encourage advanced technologies like synthetic electro fuels and hybrid planes.

We are also the only party to have detailed, sector-by-sector plans to get the UK to net-zero greenhouse gas emissions. The Green Party advocates an impossible target of reaching net zero by 2030. And the Tories still back a moratorium – not a ban – on fracking. Labour’s plans are still sketchy at best.

A crucial part of our aviation emissions policy is to reform the current Air Passenger Duty to target the most frequent flyers and stop the system of unfair subsidies that cost the Exchequer more than £10bn each year.

Our proposed reforms would change the duty for the first international return flight a person takes to zero, rewarding infrequent flyers. Far from punishing the majority, our reform would actually make that precious annual family holiday or urgent business trip cheaper than it is currently. Those few – less than 15 per cent – who fly multiple times each year would bear the progressive costs. So, how would it work? The New Economics Foundation published a paper in 2015 which provides a useful basis on which we would model our policy, subject to review in government.

They proposed that the second return flight would be charged an additional £20, a third flight £60, rising to roughly £420 for a ninth annual return flight. In other words, the wealthiest, most frequent air passengers would pay the most. This is fair and necessary.

To administer this reform, HM Revenue and Customs would need access to data currently collected by the Home Office on international passenger movements and airlines would need to record customers’ passport numbers at the point of ticket sale instead of the time of boarding. This reform would raise an estimated £7bn in annual revenue for the Treasury over time, making huge sums available for rural bus services, reopening

branch rail lines, converting rail to ultra-low-emissions technology and investing heavily in renewable energy and carbon-zero, affordable homes.

There is already huge public support for policies that seriously tackle the climate emergency. Tens of thousands of people have signed up to www.flightfree.co.uk. Even KLM, the Dutch carrier and one of Europe’s oldest airlines, has asked passengers to fly less – a sign that aviation’s contribution to climate change is too serious to ignore.

Like Veganuary, which people and businesses have embraced as a way to cut our food carbon footprint, we believe personal pledges to fly less or to give up flying altogether are also a crucial first step for individuals.

And yet, even these measures will not be enough. That’s why our manifesto will pledge to support renewable energy, zero carbon transport, heating, and housing efficiencies as well as planting 60 million trees every year to remove carbon from the air.

The final piece of the green aviation puzzle is jet fuel. Research into cleaner burning waste fuels, like the kind being developed at Herriot Watt University in Scotland is vital. These green alternatives are unlikely to entirely replace oil-based aviation fuel, but they could massively reduce the industry’s carbon footprint.

Norway announced in October that as of 2020, all airlines operating there must incorporate 0.5 per cent advanced biofuel into jet fuel. This will mean 6 million litres of biofuel – made from waste and leftovers, not palm oil – will be used by planes operating in Norway. It will cost more, but Norway’s government has recognised the need to start cutting greenhouse gas emissions from aviation immediately.

Fixing aviation will not be easy, but we must do it. Britain has a chance to lead the world on this urgent task. Imagine our beautiful planet safe from the catastrophe of climate change, where future generations can enjoy the natural beauty and security we might easily take for granted. Now that is thrilling.

The cutting edge in offshore generation

The economic and technological success of offshore wind is a constant, writes **Ian Cotton**, professor of high-voltage technology at The University of Manchester

Plummeting costs and technological breakthroughs led to the International Energy Agency's autumn prediction that offshore wind generation could grow as much as 15-fold in the next 20 years. The March 2019 offshore wind sector deal included a pledge to increase the share of electricity from offshore wind to nearly a third by 2030. Work in this industry has produced a mix of technological improvements and economies, achieved by scaling production – which, in turn, has resulted in improved investor confidence and a reduction in the cost of capital. The Contracts for Difference (CfD) strike price is now at around £40 per MWh.

We have come a long way, but commitment to, and investment in, offshore wind needs to be sustained. It must continue into the long term in order to truly translate into the next energy revolution. Nothing should fall through the cracks if today's successes in

driving down manufacturing costs are to be built upon. Industry, supply chain, utilities, and stakeholder priorities must all be taken into account.

The University of Manchester is at the heart of the booming offshore wind energy sector. Our academics are helping find solutions to big system challenges and are coordinating input from across departments to ensure each solution is considered from all angles.

Our computer models – enabling electricity network operators to learn how to control the energy generated by large-scale windfarms – have played a vital role in bringing down the upfront costs of setting up an offshore windfarm. Our role as a key partner in the University of Plymouth-led, Engineering and Physical Sciences Research Council-funded Supergen Offshore Renewable Energy (ORE) Hub enables us to continue developing integrated modelling and underpin understanding in order to deliver such



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HOME Offshore autonomous robot asset at MediaCityUK, Salford

tangible benefits.

While the cost of key elements in wind energy, such as turbines, has fallen, operations and maintenance remain a significant outlay for the sector. Stepping up to solve these challenges is Holistic Operation and Maintenance for Energy (HOME) Offshore. This Manchester-led partnership between five UK universities, funded by the EPSRC, brings together some of the leading minds in next-generation energy to investigate how big data, robotics, artificial intelligence, and virtual reality can improve offshore windfarm monitoring and maintenance. The university's Thomas Ashton Institute is also involved in looking at the risks presented to the offshore wind turbine workforce and evaluating the technological solutions to help improve health and safety.

Key to pushing offshore wind to greater heights, both figuratively and literally, are the materials that will allow

for bigger offshore turbines to be built with improved longevity and reliability. The Henry Royce Institute, based at Manchester, is the UK's national institute for advanced materials and home to some of Europe's best X-ray imaging facilities. Researchers there are conducting pioneering work on the imaging of wind turbine composites to help ensure bigger, more effective wind turbines can be safely introduced. Materials research can also play a key role, not just in the enhancement of established turbines, but also in the development of innovative step changes for the wind power fleet of the future.

A key challenge for is the development of larger-scale energy storage systems that could balance demand and supply over a period of days as opposed to

minutes. We are pushing advancements in energy storage and batteries, which grow in importance in line with more renewable generation, and our research covers network resilience and effective grid connection.

Manchester benefits from expertise across many and varied disciplines. We can experiment in applying the learning and techniques from one area, such as condition modelling for marine energy, to another, such as using this technology for offshore windfarms. We are also upskilling the workforce who will be responsible for applying the technologies our academics are working on today when they join the industry tomorrow.

For more information, please visit: manchester.ac.uk/energy-research

CASE STUDY: HOW GRAPHENE INNOVATION COULD GIVE THE UK ECONOMY A POSITIVE CHARGE

Dr Craig Dawson

Manchester has a diverse portfolio of energy storage technologies that use graphene and other next-generation 2D materials, known as graphenes. We lead research from initial concept through to working prototype across a science supply chain that includes a world-leading research community based across our campus; proof of feasibility in our specialist research-led National Graphene Institute; then through to scale-up in the application-focused Graphene Engineering Innovation Centre (GEIC).

The GEIC is home to experienced innovation experts working on how best to incorporate graphene into batteries and similar energy storage devices. We realise that not all graphenes were created equal. However, by combining our knowledge of these new ultra-thin materials with our formulation and engineering experience we are confident of replicating many of the performance gains that have been heralded by academic research.

Put simply, graphene integration into batteries and related devices is not a plug and play. More industry-focused development is required to achieve the breakthroughs needed to deliver the long-anticipated revolution in energy storage technology.

An example of Manchester's lab-to-market approach is First Graphene Ltd – one of our commercial partners which has recently signed an exclusive worldwide licensing agreement with the university to develop a graphene-hybrid material for use in supercapacitors. These powerful new-generation energy storage devices can be used in applications ranging from electric cars to elevators and cranes.

For more about our advanced materials research, please visit: manchester.ac.uk/advanced-materials-research

Dr Craig Dawson is graphene applications manager at The University of Manchester

A sea change to net zero

The tide is turning for the UK's marine energy market, writes **Sue Barr**, chair of the Marine Energy Council

Our current climate crisis demands innovation in energy generation. To reach our targets, we must change how we generate, distribute, and consume electricity. Renewables have, on certain days, reduced coal power generation to zero but we need diversity in energy generation.

Today, the UK leads in ocean energy – harnessing the power of the waves and predictable tides around our islands. Our coastline accounts for 35 per cent of Europe's wave resources and 50 per cent of its tidal resources.

Estimates predict 20 per cent of UK electricity could be supplied by ocean energy with a net cumulative benefit of £1.4bn by 2030 from tidal energy providing 4,000 new jobs in regional economies, while wave energy is predicted to support 8,100 jobs by 2040. However, marine energy needs a market. The UK Marine Energy Council believes that marine energy can meet the UK government's "triple test" for support in the following ways:

Maximum carbon reduction

For every kWh generated by marine energy, 394g of CO₂ is saved in comparison to conventional generation.

Marine energy could provide a reduction of 4 MtCO₂ per year from 2040.

Cost reduction pathway

Marine energy is becoming cheaper. With 200 MW of deployment, tidal stream generation could reach £150 MW/h. Further rapid reductions in costs can also be achieved.

The UK's global advantage

We lead in the development of technology, with UK companies such as Orbital Marine Power, QED Naval, Marine Power Systems, and Nova Innovation.

The European Marine Energy Centre (EMEC) established in 2003, is a world first, hosting multiple projects, including the FORSEA Interreg NWE project. Through FORSEA Orbital's SR2000 2MW, the world's most powerful tidal turbine, produced over 3 GWh of generation in 12 months powering over 800 homes. That represents 7 per cent of Orkney's electricity demand – so for one day in every 14, a community ran completely on tidal energy.

MeyGen, the world's largest tidal array was deployed in Scotland by Simec Atlantis and the UK hosts several global companies. Swedish tidal developer, Minesto, based operations in Anglesey, and Bombora Wave Power, an Australian wave energy company, has headquartered European operations in Pembrokeshire.

UK tidal technology is also part of the €46.8m Interreg Tidal Stream Industry Energiser Project to deliver tidal energy in France and the UK with investment driving significant supply chain development. A diverse range of firms now have unprecedented experience in the sector, exporting skills globally.

Economic opportunity

Marine energy can deliver regional economic opportunities to areas such as the Highlands and Islands of Scotland, the South West of England and the

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Marine Power Systems



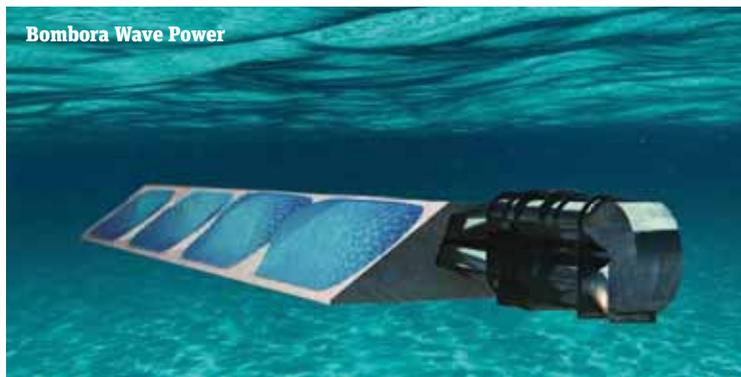
Orbital Marine Energy



Minesto



QED Naval SubHub



Bombora Wave Power

UK marine energy – leading the world

Ocean energy could be worth £1.4bn by 2030

coast of Wales. Up to 60 per cent of the economic benefit of both GVA and jobs will be in coastal areas. The International Energy Agency forecasts that around 337 GW of ocean energy capacity could be deployed globally by 2050. This represents a £76bn market and a huge opportunity to export.

The UK lead is at risk

Government support of marine energy is critical to deliver this sector. The Marine Energy Council has proposed three interlinked support models to

deliver marine energy to a cost-competitive position and secure a predictable, clean energy supply for the UK. This includes an Innovation Power Purchase Agreement (IPPA) and innovation “pot” for emerging technologies through the Contracts for Difference framework. Revenue support will deliver our marine energy future, supporting the government’s own clean growth targets.

Ocean energy can commercialise here in the UK and ensure that we retain the world lead in this emerging industry.

Are you with us?



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*The electric range you achieve in real life conditions will depend upon a number of factors including the starting charge of the battery, accessories fitted (post-registration), variations in weather, driving styles and vehicle load. Only compare fuel consumption and CO₂ figures with other cars tested to the same technical standard.