

FUTURE INDUSTRIES

Technology led growth for Britain in the
2020s

Progressive
Britain
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ABOUT THIS PAPER

When Labour re-enters government it will be faced with the challenge of providing real growth to an economy facing serious external pressures and internal (and long running) structural issues. We will not be able to sustain the everyday, foundational economies we need or rebuild the public services we require, unless we do so.

We believe that the application of science; the promotion of technology-based sectors, industries and services; and the productivity they generate are all core to delivering the economic growth that Labour has promised. Through investment and partnership with industry, Labour can start to unpick the structural issues of low productivity, regional inequality and low skills.

This paper sets out our early thinking about the potential for UK future industries, and what the UK government can do to stimulate and promote them, as part of the Labour Party's emerging Industrial Strategy. It begins with two short provocations setting out the current context, to inform the analysis that follows.

We have identified six industries, broadly construed, which are or will be at the cutting edge of the high-tech economy now or in the future. It is not an exhaustive or exclusive list but, through a mixture of initial thinking and interviews with industry and its representatives, we hope to stimulate thinking in the party about the steps it can take in government to develop a high-tech, high-productivity, high-growth industrial strategy.

The six areas are:

- advanced manufacturing & materials & supply chains,
- life sciences,
- A.I and machine learning,
- space & satellite,
- low carbon energy,
- & zero-emission transport.

For each area we give brief context, including government policy at this point, and broad policy suggestions for Labour to consider. We hope these initial findings will be useful as Labour begins to sketch out its industrial strategy and plan to develop them in more detail as is useful.

MAXIMUM IMPACT FOR MINIMUM INTERVENTION

The perspective from which we have undertaken this review has allowed us to think about the policy interventions and principles of intervention that would be beneficial across the often quite different industries we have considered. Labour should focus its initial energy on where there are common asks, or common issues to be overcome. In this way it will get the greatest impact for its investment.

LONG TERM STABILITY

Across industries we heard of frustration with the lack of long-term planning during the last decade. Business wants macro-economic stability and continuity of policy so as to plan and in truth the political cycle and external events are always going to challenge this. However, Labour should be clear about the direction in which it will go, if not the specifics of how it gets there, and should set out its intended path before getting into power. Long-term goals, policy machinery & instruments, and accompanying funding cycles are needed to promote investment to match the scale of the party's ambitions.

SKILLS AND THE IMPORTANCE OF EDUCATION

Technology-based jobs need a higher skilled workforce. This is not a particularly novel observation but despite the strengths of Britain's further and higher education institutions, industry needs more skilled workers. Universities and colleges should be reformed and supported to create both the skill base and commercialised intellectual property which Britain needs in order to gain a competitive advantage and grow. We also need changes to apprenticeships to create the workforce we need for future industries.

AGGLOMERATION AND REGIONAL DEVELOPMENT

Technology-based industries are dispersed around the country, but many benefit from clusters, including research institutions and a start-up ecosystem to be competitive. Where these already exist they should be supported and Labour should take proactive steps to develop clusters for a range of industries in sites around the country.

For example, life sciences should be supported in Oxford and Cambridge, but there are also already the foundations for a hub for space in Cornwall and advanced materials and manufacturing in the North West. Local, regional and devolved governments must work with businesses and academics to create and encourage new economic and industrial ecosystems across the country, recreating important links between regions and 'indigenous' industries.

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CONTEXT

GROWTH, INDUSTRY AND INNOVATION AS GLOBAL AND LOCAL PHENOMENA

GROWTH, TECHNOLOGY, AND GOVERNMENT IN THE 2020S

Peter Mandelson

Britain is facing an immediate cost of living crisis, but the major longer-term challenge is economic growth. Sustained weakness means, if we are not careful, we will start drifting back to the sclerosis the country experienced in the 1970s. Even if we avoid stagflation, the consequences of the last decade of lost growth and falling trade mean that we must run much faster as a nation to move forward.

We cannot sustain the everyday, foundational economies we need, or rebuild our public services we require, unless we raise the country's overall, long-term growth rate. But we do not have to resign ourselves to inertia and decline. We can opt for revival by utilising our innate strengths and the tools of a modern industrial strategy to catalyse the tremendous innovative and productive power of our nation.

Confused and contradictory direction from central government has left us without a plan or sense of driving, national mission. I regret this but it is a substantial opportunity for the Labour Party. Labour needs to raise the bar of its own policy thinking ahead of the next election and shoot for a watershed win like Mrs Thatcher's in 1979, not just sneaking over the finishing line as Labour had done five years before her in 1974.

This will require re-imagining how we make our living in the world and re-thinking how we leverage our world class science and technology base to create new industries and businesses for the future, whether in artificial intelligence, robotics, cloud technology and computing and their applications, for example, to mobility, healthcare, and defence.

This high-tech vision must embrace places like my own former constituency, Hartlepool. Once a great centre of coal mining, industry, and trade it is a place where more than 65 per cent of people voted to leave the European Union. Where many voters gave up on growth and the promises of a bigger pie because they did not see – and still don't – a proper slice of that pie reaching them or their families.

Some blame the woes of places like Hartlepool on 'globalisation' – the growth of international trade and global supply chains and the emergence of fast-growing economies like China and others in Asia. Instead, I firmly believe that globalisation is a net positive because it creates market opportunities for an advanced economy like Britain's.

But we are far from operating a perfect model, we need to build a more equitable globalisation and we must pay greater attention to issues connected with national resilience and security.

The biggest risk in the current debate is that we move from the undeniable truth that globalisation could work better to the false conclusion that we are better off without it. We wouldn't, we would all be less well off – and specifically the less well-off parts of the UK would be least able to absorb this shock.

We have produced this paper because technological change, and its adoption and integration, is an important driver of productivity and economic growth for the whole UK. It needs to be supported and shaped through public and private funding, nimble government regulation that favours innovation and the fostering of new supply chains through entrepreneurship and business growth, supported by intelligent public procurement.

Governments do not create jobs across the vast swathe of the UK economy, businesses do. But government sets the framework and that's why a meaningful growth strategy needs a proper system of investment incentives and proportionate rewards for risk taking.

Labour has to do the hard thinking: what are the new institutional means and mechanisms required to convert government investment and action into British private sector business growth and jobs across the UK?

An incoming Labour government needs to have clear, specific goals. It must understand what it can do in partnership with business. Taking on the responsibility for adding heft and heavy lifting to the operation of markets by using the power of the government balance sheet and public procurement to make a vital difference.

It is about a relentless focus on the markets and jobs of the future – the new economy - using government where appropriate to mitigate risk in long-term bets on new industries and technologies and laying the foundations of potentially major new supply chains in other science-based sectors where the potential for growth is real whether in biotechnology and life sciences, low carbon power generation including hydrogen and nuclear, zero emissions transportation and the space and satellite sectors.

Modern infrastructure as well as skills require substantial government investment and this, too, should be linked where possible to domestic manufacturing and public procurement. There are also important links to the everyday economy. Repurposed high streets will benefit from technological advance as will modernised public services through the application of AI and other science, for example identifying groups of people liable to preventable disease and

managing care for the elderly with remote diagnostics and virtual group meetings for those with mobility problems.

In the future, our research-intensive universities will need a greater focus on generating societal and economic benefit from research and we will need more US-style investment management companies attached to our universities to commercialise research.

The overall aim is clear: to marry up our science and technology base and workforce skills to the markets being built out from the digital, AI and decarbonising transitions, identifying the business and commercial opportunities linked to them and focusing government support on the whole supply chain so that innovation and production coheres. And be willing to take some risks in doing this and to act at scale where necessary.

In this paper we take up these themes across a selection of the UK's critical high-tech industries. We find both common and distinct asks from industry that Labour should consider as it thinks about what an industrial strategy for the next decade, and longer, should be. We hope it can support dialogue between the party and the industries who will deliver the growth it has promised.



EXPERIENCE GROWING INCLUSIVE ECONOMIC ECOSYSTEMS AROUND THE UK

Cllr. Stephen Cowan

In their book, *No Ordinary Disruption: The Four Global Forces Breaking All the Trends*, Richard Dobbs, James Manyika and Jonathan Woetzel explain how “Compared with the Industrial Revolution, this change is happening 10 times faster, at 300 times the scale, or 3,000 times the impact”.

There is only one viable answer to the competitive challenge globalisation and the race for technological supremacy presents: become more competitive and do so in the emerging sectors that will dominate the global economy in the coming decades. Developing economic ecosystems in these sectors across the UK must be an essential part of a new Labour government’s approach to furthering the country’s economic and security interests.

World class science and technology institutions are the crucial element found in almost every emerging technological economic hotspot from Massachusetts’ Kendall Square, Barcelona’s 22@Barcelona to Hammersmith & Fulham’s White City Innovation District.

The White City example is interesting as a model for elsewhere. Hammersmith & Fulham’s Labour administration developed their industrial strategy while in opposition. The strategy sought to transform Imperial College London’s strengths in science, technology, engineering, maths, & medicine into start-up and scale-up businesses while also attracting anchor corporations in those sectors. At the same time, it built on the Borough’s heritage as an arts and media centre.

Despite Imperial having long been based in Kensington and only newly arrived in White City, in 2017 the Labour administration and Imperial signed a formal partnership launching their joint endeavour to grow an inclusive local economy - making H&F, Imperial’s anchor borough.

Since then, 6,500 new jobs have been created in biotech, medtech, cleantech, engineering, AI, quantum computing, defence innovation and foodtech. It has attracted global anchor organisations, like NATO, Novartis, Airbus, ITV, and The Royal College of Art who sit alongside biotech pioneers like Synthace and Autolus. Over 60 life science businesses have been created, grown, or moved into H&F. White City companies have raised over £1.2bn in investment. The UK Competitiveness Index now predicts Hammersmith & Fulham will see one of the highest ongoing rates of productivity-per-worker while high-growth business investment in the Borough outstrips the rest of West London combined.

The partnership sought to facilitate this growth by delivering over 1.5 million square feet of high-tech workspace. It also took the following measures to encourage start-up and scale-up enterprises:

- Set up Upstream to provide targeted business support which aims to facilitate advice and smarter access to investment.
- Set up an Industrial Strategy Board to build consensus and coordinate actions
- The Borough introduced Blenheim Chalcot (a venture builder) to Imperial and successfully encouraged them to take space on Imperial's White City site.
- The Borough changed its planning guidelines to insist property developers deliver affordable flexible start-up and scale-up space
- The Borough is seeking to align schools, apprenticeships, and retraining programmes to the emerging opportunities in the Borough. The Phoenix Academy and Fulham Cross Academy are both members of its Industrial Strategy Board
- The Borough is building an £118m education and youth centre called Ed City in White City so local young people can share in the opportunities arriving on their doorstep.
- The Borough signed an economic collaboration agreement with the City of Barcelona linking the White City Innovation District to 22@Barcelona to share best practice and develop closer working ties.

The contrast with 22@Barcelona innovation district is insightful. In Catalonia there is a more muscular regional and city state. Their three T's approach to developing 'talent, technology, and territory' is facilitated by a greater capability to intervene in the economy. They influence all levels of its education system; the city has invested €10m into a fund matched by €40m from the private sector to provide a localised venture capital offer to start-ups; and they gain thirty per cent of the land in any development in the innovation district which is put to use meeting 22@Barcelona's economic growth needs. This is producing rapid change. In 2000 22@Barcelona had no universities, now it has ten because they were able to gain a substantial amount of land from developers and give it to the universities they wanted to attract.

Other models around the world demonstrate a bigger role for government. The German Länder and city states are actively charged with facilitating economic growth. South Korea's drive to grow ten innovation cities is a consequence of government strategy that has relocated institutions, provided R&D funding and is designed to encourage small and medium-sized enterprise growth in localised industries.

It now leads the world in the Bloomberg 2021 Innovation Index. Germany is fourth. The EU has six of the top ten countries in the index. Britain is eighteenth. All of the most innovative locations in the index rely on a consistent governmental commitment to R&D and the development

of localised economic eco-systems that combine public and private resources.

After ten years in office, the Conservative government produced its Research and Development Roadmap which it updated in 2021 green lighting significant increases in R&D spend. While there are good things in this plan, it is late in coming, lacks essential elements and doesn't go far enough so will not achieve the necessary successes.

An incoming Labour government must address these failing. It must innovate and develop the institutional means and mechanisms to convert government investment and action in the knowledge economy into localised business growth and jobs.

Labour should incentivise leading academic institutions (many currently on the golden triangle of London, Oxford and Cambridge) to set up R&D outreach operations in towns, cities and regions of the UK that can be chosen as the base for emerging sectors of the knowledge economy. And it should work with local democratic leaders to take coordinated measures that create the relevant institutional environment that will encourage clusters of start-ups and scale up businesses while attracting anchor corporations relevant to localised economic eco-systems.

Constitutional change should tackle Whitehall's centralised short termism instead empowering local and regional authorities with both the obligation and the powers to have greater influence on land development and to work with private firms to develop long term economic plans that quickly grow knowledge economy eco-system in their target localities.

Inclusivity must be central. Aligning all stages of education, apprenticeships and life-long learning schemes with local career and business start-up opportunities is crucial. Producing affordable childcare will be essential to making the opportunities accessible to all. And building housing that is built to house people needed for the local economy while addressing social needs will require critical changes in the balance of power with property developers if these emerging economic powerhouses are to avoid the speculative investors that leaves large swathes of new build schemes unoccupied in high value areas.

Lessons from around the world spotlight the potential mechanisms an incoming Labour government could utilise to revitalising communities with new economic growth in the smartest sectors of the global economy.

Developing localised clusters of excellence is not only essential for the renaissance of many of the UK's left behind towns, cities and regions, it is essential Britain raises its game if our country is not to find itself left behind in a world economy that is changing faster than ever before.

FUTURE INDUSTRIES

*EXPLORING CHALLENGES AND OPPORTUNITIES FACED BY HIGH-TECH BUSINESSES
AND THE ROLE FOR A FUTURE INDUSTRIAL STRATEGY*

ADVANCED MANUFACTURING & MATERIALS AND SUPPLY CHAINS

ADVANCED MANUFACTURING

Advanced manufacturing can be defined as innovative technologies to create existing products and the creation of new products. This can include production activities that depend on information, automation, computation, software, sensing, and networking.

These add significant value to manufacturing by 1) productivity gains and 2) the ability to manufacture materials and products not previously possible.

MATERIALS AND SUPPLY CHAINS

The materials industry involves the securing, development and processing of raw materials including metals, minerals and composites to produce intermediate manufactured goods.

This is an essential part of the manufacturing value chain and underpins downstream production, energy security, and sovereign capability in a range of technologies and the net zero transition. Strengthening the UK's production and processing of key materials can also encourage agglomeration effects of OEMs locating close to suppliers.

EQUIPMENT SUPPLIERS

These are the companies which design, build and supply the machines and factories used in the production process. These businesses are where a vast amount of technical expertise and a competitive edge lies in the most advanced manufacturing economies.

UK GOVERNMENT POLICY

The UK Government's policy on advanced manufacturing, materials and supply chains is embedded in their general approach to industrial strategy: the 2017 Industrial Strategy, the 2021 'Build Back Better: our plan for growth' paper and the 2021 Innovation Strategy.

Of these papers, the 2021 Innovation Strategy is most significant for Advanced Manufacturing and Materials. Published in July 2021, this includes 'actions' such as:

- Increase annual public investment on R&D to a record £22 billion.
- Reduce complexity for innovative companies by developing an online finance and innovation hub between Innovate UK and the British Business Bank.
- Consult on how regulation can ensure that the UK is well-placed to extract the best value from innovation.

In July 2022 the Government published a Critical Mineral's Strategy setting out a number of measures to increase the UK's domestic capabilities in sourcing and processing, as well as strengthening international supply chains, of critical minerals.

The government has established some specific policies for the steel sector including:

- Publishing an infrastructure pipeline which sets out the UK's future infrastructure needs to beyond 2030. This is intended to help producers understand steel requirements in the UK over the next decades, enabling capacity planning.
- Committing to support UK steel manufacturers through public procurement policy including setting guidance for the public sector on steel procurement.
- Providing compensation for energy intensive industries for indirect costs (higher electricity prices) incurred from low-carbon energy and emissions policies.
- Steel industry stakeholders have been consistently calling for further government support, particularly on energy prices and through public procurement.

RECOMMENDATIONS

INCREASE INVESTMENT IN REAL-WORLD APPLICATION OF RESEARCH IN MANUFACTURING, SUCH AS THROUGH THE CATAPULT NETWORK, TO ABOVE LEVELS IN COMPETITOR NATIONS.

Despite the UK's strengths in research, there is insufficient downstream application of research innovations into UK companies and manufacturing. This represents a huge lost opportunity which should be addressed by significant new investment in the translation of research advances into real-world industrial applications. The UK could examine whether university funding should be more strongly linked to application in UK business.

ENCOURAGE AND SUPPORT INVESTMENT IN THE LATEST TECHNOLOGY IN UK PLANTS.

Steps need to be taken to invest in new plants, equipment and technology to increase produc-

tivity, margins and wages in UK materials industry. The exact mechanism, tax breaks, direct support etc, will depend on the circumstances in each sector and the wider economy. Support new skills and a just transition for workforces.

New industries and production methods require a workforce with relevant skillsets and experience, especially in digital skills. Industry, universities and technical institutions, trade unions and government at all levels should work together to ensure skills needs are met and workers are supported through this transition.

IDENTIFY GAPS IN UK MATERIALS SUPPLY CHAINS AND DELIVER A STRATEGY AND CAPABILITIES TO ADDRESS THESE.

Critical materials for security, hi-tech and zero-carbon economy are often subject to unsecure supply chains and at risk from rising geopolitical tensions.

The 2022 Critical Minerals Strategy seeks to address these issues and should be continually reviewed and enhanced. The UK could become a centre for processing, refining and mid-stream manufacturing of such materials for domestic and regional downstream markets.

The UK exports much of its scrap secondary raw material. Increasing recycling/ the circular economy in the UK, including collection, reprocessing and secondary material furnaces is an essential part of strengthening supply chains and improving sustainability. Invest in low carbon electricity generation.

Energy intensive industries require secure, affordable low carbon energy supplies. UK-based industries are often at a disadvantage due to the cost of energy. This should be addressed as a priority within a low carbon energy strategy.

LIFE SCIENCES

In the broadest sense, the term life sciences covers biology, medicine and agriculture. In the context of UK government policy, it almost always refers to pharmaceutical development and other medical technology development and marketisation. That is the definition we will use for this project. As with many of the future industries there is a product development element, and a manufacturing element. Regulation, and technical skill sets involved in that are also critical to the industry.

The industry employed 268,000 people across 6,330 businesses and generated a turnover of £88.9bn in 2020. The industry is concentrated in the Southeast, London, and East and the vast majority of people employed in it, 76%, are employed by the big players, rather than SMEs and AstraZeneca and GlaxoSmithKlein (GSK) are by far the biggest of these – dwarfing the competition by market cap. GSK is in fact the top company investing in UK R&D across all industries, investing £4.5 billion in 2019.

In the post Covid context interest in life sciences has never been higher. Many countries were disturbed to find they were not only not part of the development of a vaccine but lacked the manufacturing base to produce either vaccines or medical equipment.

They are now proactively looking to remedy this situation, with Emmanuel Macron inviting global pharma leaders to the Elysée Palace recently to make the case for investment in France. The UK can boast many advantages in life sciences but even the major players headquartered here must make hard-heading decisions about where they invest, based on small margins and efficiencies.

UK GOVERNMENT POLICY

There is a wealth of strategy from the pre-Johnson era, much of it produced independently and in collaboration with business. Notably the 2017 Life Sciences Industrial Strategy, led by Professor Sir John Bell (now of Oxford). It makes specific recommendations including:

- Creation of a ‘Health Advanced Research Partnership’ on the DARPA model. This has not happened but may be covered by the government’s ARIA programme.
- Domestic spending on R&D to be in the upper quartile of OECD members. This has happened on some metrics, but is also somewhat unambitious. We currently place behind comparable economies like Germany, France and Korea in raw spending and are actually 21st out of 40 countries when it comes to spending as a % of GDP - behind the US, Japan, Korea and most Western European economies.

- The growth of life sciences clusters. Reports from 2021 from UKRI calling for the same thing suggest this has not happened, and the Oxford- Cambridge arc project has been shelved.
- In 2018 we also saw a life sciences sector deal, which includes a wide range of measures including direct government investment, co-finance with industry, new bodies and regulatory changes.

Despite government's insistence on the importance of the industry it has not necessarily supported it with policy. UK government seems to have shelved plans for an 'Oxford Cambridge Arc' infrastructure project

RECOMMENDATIONS

ENSURE THE UK LIFE SCIENCES INDUSTRY HAS A COMPETITIVE OFFER IN THE RACE FOR GLOBAL TALENT.

Government can support the industry directly, but building a competitive environment is broader, encompassing our academic base, start-up environment, and even quality of life. Ensure the UK life sciences industry has a competitive offer in the race for global talent.

For many high specialised life science research and discovery roles there are only a handful of people in the world who can fill them. Post Brexit, the UK should seek to develop an immigration scheme that is as frictionless as possible for these people.

Generally, the points-based immigration system is not a barrier to these workers, but the UK should consider if the tone and tenor of immigration policy generally may create the perception that even highly skilled immigrants are unwelcome. Policy on family and routes to citizenship should also be made as friendly as possible.

The current system also offers few incentives to high skilled migrants. Labour should consider if, in critical strategic industries like life sciences, tax incentives should be offered (as already happens in Holland).

SUPPORT LIFE SCIENCE DISCOVERY AND DEVELOPMENT CLUSTERS

Successful discovery and development require an academic base, testing and development opportunities (for pharmaceuticals, this means hospitals) and a thriving start-up community. In the clusters that already exist, specific funding for research and business catapults is needed.

Alongside targeted funding, investment in infrastructure more broadly is important, perhaps through levelling up programmes however they are constituted in future, with a recognition that issues such as the housing crisis in the Oxford Cambridge arc makes it less attractive to global talent.

For the cultivation of small clusters, and potential development of new ones, long-term funding for cluster development organisations is needed.

Overall, the UK is geographically quite small and therefore ripe for the development of 'super clusters' whereby multiple clusters are linked and able to multiply benefits of each other. Labour should consider this as a long-term goal, both for the benefit of the industry and for the regional inequality and integration between UK nations benefits it would bring.

SUPPORT LIFE SCIENCE MANUFACTURING AROUND THE COUNTRY

Life science manufacturing is less depending on the agglomeration benefits described above than the discovery and development parts of the industry. It can be sited around the country but does require a skilled workforce, particularly engineering and maths.

Incentives should be provided to the maximum value possible for companies to build these factories, especially in areas that would benefit from skilled employment. The logic of this initial investment from government is that these facilities are 'sticky', not easily transferred or closed down, and will therefore provide economic benefits over the long term.

ENSURE MEDICAL DATA IS AVAILABLE IN A SAFER, MORE TIMELY FORMAT

Despite the advantages offered by the NHS, the UK has fallen behind on the use of patient data. This is due to the way the data is collected and stored rather than privacy regulation, with issues around the interoperability of data sets and timeliness of the data.

Government should support the creation and use of data standards in this area, developed with the health service and industry. These can enable the use of data both in the health service and industry, while protecting patients.

REFORM APPRENTICESHIPS

The life sciences industry struggles to recover the value it contributes to the apprenticeship system in the UK through the apprenticeship levy, getting back about 25% of what it puts in.

This means the levy is not meaningfully contributing to closing the skills gap or improving access to the industry for young people.

Labour should make life science apprenticeships more flexible, to allow for example an apprenticeship to be carried over in the case of M&A (relatively common in life sciences) and specific focus on improving diversity. Labour should also work with industry and UCAS to make sure life science apprenticeships are well advertised and it is seen as a legitimate route into the industry.

LOW CARBON ENERGY

Developing existing and new sources of low-carbon energy, as well as efficient means to transport and store that energy, is central to achieving net zero on time and with minimum disruption to citizens and businesses.

Energy supply is a foundational issue that underpins every other area of the economy. As the UK energy system becomes ever more electrified, policymakers will have to ensure sufficient capacity to meet growing demand while also reducing emissions. At the same time, in light of the war in Ukraine, and the imperative to reduce dependence on unreliable energy producing countries, especially Russia, it will be crucial to maintain security of supply and ensure that prices for consumers and generators are fair.

Policies need to ensure coherence at every stage — from generation to transmission and consumption — in order to make the transition efficient and effective. There are broadly two stages for which policies need to be developed: ‘the end state’ of net zero, with a near-fully electrified energy system; and ‘the interim’, where existing technologies and energy sources that may in future become obsolete require support to speed up the transition in the interim.

UK GOVERNMENT POLICY

The government’s recent energy security strategy set out a four areas of focus to address the dilemmas highlighted above. First, reinvigorating investment in UK oil and gas supply in the short-to-medium term to provide surety of supply and affordable prices in the interim of the energy transition. Second, speeding up investment in renewables, notably onshore wind

and solar, which have hitherto played a secondary role to offshore wind. Third, supporting investment in nuclear, which is seen as the long-term replacement of gas as the provider of baseload capacity. Finally, incentivising investment and take up of hydrogen, which is expected to replace some lost capacity from natural gas and also have uses in transport.

Key government commitments, set out in its Net Zero Strategy, include:

- Decarbonising the UK power system by 2035;
- Delivering 40GW of total offshore wind capacity by 2030, including 1GW of floating capacity;
- Delivering 5GW of hydrogen generation capacity by 2030;
- Delivering 6 MtCO₂ a year of industrial CCUS by 2030, and 9 MtCO₂ a year by 2035;
- Phasing out new gas boilers by 2035; and
- Supporting the installation of 600,000 heat pumps a year by 2028, reaching cost parity with gas boilers by 2030.

RECOMMENDATIONS

COMMIT TO ESTABLISHING A STABLE BUSINESS ENVIRONMENT FROM THE FIRST FISCAL YEAR OF THE NEXT LABOUR GOVERNMENT.

Key taxes and investment incentives should be put in place early and left as unchanged as possible. Any major incentives should be established for at least the period of the first parliament and ideally longer, with a clear trajectory set for how those incentives will change over time, if at all.

Labour should consider establishing a longer-term fiscal mechanism for capital investment outside of Spending Reviews to provide certainty and clarity to businesses and investors in which to plan and make investments.

PROVIDE A CLEAR, LONG-TERM PIPELINE OF PLANNED GOVERNMENT FUNDING FOR NET ZERO PROJECTS TO GIVE FIRMS A CLEARER BUSINESS CASE FOR THEIR SHAREHOLDERS AND STIMULATE INVESTMENT.

Commit to simplifying processes for business, especially SMEs, to apply for government incentives, setting a target to reduce average applications times.

Funding and loans should also be supported by a mandates minimum levels of innovative content in government procurement contracts (starting low and ratcheting up over time), leveraging the UK's £200bn procurement market to create a clear end-buyer for innovations.

DEVELOP A 'NET ZERO SKILLS PLAN' TO ENSURE SUFFICIENT CAPACITY TO DELIVER NET ZERO PROJECTS AS THEY REACH A BOTTLENECK AHEAD OF 2030 TARGETS, HELPING TO AVOID DELAYS AND COST OVER-RUNS.

Either expand Catapults to include a larger commercialisation function, or develop new agencies focused on the diffusion of innovation more broadly across the UK business community. This could include expanding existing programmes within Innovate UK or creating new structures.

AIM TO MAKE THE UK THE BIGGEST CARBON CAPTURE AND STORAGE MARKET AMONG MAJOR EUROPEAN ECONOMIES, UTILISING OUR SUBSTANTIAL POTENTIAL STORAGE CAPACITY AND EXISTING MAJOR OFFSHORE ENERGY INDUSTRY.

Supporting this, a Labour government should explore the establishment of a sovereign wealth fund using tax receipts from North Sea carbon storage (phased in once up and running at scale) to ensure these natural assets are this time utilised in the long-term national interest, unlike in the 1980s.

Labour should also take steps to ensure that the value chains of developing industries such as hydrogen and carbon capture remain in the UK, avoiding a repeat of the UK's offshore wind industry, where most high-value manufacturing is done outside the UK.

A.I AND MACHINE LEARNING

The field of artificial intelligence is extremely broad, and as new applications are being discovered/pioneered it is likely to get broader rather than narrower. Ultimately the goal is to reproduce human style decision making in a machine. But excitement about this long term goal can eclipse in the public debate the way the technologies are used in industry today.

They key technologies are:

Big Data: these technologies assist in the collection, management and analysis of very large data sets. Examples include calculating a customer's lifetime value to a business.

Machine Learning: Machine learning is a way of doing analysis of data. It generally involves 'training' a programme on existing structured data, until it is able to produce the correct

outcomes from new data it has not seen before. It can describe, predict or prescribe without human input, depending on what it has been trained to do. Examples include recommended items in online shopping.

Supporting all of this is a physical, software and skills infrastructure that includes cloud storage, electronics manufacturing, and data scientists and much more.

It is a complex industry, made all the more so because of the very different business models found across it. Some offer services to other businesses, some create products in themselves, some do the hardware, some write the programmes etc.

UK GOVERNMENT POLICY

The 2017 industrial strategy names “A.I and deep learning” as one of its “four Grand Challenges”. It claimed the UK is (was) a world leader: on the following basis:

- We have the data sets (mostly through NHS)
- We have the chips

A parallel 2017 independent review in A.I specifically highlighted three drivers behind the growth of the technology which, if are correct, are:

- New and larger volumes of data
- Supply of experts with the specific high-level skills
- Availability of increasingly powerful computing capacity. The barriers to achieving performance have fallen significantly and continue to fall.

Education and expertise were identified as being limiting factors in the growth of the industry and a series of recommendations were made to specifically upskill the workforce.

A.I got a ‘sector deal’ in 2018 which provided funding for skills and led to the establishment of three bodies: the AI Council , The Centre for Data Ethics and Innovation and The Office for Artificial Intelligence.

However, at the time of writing the UK is described by consultancy Covington as “unique amongst European countries in not having an AI Strategy” . This is despite organisations from the HoL.A.I Select Committee to the A.I Council offering recommendations for what one should contain.

RECOMMENDATIONS

SCALE UP AND COMMIT TO AN ONGOING 10-YEAR PROGRAMME OF HIGH LEVEL AI SKILL-BUILDING.

This means:

- Research fellowships,
- AI-relevant PhDs across disciplines,
- industry-led Masters
- level 7 apprenticeships.

Targets on diversity should be a condition of this government funding, to promote the participation of underrepresented groups in the industry and ensure its benefits are widely felt.

SCALE UP AND MAKE SUSTAINABLE PUBLIC SECTOR INVESTMENT IN AI, AT ALL STAGES FROM DEVELOPMENT TO ADOPTION

This means:

- In universities, more government funding for the fundamental research which underpins current and future technologies in universities,
- In business incubators and catapults, funding to support the development of A.I technologies into tools

PROVIDE ASSURED LONG-TERM PUBLIC SECTOR FUNDING FOR THE TURING INSTITUTE.

Support the Turing as key UK A.I infrastructure but ensure it is a truly UK wide organisation by requiring satellite sites in key cities.

BRING INDUSTRY, GOVERNMENT, EDUCATION AND INSTITUTIONS TOGETHER TO MAXIMISE THE BENEFITS OF A.I BY DEFINING 'MOONSHOTS' OR KEY CHALLENGES FOR THE UK AND THE WORLD.

An obvious candidate would be climate change and green technologies and such a programme would achieve the dual benefit of growing the industry while achieving the governments other goals.

MAKE LEGISLATION AND REGULATION AROUND DATA GOVERNANCE AND ALGORITHMICALLY LED DECISIONS AN EARLY PRIORITY.

As a legal powerhouse and tech leader, the UK has natural strengths in this area and Labour is best placed to come to a settlement that balances individuals rights, with the potential collective good of these technologies.

DEVELOP INFRASTRUCTURE THAT BOTH INCREASE AND CONTROLS ACCESS TO DATA.

Invest in the relevant organisations, link general principles to specific applications, and pursue initiatives for pump priming innovation and enabling safe data sharing for valuable uses.

INDICATE AS EARLY AS POSSIBLE WHAT ADMINISTRATIVE DATASETS A LABOUR GOVERNMENT WOULD SEEK EITHER TO USE ITSELF OR ALLOW INDUSTRY TO USE.

A.I led analysis of administrative data sets has huge potential to improve our understanding of issues and outcomes for citizens. NHS data is most commonly discussed, and is vital, but government holds significant datasets on citizens that could be used to tackle a range of social ills. Government can be working with the A.I industry to achieve goals including, fairer outcomes in education, genuine reductions of poverty, or increased diversity in UK workplaces. Signalling early what the goal is will allow business to plan to be involved.

SPACE AND SATELLITE

The UK space industry is a fast-growing sector and generates an estimated income of £14.8 billion per year and supports around 42,000 jobs across all regions of the UK. The UK space industry supports a range of public services – particularly through satellite data and imagery – such as disaster relief, telecommunications, global positioning system (GPS), and weather forecasting. The growing global reliance on satellites and their data, and the reducing cost of launching small satellites into space has driven the growth of the space sector.

UK GOVERNMENT POLICY

Over the past decade, the UK Government has aimed to develop the sector within the global space industry. In December 2015, Government welcomed the space industry's ambition to capture 10% of the global space market by 2030 and published its first National Space Policy, setting out the Government's main aims and policies.

The Government set out its plans to establish a new National Space Council and launch a UK Space Strategy in the December 2019 Queen's Speech (see below).

The Space Industry Act 2018 was introduced to create a regulatory framework for the expansion of commercial space activities (involving both launch to orbit and sub-orbital spaceflight) and the development of spaceports in the UK.

In September 2021 the UK Government (Joint MoD and BEIS) set out the National Space Strategy. This expects the industry to grow from £279bn in 2019 to £490bn in 2030.

The National Space Strategy identifies a 10 Point Plan of initial focus areas. These are:

1. Capture the European market in commercial small satellite launch
2. Fight climate change with space technology
3. Unleash innovation across the space sector
4. Expand our horizons with space science and exploration
5. Develop our world-class space clusters
6. Lead the global effort to make space more sustainable
7. Improve public services with space technology
8. Deliver the UK Defence Space Portfolio
9. Upskill and inspire our future space workforce
10. Use space to modernise and transform our transport system

Space is a fast-developing sector. The UK aims to launch satellites from Spaceport Cornwall in September 2022, becoming the first European country to launch satellites into orbit.

RECOMMENDATIONS

BUILD A PROGRAMME TO DE-RISK INVESTMENT IN KEY FUTURE SPACE TECHNOLOGIES.

Guaranteeing loans, or joint investment with business will address a situation where UK investment in the space industry is lower than competitor nations. Review the funding settlement from recent CSR to ensure this enables sufficient public funding for the sector.

Expand public sector procurement of space technology from UK-based companies and industry. This will support growth in the sector and give credibility for UK companies to increase exports.

REVIEW, SUPPORT AND EXPAND THE 'SPRINT' PROGRAMME (SPACE RESEARCH AND INNOVATION NETWORK FOR TECHNOLOGY) AND SIMILAR PROGRAMMES.

Collaboration between universities and businesses is essential to the future success of the space industry and this programme, and others like it, are vital to ensure that happens.

LAUNCH AN URGENT REVIEW WITH ACADEMIC INSTITUTIONS, TECHNICAL BODIES AND SPACE INDUSTRY COMPANIES TO IDENTIFY KEY SKILLS REQUIREMENTS AND POLICIES TO ENSURE THESE ARE MET BY UK WORKFORCE.

Currently, there are not enough individuals with the required skills for expansion of the industry, either in business and government. Labour should recruit and train more civil service staff with a knowledge of the space sector, and partner more closely with industry expertise where this is not possible.

Ensure overseas workers with the skills required are supported, encouraged and welcomed to work in the UK space sector, and to train UK workers in fields required.

REINVIGORATE EFFORTS FOR UK TO LEAD AN INDEPENDENT GLOBAL NAVIGATION SATELLITE SYSTEM

The UK is no longer part of the European Galileo (global navigation satellite system) project following Brexit and possibility may no longer be part of Copernicus project over NI protocol tensions.

In the first instance, Labour should work with partners in Europe to ensure UK remains part of Copernicus project. If Britain cannot re-join the Galileo project the UK should consider what role we can play in developing an independent global navigation system.

LAUNCH A REVIEW ACROSS DEPARTMENTS TO IDENTIFY HOW UK CAN UTILISE OPPORTUNITIES FROM SPACE IN OTHER AREAS OF DELIVERY.

There is a lack of joined up working in Government on opportunities presented by space applications and data. A review is needed to make sure there is a process through which these are identified and disseminated across departments.

ZERO-EMISSION TRANSPORT

Transport emissions — comprising surface transport (road and rail), aviation and shipping — comprise just under a third (32%) of all UK greenhouse gas (GHG) emissions. By far the biggest sources of transport emissions are cars (40% of the total) and aviation (23%), followed by vans (12%), trucks (11%) and shipping (9%). Buses (2%) and rail (1%) make up a tiny proportion.

Following the sixth carbon budget, and in light of the government's 2035 target to reduce emissions by 78%, transport is the single biggest target for emissions reductions in this next phase of decarbonisation. For the UK to remain on track to reach net zero by 2050, by 2035 surface transport emissions are expected to have fallen by 72%, aviation emissions by more than a fifth and shipping emissions by just under a fifth compared to 2019.

In his 2021 essay, 'The Road Ahead', for the Fabians, Keir Starmer recommitted the party to cutting 'the substantial majority of carbon emissions by 2030'. This would mean that all emissions reduction efforts would need to be further speeded up under a Labour government to reach this target, including transport.

As with all net zero policies, but especially transport, which plays such a fundamental role in people's everyday lives, the challenge is to ensure that policies enhance people's ability to live their lives as they wish and fulfil their ambitions, not constrain them. The only way to gain widespread public support for net zero transport policies, in particular, and therefore to make them as effective as possible, is to make them more attractive than the status quo.

UK GOVERNMENT POLICY

Of all the government's net zero policy areas, transport includes some of the most radical, reflecting the urgency of reducing these emissions in the next phase of decarbonisation.

New petrol- and diesel-only cars and vans will be banned from 2030 and all cars and vans must be zero emissions by 2035. The government has also pledged to consult on extending this to all road vehicles, including buses and HGVs, by 2040. Take up of zero-emission vehicles is expected to account for the single-largest reduction in transport emissions. In its electric vehicle infrastructure strategy, the government set out an aim for the UK's major road network to have a fully functioning chargepoint network by 2030.

Aviation is expected to continue to be one of the few remaining emitting sectors by 2050. In its Jet Zero Strategy, the government nevertheless established an ambition for the sector to be net zero by 2050. The overwhelming focus is on developing technologies such as sustainable fuels, zero-emission aircraft and carbon capture technologies, many of which remain in their infancy. In rail, diesel-only trains will be banned from 2040. In shipping, the expectation is that the sector will be zero emission by 2050, but targets are currently aspirational, subject to technological developments.

In its Transport Decarbonisation Plan, the government also pledged to increase active travel, with an aim for half of all town and city journey to be walked or cycled by 2030.

RECOMMENDATIONS

LAUNCH A CALL FOR EVIDENCE ON ROAD PRICING ALTERNATIVES TO REPLACE THE EXPECTED DECLINE IN FUEL DUTY AS ELECTRIC CARS MAKE UP A GREATER SHARE OF THE UK ROAD FLEET.

This should be done in close cooperation with regional mayors and local authorities to ensure any future does not make the UK road tax unnecessary complex. Explore the introduction of a credit trading system to incentivise petrol and diesel producers to develop and switch to low-carbon fuels and to provide a financial incentive for investment in the UK's electric-vehicle charging infrastructure.

CONSIDER ESTABLISHING A HYDROGEN TECHNOLOGY INSTITUTE, MODELLED ON THE AEROSPACE TECHNOLOGY INSTITUTE.

This should develop a public-private research programme for hydrogen applications, including in transport, as well as developing a pipeline of talent.

A Labour government should focus not only on developing key technologies but also supporting SMEs in adjacent, supportive sectors who will be crucial to ensure that a substantial future hydrogen industry is viable in the UK and creates a competitive advantage compared to peer countries.

CONSIDER INTRODUCING PLANNING INCENTIVES TO DEVELOP 'GREEN TERMINALS' AT AIRPORTS.

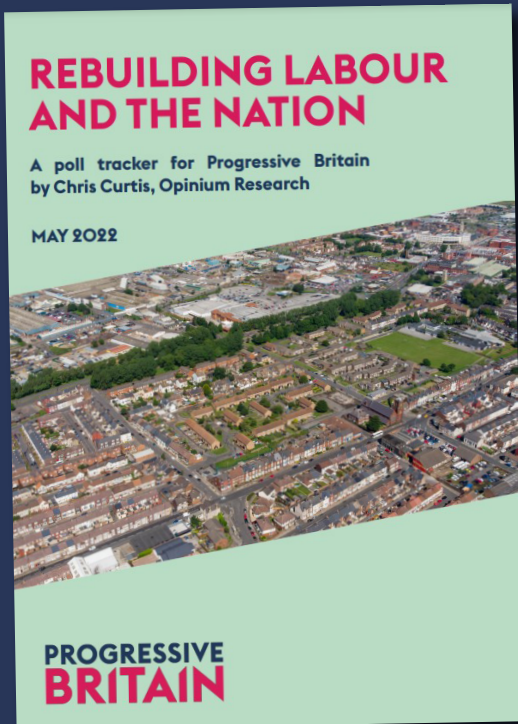
These would permit airports to expand only for more sustainable aviation technologies, and also incentivising technology that reduces engine noise and aircraft other emissions.

Labour should also explore varied rates of air-passenger duty (APD) based on fuel use, with potential low and zero rates for the most sustainable aviation fuels. Set mandates for reducing all emissions associated with aviation — including nitrogen oxides and particulates — not just carbon dioxide emissions.

REBUILDING LABOUR AND THE NATION

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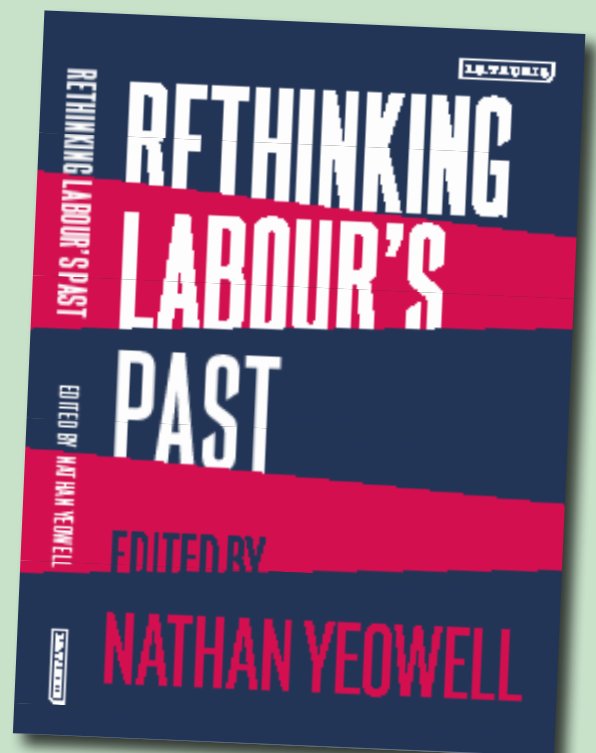
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