


Spotlight

ENERGY: THE NEW POWER STRUCTURES

Alan Whitehead / Caroline Lucas / Mathieu Flamini / Callum McCaig





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A transfer of power



For people looking to place a bet on the source of energy most likely to sustain humanity in the centuries to come, there is one glaringly obvious choice. Our planet is blasted with 170,000,000,000,000,000 joules of energy every second of every day by the sun, and this will continue to happen for several billion years. If we captured and stored one third of one hundred-thousandth of one per cent of the energy currently pouring onto the earth's surface from our star, we would satisfy completely the power requirements of human civilisation.

As any sensible investor knows, however, diversity is good, and betting heavily on just one outcome is a dangerous idea. We are already seeing the results of a single-minded approach: the primacy of fossil fuels has enriched whole economies, created millions of jobs and sustained the rapid development of the modern world, but the side-effects of their use are building into a catastrophe.

The good news is that change is happening, and happening most quickly in the new centres of financial power. In 2015, the renewable energy industry in China employed 3.5m people; its oil and gas companies employed 2.6m. In Europe, slow economic growth has led to a sharp decline in solar panel manufacturing, but the global trend is following the mathematics of opportunity: the solar industry alone now employs more than 2.8m people worldwide. In the growth of these industries, spurred by the ratification of the Paris agreement, the beginnings of profound political and economic shifts can be seen. Jobs are under threat, but new markets are growing; resources that once guaranteed prosperity are becoming toxic. A new set of bets is being made, and the stakes have never been higher.

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Greening energy through industrial strategy



Safeguarding our environment and tackling climate change must be points of priority for policy, writes Dr. Alan Whitehead MP

In November of this year, the government accepted and parliament agreed the Fifth Carbon Budget covering the years 2028-2032. Carbon budgets, designed by the Committee on Climate Change, are the vehicle by which the UK is assured of meeting our targets under the Climate Change Act – of reducing our greenhouse gas outputs by 80 per cent in 2050. They enable UK industry and energy infrastructure to develop progressive and built-in reductions of emissions, and for changes and adaptations to domestic properties and energy consumption to be made without sudden disruption – providing, of course, that policies are put in place that actually allow this to happen.

The problem right now is that government is, on the one hand, agreeing to the processes set out in successive carbon budgets without putting policies in place that can get us anywhere near – on present trajectories – actually meeting the terms of the budgets. As far as energy is concerned (and that means both power production and consumption and generation of heat in homes and industrial buildings) the picture is not

good at all. The Committee on Climate Change now estimates that to meet the terms of Fifth Carbon Budget something like 75 per cent of generation will have to come from renewables, nuclear or from plant fitted with Carbon Capture and Storage (CCS) equipment.

This figure might be modified if demand – particularly for heat – is significantly reduced, which might be achieved through radical programmes of home energy efficiency retrofitting, and if heat itself is significantly decarbonised by changing the sources of heat production, now overwhelmingly supplied by gas.

Although the emergence of significant levels of renewables onto the power systems (enabling renewables to produce about 18 per cent of power) means that we are in sight of meeting Fourth Carbon Budget targets for electricity, heat – with only 5 per cent of it being supplied by low-carbon sources, is woefully off target. And without substantial new investment in low-carbon technologies we will stall on electricity as well in the mid-twenties.

Labour's response to this imperative

Swansea Bay Tidal Lagoon will be the world's first tidal lagoon power plant



“We will ensure that 60% of all energy is renewable”

will quite simply be that, as part of its industrial strategy, we will aim to meet the challenge of energy and our carbon budgets. We will do this by committing to put in place industrial policies to ensure that 60 per cent of all energy (both power and heat) is supplied by renewable and low-carbon means. Of that total, more than 75 per cent of electricity will be supplied by renewables since the contribution heat makes will continue to lag.

And we will add to that a comprehensive programme based on infrastructure project principles of retrofitting homes across the country with the insulation and cladding they will need to become highly energy efficient.

This means, of course, actually putting policies in place to support targets. The key instruments will be the use of Labour's National Investment Bank to provide the support to put in place the next generation of renewables, and in so doing support those technologies where the UK has a world lead, such as tidal and wave technology, so that we can as a country access significant slices of the world green technology market through exporting our knowledge and developments.

That mediated support, particularly through reducing the cost of capital for development, will be accompanied by a UK content requirement which will ensure that supply chains are nurtured along with headline developments, and a robust UK chain, able to access world markets is established. We have already seen how assistance with supply chains in securing major component manufacture in the UK, such as the Siemens Offshore wind facility in Hull can work.

We want to see more of the same across a range of technologies such as supporting the emergence of tidal technology through the roll out of tidal lagoons in Swansea Bay and elsewhere and keeping supply and components substantially British. As far as heat is concerned, progress can be made by replacing the supply of gas to homes and commercial buildings by introducing

green gas – biomethane from organic waste treatment, syngas from waste processing, and on a longer time frame, hydrogen – into the system, and we will want to support the substantial expansion of plants, already quietly proving a success with 100 or so small plants already in operation to meet this challenge.

We will be taking a similar approach to the retrofit of Britain's leaky, energy profligate homes. We will mandate the National Investment Bank also to underpin activity through low-interest loans, an approach which has been successfully undertaken by banks such as the German KfW investment bank.

Looked at in this way, boosting renewable power to the level required to meet carbon budgets doesn't just end in meeting the budget. As the product of an industrial strategy it also provides thousands of good, permanent new jobs, boosts productivity and exports – and, by the way, will reduce energy bills and support a healthier population.

The alternative, as we are seeing at the moment, is a fitful, and generally counterproductive response to the need to decarbonise our energy sector, including a spate of ill-judged cuts to renewable deployment made by the government last year. The effective ban on onshore wind, and the pulling away of support for solar PV, coupled with the ending of the Zero-Carbon Homes compact and the ruinous cancellation of the UK's chance of securing primacy in CCS technology by the late cancellation of two pilot projects have left us in a sorry state as we try to consolidate the initial work on renewable deployment and green technological advance that has, at least, ensured that we meet earlier carbon budgets. Even with support for offshore wind into the early 2020s, we risk right now coming to a cliff edge in the progress of renewables.

Labour's response will not only put us back on the right track, but will ensure that we have what is often cited as the key to successful investment and support – a clear and established path ahead, with patient investment leading the way.

The UK must not deny its world-class energy industry the support it deserves, says SNP energy spokesman and MP for Aberdeen South, [Callum McCaig](#)

We must put all of our energy into all of our energy



When it comes to energy, we as a country and as a planet are presented with a choice – embrace the disruptive technologies that will change the way, and likely the price, at which we produce and consume energy or continue with established technologies that will fundamentally change our planet and our economy. In Paris last year, the world’s leaders came together to sign the historic climate agreement to limit global warming to 2°C, with a more ambitious aspiration of limiting it to 1.5°C.

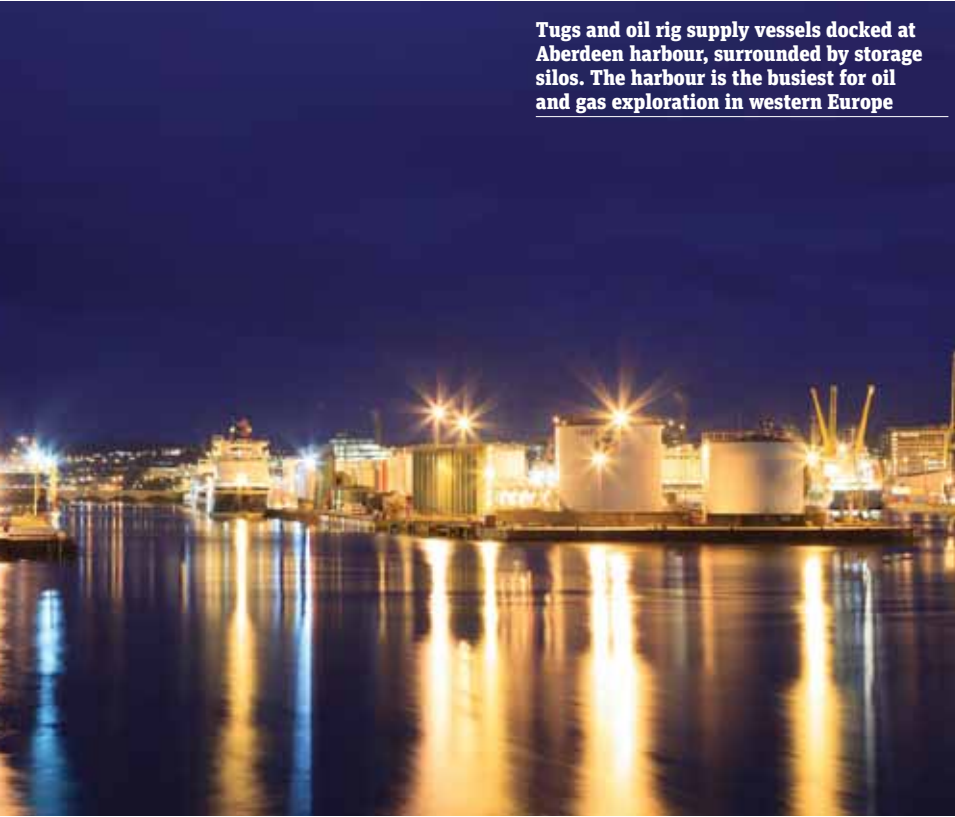
Closer to home, the challenges facing the UK energy industry are significant. Ageing infrastructure, tightening supply margins and a move to a more distributed supply system are not the kind of thing that a government minister would like to see in their in-tray. And that is just electricity supply. Add heat and transport into the mix, each delivering their own

complications, and there can be few greater challenges facing government.

As a leading proponent of a strong deal in Paris, the UK government must now take action to ensure that its deeds match the ambition of its diplomacy. To put it mildly, the scorecard is mixed. On the one hand the UK has strong climate change legislation, including long-term carbon budgeting and a commitment to end coal generation, and it has made good progress on renewable electricity deployment to date. On the other, renewable subsidies have been cut, investment in energy efficiency has stalled and projects like Carbon Capture and Storage in Yorkshire and North East Scotland have been scrapped with no notice and little justification.

Scotland has felt the brunt of these abrupt changes more severely than anywhere. Peterhead, in Aberdeenshire, was set to become home not only to the

Tugs and oil rig supply vessels docked at Aberdeen harbour, surrounded by storage silos. The harbour is the busiest for oil and gas exploration in western Europe



world's first commercial floating wind farm, but also the first gas-powered CCS plant. The decision to scrap the £1bn CCS competition on the eve of the Paris talks was the worst sort of short-term politics. Without CCS, meeting carbon reduction targets will be not only far more difficult, but far more costly.

At the same time as investment in low-carbon generation hit a wall of government-generated antagonism, the other great success story of the UK energy sector has been thrown into turmoil. The oil and gas industry, based in Aberdeen but with a presence the length and breadth of the UK, has felt the pain as global oil prices have fallen from in excess of \$120 a barrel in 2014 to the low \$20s earlier this year. This has put huge pressure on the industry and has led to the loss of tens of thousands of jobs. While the government did come forward with tax cuts in the budget this

year, it contrasts sharply with the rush to support the steel industry in its hour of need. Both these industries are vital to the UK economy, but only one has received the appropriate support from government.

The vote to leave the EU has added to the already substantial complexities facing the energy sector. Like all areas of policy, huge uncertainty shrouds government thinking on its approach to the energy sector post-Brexit. Will the UK remain in the developing Energy Union? What about the European Emissions Trading Scheme? If we leave these, too, what will be the impact on business? Will the UK continue to seek greater reliance on interconnectors to the continent to supply the electricity that is no longer produced domestically? Individually, these are large and complex questions. Taken together, they represent a challenge that is unprecedented. When

it comes to the energy trilemma, there is a strong case to be made that the UK government is failing on all three.

So, how do we move forward? Consensus, stability and flexibility across devolved government will be key. Before its demise, the Energy and Climate Change Committee completed an investigation into investor confidence, the results of which were damning. One of the key concerns was the lack of a long-term strategy, which combined with sudden and numerous changes to policy had created a climate of uncertainty, making investment decisions more difficult. The upcoming publication of the Emissions Reduction Plan and the government's industrial strategy both present opportunities for a long-term vision to be put in place. To be successful, these must be developed in conjunction with both industry and civic society.

They must also be flexible, to enable different parts of the UK to pursue differing policy objectives. The SNP has a long-standing objection to new nuclear generation based on the costs, concerns over safety and unresolved questions on decommissioning. The Conservatives have an objection to onshore wind deployment, which has led to its exclusion, along with solar, from the forthcoming Contract for Difference auction. This means that the two cheapest forms of generation will not be able to bid. Common sense suggests that new nuclear energy be developed in England, where it has support of the government, and onshore wind continue its development in Scotland, where it continues to enjoy cross-party support.

Allowing the different parts of these islands to pursue different policy objectives was the whole point of devolution. A flexible approach would allow the development of a diverse and resilient energy system capable of meeting the challenges that face the sector. There are new ministers in place and the early noises suggest they may be more willing to compromise than their predecessors, but industry has been through the mill in recent years and confidence in government is in short supply.

European energy post-Brexit: for better or worse?

Iain Conn, Group CEO of Centrica, looks at how the energy landscape will change after Article 50 is enacted

The advice attributed to President Obama's former chief of staff Rahm Emanuel – “never let a good crisis go to waste” – is wise counsel in both business and politics. These days it seems there is no shortage of crises, but Emanuel's key point is that what seems like a crisis is in fact an opportunity in disguise.

The Brexit vote was an expression of a simple fact: globalisation has been good for the world on average, but it has left significant parts of the UK behind. Energy is a significant component of the economy and of the lives of everyone, whether a family at home or a business striving to compete. The outcome of the referendum may be a regrettable fact for some businesses, but it is a fact all the same. The task now in energy markets is to turn this moment into an opportunity.

The process of executing Brexit is so large and so complex that the UK

government will need to prioritise its efforts. Energy is important, but relative to resolving the issues of access to the single market, “passporting” in financial services, membership of the customs union, or the very difficult issue of the free movement of people, it will inevitably be lower down the list.

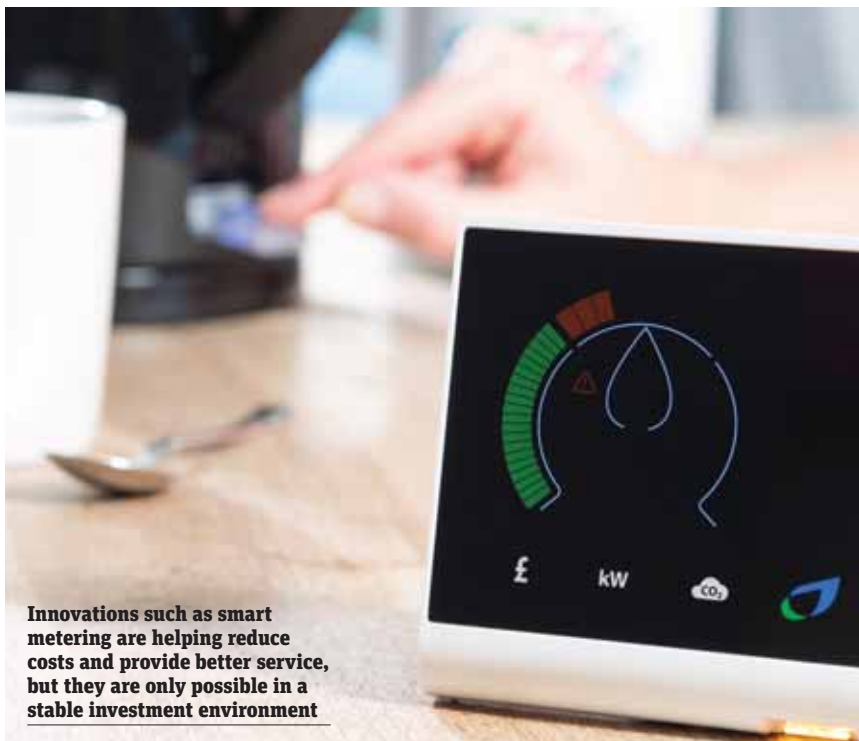
This is in part a testament to the success of both UK and European energy policy. We have an integrated system, with common approaches to the price of carbon, and regulations that are mirrored on each side of the channel. The UK itself has chosen carbon targets and an energy mix to achieve them which meets UNFCCC goals, and which also aligns us with our EU colleagues. The UK enjoys significant foreign direct investment in energy from continental energy investors such as EDF, Siemens, Dong, RWE, E.On and Iberdrola. Energy companies in the UK also have significant investments in continental Europe and its markets, notably Shell, BP, National Grid, and Centrica.

The UK has also been a leader in energy market deregulation and promoting competition, and a significant influence in Brussels regarding the development of the European energy system, energy policy and targets. There is a legitimate worry that, if the UK's active pressure for competitive markets is withdrawn, that European markets will become less lean and efficient. The EU energy market system, including the EU Emissions Trading System (ETS), also benefits from the scale of the UK energy market as a constituent. All the participants understand the system and the ETS is functioning, although the price signal for carbon still remains far too low.

Finally, the UK is now an energy importer and as such is increasingly dependent upon European markets for both volumes and price. European energy markets effectively set the price for UK energy imports of both natural gas and electricity. We are therefore bound into the European energy market system both in terms of energy policy

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Innovations such as smart metering are helping reduce costs and provide better service, but they are only possible in a stable investment environment

direction and our future competitiveness.

Given the degree of co-dependency in energy, the degree of alignment on policy, the UK's interest as an importer in ensuring the development of the most efficient European energy system, and the EU's interest in having the UK as part of that system, it would seem mutually beneficial that we continue to participate within the EU framework for energy and continue to have a voice around the table as a result.

So, if changes to the energy landscape should not rank in the top priorities of David Davis's Department for Exiting the EU (DEXEU), what are the important Brexit issues in energy?

There are three important areas: security of supply and ensuring the UK has sufficient supply diversity; ensuring that the price paid for energy by UK consumers is as low as possible; and continuity of energy rules and regulations to enable stability of inward investment into the UK and the UK's participation in the evolving European energy landscape.

In terms of security of supply, the UK has diversified significantly in recent years, building out new renewable capacity, building interconnectors for natural gas and electricity with both Scandinavia and the EU, and building

natural gas regasification capacity. We have committed to Hinkley Point C to ensure a new generation of nuclear power stations. We are now in the process of trying to ensure investment into new gas-fired power generation through the capacity market. With the EU we must continue to maintain open-market access to EU sources of energy and investment.

The key to keeping down the cost of energy to UK consumers is to ensure the EU energy market is as efficient as possible, to ensure energy efficiency is maximised, and to ensure that the cost of government policy is managed carefully and within the ability of consumers to pay. This will require continued UK participation in the evolution of EU energy policy and market mechanisms. The short-term effect of the referendum result is already visible in wholesale energy prices. The increase has not yet been fully passed on into retail prices, but an obvious pressure is being exerted – the pound is down 20 per cent against the euro and US dollar since 23 June and dollar commodity prices are rising. The best way to ensure this short-term pressure does not translate into long-term problems is to keep working together.

Finally, continuity in energy policy is

an important virtue. The UK government should ensure we do not diverge from continental Europe and create unwanted dislocations. We should ensure continuity of price signals and market mechanisms that encourage investment flows in both directions.

Centrica is today a participant in all of this, as a major North Sea producer, a power generator in both nuclear and natural gas-fired power, and the leading UK energy supplier to millions of customers every day. Through British Gas we are delivering significant improvements in customer service, developing new offers beyond simply supplying energy, and driving our own costs down. We are the leader in the rollout of smart metering, and the leader in home heating control technology through HIVE. We are building a business in distributed energy for business customers. We are also continuing to invest in Europe. Recently we have expanded into the EU with the acquisitions of Bord Gáis energy, ENER-G cogen, and Neas Energy. Centrica intends to be a major participant as the world moves to a more distributed and efficient energy system.

So, in terms of energy, is Brexit for better or for worse? As I have outlined, there are three objectives for energy as Britain leaves the European Union: continuity of policy; a focus on security of supply and access to diverse sources of energy; and to ensure the continuing efficiency of the EU energy system to keep prices down for UK consumers. These objectives can all be served in the world after Brexit.

We have bigger issues to worry about in the Brexit negotiations but, in the energy sector, it is in the mutual interests of both the EU and Britain to improve the competitiveness of Europe as a whole through delivering the most effective and efficient market system which benefits all end-users and therefore the wider economy. As the UK's largest energy supplier, we are committed to that outcome.

Skills in a changing climate

Chris Claydon, chief executive of the ECITB, explains why the oil and gas industry is critically important to the UK economy and how skills and collaboration are key to its survival

The oil and gas sector plays a critical role in the UK economy. In 2015, it provided 70 per cent of the UK's total primary energy consumption. Without it we would not be able to warm our homes, power our industries and fuel our cars.

The past two years have proved particularly challenging following a sustained period of low oil prices. The fall in oil prices, from over \$120/barrel in 2011 to around \$50/barrel today has led to falling capital investment from £14.8bn in 2014 to approximately £9bn this year. Compared to 2014 levels, industry expenditure has fallen 28.5 per cent with many projects having been put on hold or cancelled and only one new field approved in 2016. The downturn has also resulted in the industry shedding 50,000 jobs in the past year, amid the pressure to cut costs and remain competitive.

With economic challenges facing the offshore industry unlikely to disappear soon, companies are under further pressure to adapt to a 'new normal' of lower prices. This has significant implications for skills. While training budgets continue to be slashed as part of the efficiency drive, the industry is also finding novel ways to share expertise and keep skills from disappearing from the industry for good – a crucial task for ensuring it has access to the right talent pool when the inevitable upturn arrives.

As the statutory skills body for the engineering construction industry, ECITB works closely with oil and gas

companies, as well as those in the nuclear, renewables and other process industries. We invest £30m a year in developing the standards, qualifications and accredit training providers to upskill engineers, technicians and project managers. We also invest to retain talent.

Since the price of oil began to fall, oil and gas companies have been looking to reduce duplication and cost including in the area of training, and the ECITB has been leading this agenda. This includes working with the industry to remove duplication in qualifications and safety card schemes that inhibit the flow of skilled workers through the industry. In 2015, we launched a £2.1 m Continuous Professional Development programme for graduate engineers in the oil and gas industry. This not only kept people in work during a critical phase in the downturn but also helped the industry retain a key pool of skills.

Collaboration on projects is also helping the industry to contain costs and share skills and expertise. In August, ECITB launched our highly successful Project Collaboration Toolkit. This is designed to assist and guide the industry to adopt collaboration working techniques in projects right through the supply change – and testament to its success, it is now being adopted in other sectors such as nuclear new build, where the importance of effective project delivery is equally clear.

Despite the current downturn the UK oil and gas sector has vast amounts of untapped potential for the future with an estimated 20 billion barrels of untapped oil on the UK Continental Shelf. And yet, it is widely recognised that in order to thrive in the future, the industry needs to change culture and behaviours, as well overcome project execution and delivery challenges. Through collaboration and the sharing of best practice, the industry will be able to retain the skills its needs to remain globally competitive and maintain its role in powering the UK economy for years to come.

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Skills remain the beating heart of oil and gas

A skilled oil and gas workforce is one of most important factors of the sector, writes OPITO's UK managing director John McDonald

The oil and gas industry is facing challenges like never before—globalisation, geopolitical events and environmental change to name but three. Still, at a time when the economics paint a gloomy picture of activity in the North Sea, we should not lose sight of the fact that the oil and gas industry is still an important long-term driver for revenue and growth in the UK.

After production bucked a 15-year trend to increase by over 10 per cent in 2015, £100m of fresh capital has been committed this year and the UKCS continues to improve its competitiveness on the global stage. The cyclical nature of our commodity-driven market dictates that where there are highs there will always be lows. The sector will adapt as it always has done and deliver long-term sustainability through greater collaboration, innovation and improved efficiency with new technology.

Skills, however, are the beating heart of the industry. The oil and gas workforce is changing and what we have done in the past, or what we are doing now, may not be appropriate for shaping the future. Forward thinking, driven by a real analysis of the industry's needs, is critical for creating a safety and competence-based environment that secures the skills we need for today and also for tomorrow.

As the industry skills organisation, OPITO is engaged with Scottish and Westminster governments, employers, training providers, schools

and academia to develop and deliver a range of initiatives the UK needs to ensure it has an oil and gas workforce which is fit for the future.

Through regular engagement with the next generation, OPITO has found that the majority of young people living in the UK's key energy hubs who are making choices about their careers believe there is a long-term future for them in the North Sea.

More than 500 students aged between 14 and 21 from Aberdeen, Great Yarmouth, Waveney and Norwich have shared their opinions with OPITO, with an overwhelming 81 per cent saying they were interested in joining the sector. The opportunity to work around the world, the development and use of cutting edge science and technology; and salary are the top three reasons, with opportunities for personal development and the global nature of the oil and gas community also among the key attractions.

This feedback, combined with the continuing popularity and success of the Oil and Gas Technical Apprentice Programme, are extremely encouraging signs about the potential pipeline of talent for the UK's exploration and production sector. Equally as encouraging is the positive action we are seeing from employers with regards to ensuring competency across the existing workforce.

OPITO has witnessed more than a 250 per cent rise in the number of North Sea energy firms investing in the systems which assess, develop and demonstrate workforce competence since the start of the downturn.

With up to 10-20 billion barrels of oil and gas still to recover, and growing opportunities for those with transitional skills in developing and adjacent sectors, the challenge for industry and government is to maintain the momentum around ensuring competency whilst energising and encouraging young people to look to the sector as an exciting and fulfilling career choice.

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The footballer tackling climate change

In 2008, Crystal Palace midfielder **Mathieu Flamini** co-founded GF Biochemicals, the first company to mass-produce levulinic acid. Here, he tells Rohan Banerjee about his ambitious vision for renewable energy



Mathieu Flamini might have grown up in Corsica, but the Crystal Palace midfielder shows no signs of a Napoleon complex. He's softly spoken and remarkably down to earth, which is fitting really given the topic of our conversation.

In 2008, along with his friend and business partner Pasquale Granata, Flamini founded GF Biochemicals (GFB), the first company in the world to mass-produce levulinic acid, a naturally occurring chemical which has been identified by the US Department of Energy as one of 12 bio-based molecules that could help create a "greener" planet.

The oil substitute market may be worth an estimated £20bn but Flamini is quick to point out that it isn't only money that motivates him. "Many of my happiest early memories were spent in Corsica, an island of outstanding natural beauty and I have always been very close to nature. I've always been interested in

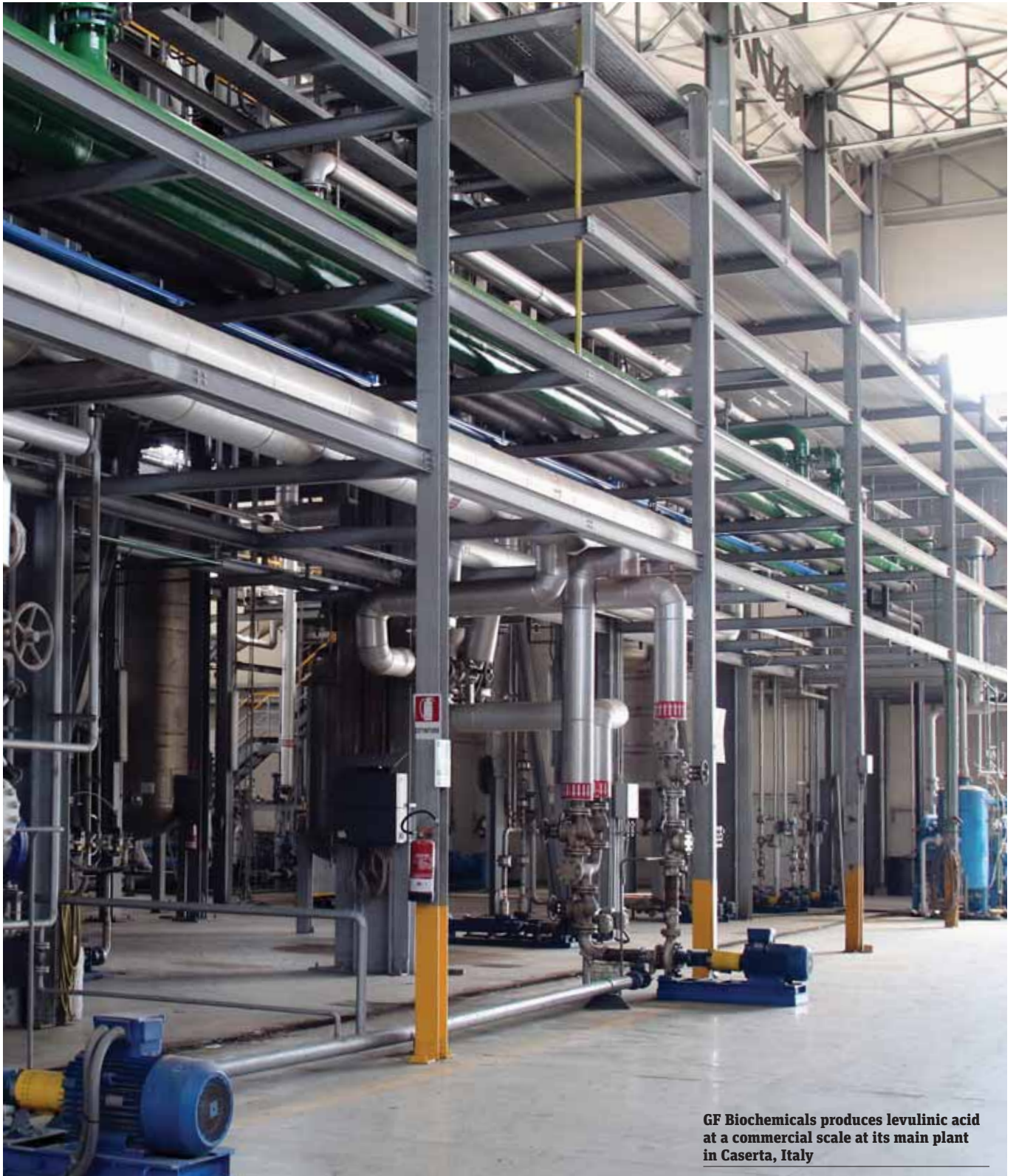
how I can help the environment and for me, climate change is the biggest problem we are facing today."

Still, the 32-year-old, in the twilight of one career, can't hide his excitement at the dawn of another. Flamini, who earned cult-hero status at Arsenal across two spells with the north London club, laid the foundations for GFB during a five-year stint with AC Milan sandwiched between them. Shortly after signing for the Rossoneri, he was introduced to Granata through a common acquaintance. "At the time he was already interested in the problem of climate change and we shared this passion and wanted to do something. After meeting with scientists and researchers, together we developed this biotechnology, first with the Polytechnic University of Milan and later the University of Pisa."

So, what exactly is levulinic acid and why is it so exciting? Flamini explains: "Levulinic acid replicates all the uses of oil but can be made directly from organic material. We're using that product to substitute for oil in a range of everyday products including detergents, cleaning products, make-up and even furniture." And how will this impact the average person? "The primary benefit is that they will be able to continue to consume such products and reduce their carbon footprint while doing so without the heavy costs associated with many renewable products that are on the market today."

The key challenges that GFB has had to overcome, Flamini says, relate to keeping production low-cost and continuous. "After we had mastered the process for producing this form of levulinic acid, we took out over 250 patents to protect the technology. The next step was to make sure that we could continue to produce it on an industrial scale."

The forecast for GFB's output is currently 10,000 metric tonnes by 2017, which is roughly 70,000 barrels. For perspective, Saudi Arabia produces in excess of 10 million barrels of oil per day, but Flamini insists this comparison is moot. "Admittedly our output is



GF Biochemicals produces levulinic acid at a commercial scale at its main plant in Caserta, Italy

“The price is the same for producers and end-users”

relatively small compared to the global oil market, but let me clarify that we are not aiming to go against the oil companies; we want to work closely with them in partnership to help them be compliant with new regulations.”

At the Paris Climate Change Conference COP21 in December 2015, world leaders agreed to binding rules to reduce greenhouse gas emissions, sending a clear signal that businesses must invest in the low-carbon transition. “As the percentage of biofuels needed to be in oil to meet environmental standards increases, as per the agreement in Paris, companies will need the technology to be able to do that. We’ve exhausted palm oil and ethanol and also found that they weren’t actually that good for the environment. Levulinic acid uses an economical, more efficient and easily obtainable raw material in biomass, and this can boost lubricity.”

Is GFB’s role, then, to facilitate rather than to antagonise? “Of course. Another example is in plastics, where we have new regulations which say that the plastic in contact with food cannot come from fossil fuels any more. It has to be a bio-plastic, so for companies producing stuff in contact with food, they need to have that technology available to them to keep up with the changing market.”

Previously, the price of many renewable energy strategies has been the source of resistance for firms. Flamini says GFB has worked hard to square this circle. “I think in the past people were nervous to invest in green chemistry because they were worried that it would cost too much. The advantage we have, and we refer to this as blue chemistry, is that the price remains the same for both the producers and the end-users, while delivering a better performance.”

GFB’s long-term vision, as Flamini outlines, is that levulinic acid will prove to be an important building block for a decarbonised world, helping to replace fossil-based chemicals and reducing the carbon footprint of consumer products. This year GFB won the Bio-Based Product Innovation of the Year award at the World Bio Market Awards,

dedicated to recognise and celebrate the companies and individuals who are driving the bio-economy.

Last year, the company was presented with the John Sime award for Most Innovative New Technology by the European Forum for Industrial Biotechnology and the Bio-economy; and the Frenchman believes he and his colleagues really are on the precipice of something special.

At present, GFB directly employs 50 people and 400 people indirectly. It has a production plant in Caserta, about a 30-minute drive from Naples, as well as offices in Milan and Geleen in the Netherlands. Flamini accepts it will take years for the company to match the largesse of the major oil firms, but is nonetheless proud with what GFB has achieved in such a short space of time. “I think we’ve gone well beyond the ‘start-up’ phase now. We’ve gone as far as to actually prove the concept – it can be done – and in less than eight years, we’re already talking about commercial applications.”

And indeed GFB continues to snowball. In February, the company bought out Minnesota-based firm Segetis, the leading producer of derivatives based on levulinic acid, with the aim of developing its bio-plastic technology, cleaning products, solvents and many other applications. Flamini and his team have already earmarked China and Brazil as potential new markets and any idea that enthusiasm for this project might wane is soon rubbish when he tells me he’s already planning for “70 years from now.”

But what of the immediate future for Flamini? He joined Palace on a free transfer from Arsenal in September, agreeing a contract until the end of the season and maintains that football his priority. “It is my passion and I think I still have a good few years left in me yet. Perhaps when I do finish playing then I can be more involved in the day to day operations of the business but I am certainly still focused on continuing my career on the pitch for as long as I can.” Better watch those bookings then.

Emerging risks in the energy sector

Energy companies should not underestimate the risk from cyber crime, writes BeCyberSure's Carolyn Harrison

When an online bank or a telecoms company hits the headlines as the victim of a cyber attack, it can reinforce the perception among other businesses that they have little to fear, because they're smaller or not in the same sector. This is a potentially dangerous mistake. In fact, companies in almost every sector are falling foul of cybercriminals every day. It just isn't headline news. Worryingly, many still think it is the responsibility of the IT Department and not a safety or a security problem.

Furthermore, most companies are so busy worrying about a technological 'silver bullet' to protect them they completely overlook the weakest link – people. Around 95 per cent of all data breaches (according to IBM) are as a result of human error.

The energy sector, including oil and gas and their related industries, are as much at risk as any other. For these industries, the stakes can be even higher than those of banking or communications; as well as the huge reputational and financial damage at risk, energy companies must also consider operational disruption, and – as has happened with offensive intrusions into Industrial Control Systems – even the potential for significant damage to property, injury or loss of life.

Managers typically underestimate the disruption that is possible, and their responsibility for it. The Information Commissioner, Elizabeth Denham, described cyber security as “not an IT issue”, but “a board issue”. Denham has

made it clear that she will make companies accountable for their data protection. The recent Tesco Bank hack required Tesco to repay its customers £2.5m in stolen funds; had this happened after the General Data Protection Regulation (GDPR) comes into force in 2018, the fines imposed would in all likelihood have dwarfed the cost of the attack itself.

That said, the reputational harm and distraction from core business that a cyber attack causes become ongoing costs that are not easy to quantify.

No company is too big or too small to be of interest to cybercriminals. Every bit of data – everything – has value to the criminal. Small businesses are not ‘main target’ but act as conduits to a larger prize; they are the weak links in the supply chain.

Fortunately, there are some relatively simple steps that will make your organisation safer. Start with governance, accept cyber security as a business risk and make sure your organisation is ready to deal with a breach. Bridge the gap between IT, HR, security and senior management, to make information security something everyone knows about and works on proactively. Make sure employees are educated to the threat, and are regularly reminded and updated – especially with regard to opening emails and attachments. As devices multiply, so do opportunities for cyber criminals. Smartphones and tablets are as vulnerable to viruses as other computers. 'Internet of Things' devices which, though you may not realise it, are connected directly into computer networks, frequently have zero security. Social media sites are breeding grounds for cyber infection. If someone works and plays on a smartphone, the risk rises dramatically.

BeCyberSure is a global specialist in information security that helps deliver the protection and education needed throughout public and private sector supply chains. For more on how to protect your business, visit:

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The beginning of the end for oil and gas?

The economics of energy generation are changing, writes **Chris Anderson**, CEO of 4C Offshore



While 2016 has been a year of profound change in many areas, it may in time be recognised as the beginning of the end of the age of oil and gas, and a point that led to transfers of political and economic power across the globe. I am not suggesting the end is nigh; demand is still there, and it is still growing. Prices continue to fluctuate in response to that demand. But organisations that previously provided traditional energy sources such as coal, oil and gas are moving into new energy markets, hinting at an end of an era.

The third quarterly 2016 earnings report for European energy giant Dong Energy was hardly the most exciting reading, but it was significant, especially because the document was accompanied by a statement from the CEO confirming Dong's intention to phase out its oil and gas business interests – the very purpose for which the company was founded.

Dong Energy is now developing offshore wind energy sources (making it now the largest single developer within Europe), bio energy, and green energy distribution. If this was an isolated case, there would be no cause for concern for those invested in oil and gas. Companies

realign themselves to new markets all the time. But this event is far from isolated. The German utility company RWE – another giant – began a full restructuring process this year, pooling renewable energy, grids and retail business areas in Germany and abroad into a new subsidiary. Peter Terium, CEO, described the move as “our response to the transformation of the European energy landscape”. Earlier announcements highlighted that in the first three quarters of 2015, the group's earnings were down six per cent year on year, and its operating result decreased by nine per cent, a lapse in performance that was blamed on shrinking margins in conventional electricity generation. Its renewables division, on the other hand, has been expanding and becoming more profitable. E.ON announced a similar strategy in May, with a focus on renewables, energy networks, and customer solutions.

The change is gathering pace not only at corporate level, but also in government. This year, three of the four political parties in Norway – one of the richest oil-producing countries in Europe – have agreed to ban petrol and diesel car sales from 2025, news that

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shook the motor industry. Statoil, the formerly state-owned Norwegian oil and gas business, is becoming an increasingly important developer of offshore wind technologies. It is currently completing construction of the Dudgeon Offshore wind farm off the Norfolk coast, runs the successful nearby Sheringham Shoal windfarm and has also shown interest in acquiring the offshore wind lease area off Oahu, Hawaii, in a bid for global reach.

Nuclear-energy-rich France has also committed to an offshore wind development programme, and is working to fast-track experience and knowledge in floating offshore wind technology with the probable intention of becoming a global provider. In the

The UK has the world's largest offshore wind capacity

Netherlands, the infrastructure for electric cars is so well-developed that electric taxis are now the norm, not the exception, at Amsterdam's Schipol airport. Electric cars are just one of the technologies in which a new breed of entrepreneurs, from startups as well as large corporations, are discovering huge scope for growth.

The European energy landscape is changing fast, and the UK will not immunise itself from this through Brexit. We need to secure our energy supply, not by drilling holes in the ground to find more gas, more oil or even more coal, but by embracing newer technologies, changing infrastructure and upgrading our transport.

The good news is that this is already happening. Take offshore wind – a renewable technology that is mature enough to provide electricity generation that equals the largest conventional power stations. The UK has the largest installed base of offshore wind generation on the planet. Costs have fallen significantly, reducing the amount of government support needed, and the technology is on a trajectory to come down much further in price. It will reach parity with the cheapest of the old power sources in less than a decade. The UK government demanded costs came down to £100 per MWh by 2020. In the next auction round, due April 2017, we anticipate bid prices between £81 – £88 per MWh. This already beats Hinkley Point C's guaranteed price of £92.50 per MWh (index-linked and for 35 years), a decade (and £18bn in construction costs) before Hinkley comes on line. By 2020, the likelihood is that the UK will more than double the amount of electricity generated by offshore wind.

We are also developing submarine electricity connections (interconnectors) to other countries. These are often seen as a cheaper alternative to building a more power stations for generation and reserve capacity, and we pay for the electricity when needed, allowing for grid flexibility, export of electricity surplus and balance of supply.

We already have interconnectors in

place that allow us to share power with France, the Netherlands and Ireland. We are currently building or planning to build more than seven further connections to Norway, France, Denmark, Ireland, and Belgium. A total of 19 are proposed in the long term. Each connection can provide the UK with the equivalent of a large power station, and they're quick to build. A five-year turnaround can be achieved if the countries at both ends of the cable work hard and fast.

Some argue that electricity demand is plateauing, but this is as unlikely. Electric vehicles alone will hugely increase electricity demand, as most of the UK's 26 million cars are petrol or diesel. Change those to electric cars, and we are likely to need another five to eight large power stations just to recharge them. And electrification of transport is just the start. Demand for new electrical devices is set to increase. There are many reasons, but consider: we are a rapidly ageing population. As health care costs increase, devices such as security systems, mobility scooters, medical aids and robot lawn mowers can support us to live at home for longer, if we have cheap, sustainable power.

The organisations spearheading the change are not irrational, risk-taking entrepreneurs but conservative, rational global corporations doing their best to see into the future and plan for it. Like me, they don't see a world where the oil, coal and gas runs out, but a world where it makes more sense not to use it. The only question is how we make the transition. Many stock markets are underpinned by oil, gas and mining stocks; if these energy sources have to remain in the ground, they become worthless, markets feel the impact and economic and political power undergo dramatic shifts.

The UK is well placed to follow the example of companies such as Dong Energy and make the transition to the new economies of increased electricity demand, supplied by renewable sources such as offshore wind, on a grid interconnected with our neighbours.

Breathing life back into UK climate policy

The UK has committed to some necessarily ambitious decarbonisation targets. With these in mind, onshore wind energy must be at the heart of the mainstream, writes Green Party co-leader **Caroline Lucas**



Countries across the globe came together to sign an historic deal on climate change. Though many of us fought for a stronger agreement, what came out of Paris did at least see a commitment to keeping warming to two degrees - and, importantly, to pursue efforts to stay below 1.5 degrees.

It's fair to say that the UK government, working with colleagues in Europe, played an important role in the Paris agreement - and earlier this month ministers warmly patted themselves on the back as they ratified the deal here in the UK.

Whilst the Paris Agreement marked one of the most important moments in the global fight against climate change, we must not forget how far we have to go. Without a step-change in ambition, we will blow the 1.5 degree goal in three years, and, by the end of the century, the world could have warmed by four degrees or more.

Even if we keep warming to two

degrees, the effect of climate change presents a profound danger to us all. From floods and droughts, to crop failure and refugees; climate change will irrevocably change the world we live in.

Here in the UK, we should celebrate our world-leading Climate Change Act and its legally binding five-yearly carbon budgets. But despite its impressive legal framework, the UK government remains painfully slow at delivering on the emissions reductions it requires. We currently lack almost half the policies we need to meet our 2030 targets - indeed, over the last year, we have gone backwards.

Beneath a layer of green spin, ministers have demolished many of the UK's renewable energy and energy saving policies. The UK's attractiveness as a destination for renewable investment has dropped to an all-time low. The solar industry has lost 15,000 jobs in the last year alone, and only 10 new community energy organisations have been registered this year, compared with 76 in 2015.

Then there are the energy projects that the government has supported. On the one hand there's the multi-billion pound

We now have ministers who understand the challenge

folly of Hinkley Point, which will not only divert resources away from low-carbon energy, but holds the electricity grid back from becoming more responsive and decentralised. Then there's the planned 'dash for gas' that's seeing our beautiful countryside measured up for fracking.

These reckless decisions are at odds with the climate reality. As economists, physicians, engineers and scientists across the world have now made clear,



The 2015 Paris Climate Conference saw world leaders sign a legally binding agreement on climate change, with the aim of keeping global warming below 2°C

there can be no new fossil fuel infrastructure and we must keep the vast majority of fossil fuels in the ground.

In the UK, we stand at a fork in the road, and the threats are clear and present: from Donald Trump across the pond to the reactionary elements within the Conservative party here. The central challenge for all of us fighting climate change here in the UK is to breathe life back into the Climate Change Act.

The good news is that we have two ministers in charge of climate and energy policy, Nick Hurd and Greg Clark, who understand the task in hand. And after six years of a Treasury led by a man who reportedly described green campaigners as the ‘environmental Taliban’, we now have a Chancellor who has been very clear about the need to tackle head-on the biggest challenge of our age. Early signs from Theresa May haven’t been overwhelmingly positive but with the potential for a more proactive approach to economic policy and the cross-departmental Emissions Reduction Plan pencilled in for the new year, there

is hope yet.

From Greenpeace to National Grid, Policy Exchange to Energy UK, the consensus is that the alternatives to fossil fuels and nuclear are not only healthier and fairer, but also that they make economic sense. Smart meters, home and grid-scale batteries and flexibility from energy-intensive industries, coupled with the renewable energy we have in abundance, would be much more efficient than building new power stations to meet extra demand during relatively short periods. The cost of wind and solar continues to drop by the day, and we know that a nationwide scheme of home insulation would hugely reduce demand, keep people warm in their homes and provide jobs in every constituency for a fraction of the price of nuclear white elephants.

If the government wanted to make a bold statement of their intent to meet the climate challenge head on then there’s an obvious place to start: remove the de facto ban on onshore wind power. Onshore wind now matches new gas

power stations on price, while its popularity has just hit record highs.

Polling released recently by climate change charity 10:10 and ComRes showed 73 per cent of the public back it - compared to just 34 per cent for fracking. In 2015 onshore wind delivered 6 per cent of all UK electricity demand, a tripling on its 2010 contribution - and 20 per cent of all renewable generation. It is now categorically mainstream - and as the windiest country in Europe it’s a resource we’ve only just started to tap.

Putting onshore wind back into the energy mix would just be the start of the transition we need to make. Interestingly, many of the key people behind the Climate Change Act recently suggested they could have gone much further at the time - an important reminder to never stop pushing at the boundaries of what we think is possible. As the climate crisis unfolds in front of us, a bold, dynamic and adventurous politics that is unafraid to challenge and confront has never been more necessary.

In the heat of the community



What is district heating – and can this hot new trend really provide an answer to fuel poverty?

India Bourke finds out

Hygge, the Danish art of cosiness, is in vogue this year. Numerous books and lifestyle pages sing the Scandinavian praises of woolly socks and scented candles.

Yet achieving inner warmth often assumes a reliable source of outer heat – something that, for over 60 per cent of Danes, is not provided via individual oil or gas boilers, but through locally-run, district heating schemes.

In this highly collective system, otherwise known as a heat network, boilers are replaced with water warmed at a nearby energy centre and piped directly into people's homes. The connection to a decentralised energy source increases efficiency and broadens the scope for low-carbon generation, such as the capture and reuse of waste heat – from factories, power plants, or transport infrastructure.

At the redevelopment of the iconic Battersea Power Station in London, the

new luxury flats, organic bakery, and Apple's new London Campus are all to be warmed by their own 6,574m² energy centre.

The combined heat and power (CHP) plant will generate up to 7MW of electricity, then redirect the excess heat into heating, hot water and cooling for the wider site. A feasibility study has also been run to see if water pumped from the Thames could provide the centre with even cleaner energy.

Similarly ambitious schemes can be found across the capital and the country. At Elephant and Castle, energy giant E.ON has been contracted to provide a biogas-linked energy hub. In Bristol, the mayor has approved £5m of funding for a low-carbon heat network that will eventually phase out natural gas in favour of renewable alternatives.

The expansion coincides with a government push to cut the UK's energy use and meet its climate change targets.



SHUTTERSTOCK / SONGQUANDENG

Individual boilers are no longer needed

In 2015, the Spending Review announced over £300m to support investment in heat networks and help “build an energy infrastructure fit for the 21st century”.

But not everyone has entirely welcomed the move. Battersea Power Station once sent its own waste heat under the river to Pimlico, where it was used to warm a local housing estate. The upgraded system that still serves the community today is one of 2,000 heat networks already in operation around the UK – and each scheme has varying levels of consumer satisfaction.

According to a *Which?* survey of 50 such schemes, the centralised infrastructure removes the need for individual boiler maintenance, and offers the potential to reduce emissions. But the extensive capital required to set up the projects also means that customers are often locked in to long-term contracts – heightening the need for fair charges, transparency around the

derivation of bills, and the smooth running of service.

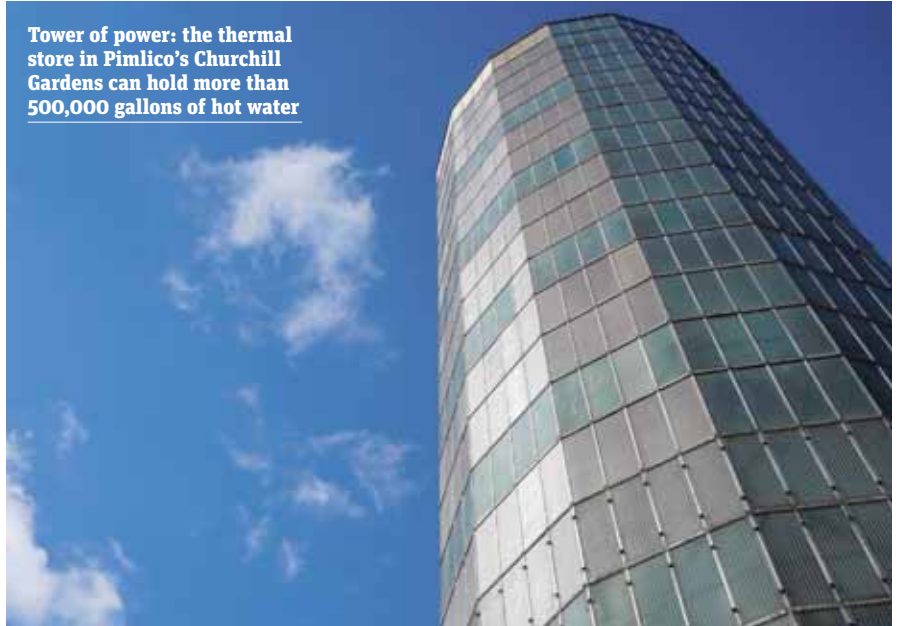
Ruth London, a campaigner at Fuel Poverty Action, has seen the lack of regulation surrounding the industry affect some of the most vulnerable in society: “A couple of years ago, people started coming to us about the way they’d been locked into contracts with monopoly district heating suppliers and were facing staggering bills and often unreliable service, apparently with no recourse.”

One such instance can be found at Myatts Field North, not far from Battersea, where a recent redevelopment of the 1970s estate saw responsibility for renewing the site’s energy centre pass to energy giant E.ON. Since then, residents have reported outages, inadequate hot water and high bills.

For Philip Tromans, a private tenure resident, the lack of transparency over bills and water temperatures has led to

Prices are set on the needs of users, not the cost of gas

Tower of power: the thermal store in Pimlico's Churchill Gardens can hold more than 500,000 gallons of hot water



scepticism about district heating's wider claims to increased efficiency. "If it really is more efficient and cheaper, then you would expect to see that reflected in your bills," he says, pointing out that his own bills are higher than the figure the Heat Trust's Heat Cost Calculator quoted him for heating his home with a gas boiler.

A spokesperson from E.ON told me that the company has "hopefully turned a corner" with regard to the early engineering issues at the estate, but that it still needs "to get a bit better at improving things and sharing more with the residents."

If it doesn't, then schemes like that at Myatts Field risk darkening the name of heat networks in general.

According to Dr Charlotte Johnson at UCL's Energy Institute, district heating providers would benefit from taking a more transparent and inclusive approach. Tariffs pegged to the price of gas, for instance, do not help reflect the vastly different infrastructure that heat networks entail.

Michael King, Convener of the District Energy Vanguard Network, has a similar perspective. In the current system, he explains, the profit obligation of private-sector energy companies can be at odds with the interests of customers.

But there are alternatives. In Aberdeen, King helped the City Council establish a not-for-profit independent company that

provides "affordable warmth" via district heating.

Its prices are set not against the price of gas, but against the needs of its users – specifically, never higher than 10 per cent of the income of a single pensioner household on benefits – and the results have turned around the fortunes of some of the city's dampest tower blocks. Instead of wanting to move out, people now want to move in, King says.

This is much closer to the ethos that operates in Denmark. For Brian Vad Mathiesen, professor of energy planning at Aalborg University, the "extremely popular" system is a result of the fact that, by law, the heating supply companies are not permitted to make a profit beyond their own sustainability. Companies are also required to submit their tariffs to a central body for annual publication, allowing consumers to compare like with like.

Back in the UK, the government's pilot of its Heat Networks Investment Project makes no such specification. But it is set to assess local authority applications for capital funding on a set of multiple criteria.

As Mathiesen is keen to stress, district heating is only a success in Denmark "because it is generally cheaper than the alternative and because the system is trustworthy." Perhaps this, not *hygge*, is the key to keeping cosy this Christmas.

Building confidence has never been so important

Louise Kingham
OBE FEI, chief executive of the Energy Institute, says a stable and long-term strategy is crucial to managing Brexit's impact on the energy industry

Despite the initial concerns about the fallout from UK negotiations with the EU, transparency from government, investment in infrastructure and secured access to skilled labour could help mitigate any negative impacts of Brexit. This was the message from five energy experts representing policy, oil and gas, renewables, utilities and academia, invited by the Energy Institute (EI) in October to debate the implications of the referendum result on the UK's energy sector and reflect on the EI 2016 Energy Barometer survey conducted before it.

The relationship between the UK and the Internal Energy Market (IEM) was a key area of discussion. Panellists agreed that the UK should at least secure observer status, and ideally, access to the IEM. At best, the UK should negotiate for continued membership to ensure trading continuity and keep energy prices low, avoiding increased tariffs or trade barriers.

Whilst the EU referendum result is unlikely to affect the short-term supply of energy in the UK, the current uncertainty surrounding Brexit may inhibit foreign investment in projects at the beginning of their financial development. The loss of funding through the European Investment Bank and European companies was also raised. The cost of replacing power stations and nuclear plants will be high – and consumers will eventually be financing

the bill through higher prices.

Uncertainty about the status of EU workers is also causing concern for both the industry and academia as the sector is highly dependent on their contribution. The government must protect the status of EU workers settled in the UK and simplify the labour movement process. There is also a call for the new Secretary of State for Business, Energy and Industrial Strategy Greg Clark to outline plans and timetable for the negotiations in order to re-establish confidence amongst investors.

But it's not just about what the UK wants, it's also about what other European members will allow. Each member will have their own interests and any UK 'gain' in negotiations could be their 'loss'. Inevitably, there will be a difference between the needs of the energy sector, the government's demands and the EU's response. Still, the debate recognised there were a number of mutual wins which could quickly be taken off the table for the benefit of all parties.

The key messages from this Brexit debate and the EI's 2016 Energy Barometer report were presented a few days later to the All-Party Parliamentary Group of Energy Studies (PGES) by EI President Prof Jim Skea CBE FEI and Dr Joanne Wade FEI, Chair of the EI's Energy Advisory Panel. They drew attention to three key concerns among energy professionals: climate change mitigation, the impact of sustained low crude oil price and most prominently, the policy uncertainty which is seen as the industry's biggest challenge – even before Brexit.

They emphasised the need for a long-term, proactive and stable strategy to achieve environmental and renewables objectives; while also highlighting the importance of communication between government, industry and users in tackling system challenges. Strong partnerships between these players will be key to maximising chances for wealth creation and to enable energy to contribute to social as well as economic progress.

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A new oil in the machine

Investing in renewables isn't just environmentally responsible, it offers increasingly attractive returns, writes Heron Global's Ajay Kohli

Heron Global Partners is excited to announce that it is the exclusive partner to a groundbreaking company set to take the renewable energy sector by storm in the area of biodiesel production. It has issued a series of bonds offering a fixed rate of nine per cent per annum for five years.

The area of renewables is an expanding investment sector with the potential for hugely impressive returns driven by a continuing and increasing government impetus for growth. The UK government is legally mandated under the Climate Change Act, to cut emissions by 80 per cent by 2050, with a target of generating 15 per cent of UK energy requirements from renewable energy sources by 2020. This is a binding commitment, potentially punishable by European Union sanctions if missed.

In order to incentivise investment in small-scale renewable and low-carbon technologies so its targets can be met, the government launched the Feed-in-Tariff (FiT), administered by OfGem, in April 2010, as well as the Renewable Obligation (RO). This gives a degree of financial certainty to eligible generators as to the tariffs they can expect to receive as a minimum for every hour of electricity generated.

As opposed to conventional road diesel, which is made from petroleum and which emits large quantities of sulphur and other toxins into the atmosphere when burned; biodiesel is made from organic material, is

biodegradable and naturally contains little sulphur. In addition, much of the carbon dioxide released on burning biodiesel is absorbed by the plants that grew in its production.

Biodiesel can also be generated by recycling Used Cooking Oil (UCO), a waste product that would otherwise be sent to landfills or poured into drains (both disposal methods having negative impacts on the environment). As such, the use of UCO to produce biodiesel is a win-win process that recycles a waste material to produce a cleaner, renewable fuel source for the generation of electricity.

As well as reducing the environmental impact of using conventional fossil fuels in electricity generation, using renewable energy sources can deliver public health benefits by way of reduced air pollutants. The mini-bonds have been popular due to the transparency of projected returns which, given government-backed incentive schemes, make the interest payments offered viable.

As with any investment, the bonds do carry an element of risk. Principal risks in this arena include changes in the political, legislative, tax or environmental landscape that could prove more restrictive or financially unfavourable; the risk of delay in the obtaining of planning consent or grid access for a development site; construction delays or cost overruns in the building of biodiesel generation sites and increased competition in the sector.

The generating facilities the company intends to build will be small-scale and unobtrusive, ensuring minimal environmental impact and that they may be located in pre-existing industrial estates around Kent and the rest of the Home Counties.

Heron Global Partners is proud to be associated with yet another clean, green investment initiative and of its clients in leading the UK on the path of funding more renewable energy projects in the future.

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Is this government really committed to localism?

When the Lancashire fracking ban was overturned by Sajid Javid, many saw it as an about-face on the promise of devolved power. **Cat Smith MP** says it has only strengthened local opposition

When I stood in the Lancaster and Fleetwood constituency at the General Election in 2015 I did so saying publicly that I would oppose fracking. This was a widely felt issue, with the majority of the electorate opposed to fracking in all parts of the constituency from rural to urban.

Concerns raised were of course varied. Some residents were worried about earth tremors, a reasonable fear given the proximity of my constituents to the test-drilling site in Blackpool which caused them in 2011. Other concerns came from residents taking water directly from the water table. Was it really safe to drink? This was a particular issue for those in rural parts of my constituency who are not connected to mains water and for farmers who use surface water to tend to their crops and livestock.

Eighteen months on from that election, where I won the seat from the Conservatives (although even I wouldn't argue purely on an anti-fracking ticket), my constituents have been rocked by the recent overturning by the government of Lancashire County Council's decision not to permit fracking. There is a strong feeling that this is an affront to local democracy. It seems the government's commitment to localism only applies when local communities agree with what ministers think. Forcing fracking upon the people of Lancashire is a slap in the face to democracy and any pretence of devolution to the north.

Scientists agree that if we are to avoid dangerous levels of global warming, more than 80 per cent of known fossil fuels need to stay in the ground. It is a fact

that has been acknowledged by Shell, President Obama and the Governor of the Bank of England. Fracking, however, risks replacing renewable energy, rather than coal in the UK. The government has already committed to the phase out of coal by 2025. The fracking industry's best estimates believe that it will be around the middle of the next decade before the UK produces significant quantities of shale. Fracking for unconventional oil and gas just adds to the stockpile of fossil fuels that we can't burn, making it more challenging to keep the world below the internationally agreed target of no more than 1.5 degrees of global warming.

It is increasingly obvious that we cannot ignore that the global transition to a 100 per cent clean energy economy is rapidly accelerating. At the heart of the historic Paris climate agreement reached last year is a commitment to reaching zero emissions global economy in the second half of the century. An agreement signed up to by this government. Mark Carney warned that to minimise financial risks from this transformation of the global economy, the transition away from high carbon industries should begin early and follow a predictable path, helping markets to anticipate the transition to a net zero economy.

The Labour Party's position on fracking has changed since the general election. In September 2016 the Shadow Secretary of State for Energy and Climate Change, Barry Gardiner said: "The real reason to ban fracking is that it locks us into an energy infrastructure that is based on fossil fuels long after our country needs to have moved to clean energy."

Parliament has ratified the Paris Agreement. Now we urgently need a plan to deliver it. The government should look at the evidence and listen to scientists, economists and local communities across the UK. To protect our environment, to support our economy in the long term and to provide regulatory certainty about the direction of travel, the government should support my call and the call of the Labour Party for an outright ban on fracking.

Devolution only when it suits

A key central government policy of recent years has been the devolution of power to a local level, predicated on a belief that people who know most about their area are best placed to make decisions which affect the lives of those who live there. But the secretary of state's decision to overturn Lancashire County Council's refusal of an application to drill and frack for shale gas provides a lesson in how localism fares when it collides with one of the government's strategic priorities.

Here in Lancashire we've enthusiastically embraced the opportunity to take more decisions locally, and are already beginning to see the benefit of closer working between local government, communities, and businesses when targeting investment in skills, transport and growth.

Many of these investments have involved improvements to roads and other infrastructure, often with the need to first gain permission through the planning regime. While major developments often split opinion, one of the strengths of planning in the UK is that applicants can appeal against decisions that go against them. And as part of that process, the secretary of state has long had the power to recover the final decision.

However, it is easy to understand the frustration and anger felt by those in our community who opposed the applications and now find their local representatives over-ruled by the secretary of state - a member of a government that has made very clear its determination to see shale gas exploited on a large scale.

Fracking is clearly a very emotive



The government's decision to overturn Lancashire's fracking vote doesn't say much for their commitment to devolution, writes Jennifer Mein, leader of Lancashire County Council

subject, the evidence for which became most clear to me upon seeing the tens of thousands of responses which arrived in our mailroom over the course of the planning consultation. The majority expressed their concerns that this industry might start to operate in the county, but many identified potential benefits and stated their support.

Our planning committee certainly felt the weight of responsibility placed on them in taking what would be held as a landmark decision, and were reminded of the depth of feeling generated by the subject by the good-natured but noisy

demonstrations attended by hundreds outside County Hall during deliberations.

Throughout this process, those local councillors sought to consider the applications on their merits according to planning law. They listened carefully to views on all sides of the debate and made their decisions on that basis.

Our individual county councillors hold different and sometimes opposing views, reflecting the wide range of public opinion on the subject, but we have been united as a council in twice calling on the government to support industry-specific regulation to address local people's concerns. We have asked the government to lift the covers off a heavily redacted report about the potential impact of shale gas exploration on rural economies. And we have asked the government not to take planning decisions out of local hands.

We have done all this because this is what local government does, across the country, day in and day out. We understand our communities and are best placed to represent them, and make decisions that affect them.

Regardless of how the secretary of state's decision plays out – and there will be more legal twists and turns yet – the fact remains that residents and businesses in Lancashire made their views known and their councillors made their decisions based on all of the evidence put to them.

That the government then overturned three of those decisions gives weight to a suspicion that localism only applies until the centre disagrees, and highlights the gulf between people seeking reassurance and answers and a government that will not supply them.

The technological turning point

Emerging technologies are about to disrupt the energy industry as never before, write Natural Power's director Jeremy Sainsbury OBE and market analysis manager Jeff Bryan

Global electricity generation has more than doubled since 1990 with the most significant increases in demand having occurred in developing markets such as Asia and the Middle East. While there has been some growth in the generation capacity of coal and natural gas, mainly in these developing markets, renewable energy has been the fastest growing generation technology over the last 15 years. Cumulative renewable energy capacity (excluding hydroelectricity) has grown 11-fold since 2000.

According to Bloomberg New Energy Finance (BNEF), renewable energy is already the cheapest form of generation in several countries, including the United Kingdom. By the end of the 2020s, renewable generation technologies will be the cheapest form of energy across the globe. How do we ensure delivery? Energy is always going to have a strong political influence balancing the pressure of the market. Therefore, we will deal with the policy agendas and the market evolution as we see it developing below.

We are already seeing governments place greater emphasis on emissions reductions in the developed world and emissions limitations in the developing world. Renewable energy cost reductions and reliability provide a stable framework for the delivery of these aims. COP 21 will drive investment in zero emissions technologies as countries around the world seek to limit a global

temperature rise to 1.5° celsius above pre-industrial levels. The policy agenda is favouring auctions to discover the lowest priced mature renewable technology in each market.

In the next five to 10 years we are likely to witness the turning point in the global energy market. Renewable energy technologies are already price makers in a number of mature markets and future technologies will make generation smarter and more efficient, driving the costs down through increased output and better, more intelligent management of assets.

Disruptive technologies, such as smart meters, demand-side management and batteries, along with significant improvements in energy efficiency will facilitate the electrification of the heat and transportation sectors and push the evolution of global markets. In this process markets are likely to move faster than policy frameworks, leading to the market driving future investment by the end of the next decade. This new market will see a complete change in the conventional relationship between the generator, supplier and consumer.

In this new world the management of data will shift the power within the market to the consumer, akin to the revolution in the telecoms industry, where consumers are likely to purchase megawatts of power the same way they purchase megabytes of data. Generators will have to build and generate power at the most competitive rate and deliver it in the most efficient manner.

Natural Power has witnessed several step changes in the industry during its 20-year history, and prides itself in its ability to anticipate the markets. By constantly building intelligence on the technologies and market forces that affect this global industry, we ensure that those we work with are in the best possible position, not just to face the challenges of the future, but to help them profit from them too.

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Did you say you wanted a revolution?

Andrew Grover,
CEO of the UK's
leading boutique
energy consultancy,
Advantage Utilities,
talks John Lennon,
the energy
revolution and
championing great
British business



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As 2016 continues its frenetic sprint towards a close, there seems to be one prevailing sentiment – that of change. And not just the gentle peaks and troughs of everyday experiences, but a ‘revolutionary’ desire for people to have a voice and for it to be heard. We’ve witnessed events this year which previously would have been unheard of – Britain voting to leave the European Union, a reality TV star property magnate winning the US presidential election, Brent oil prices swinging from highs of \$100/barrel down to the low teens in a matter of months, Sterling at a 30-year low. What next? To quote the words of John Lennon: “You say you want a revolution?” It seems this would be the case.

Reading last month’s report to the House of Commons, the then Energy & Climate Change Committee even went as far as calling the current flux, the Energy Revolution – a shift in the way power and gas is generated, prompted by a combination of concerns around our economy, our environment, our society and our health. But with Brexit and the well documented opinions on climate change of the US President Elect, where does this leave our own energy policy? Last month, the government announced it was merging the E&CC committee into what is now the Department for Business, Energy & Industrial Strategy. Their then chair, Angus Brendan MacNeil, said that their decision to merge “represented a huge opportunity to embed

decarbonisation into mainstream business policies.” If the desire is to bring the Energy Trilemma (how we find the balance between ensuring energy security, affordability for consumers, and the need to meet long-term decarbonisation goals) into the heart of business decision making, it presents a huge opportunity for change.

The UK is the fifth largest global economy with over 5.4m businesses vying to be the most profitable. They have their own trilemma which means that consultancies like Advantage, suppliers, manufacturers and partners, all need to have the very latest understanding of emerging technologies, regulatory requirements, and an understanding of the pressures that UK businesses are currently under. Businesses told the E&CC that innovative technology such as bio-energy with on-site incinerators, peer-to-peer energy trading, community energy projects, electricity storage and innovations in the water sector are all solutions that they would be interested in. Mr MacNeil talked about how the UK is moving away from the “classical model of large, localised power generating stations towards a decentralised system, where generation and demand can be met at a distribution and individual level” so it seems likely that we’ll experience more of these new solutions emerging into the UK’s energy mix.

But with over 99 per cent of UK businesses being classified as SMEs, the need for agile, affordable and scalable solutions is paramount. With most UK businesses using between 15,000 and 25,000 kWh each year, they’ve already experienced a 100 per cent increase over the last eight years mainly due to increased demand and the ‘non-energy costs’ proportion of their bill. So it hasn’t just been the volatility of the energy and commodity markets that we’ve all born witness to, but a revolutionary shift. The E&CC said it welcomed “positive disruption” to improve the energy of tomorrow - so do we, and my team and I are ready.

Towards a golden age of investment and innovation

The decision to leave the EU presents us with an opportunity to modernise our energy sector and raise standards industry-wide, writes chief executive at Energy UK, Lawrence Slade

In 2016, the UK was split clean down the middle by the vote to leave the European Union. While the glare of Brexit can be blinding, we must not allow the seismic events of June to obscure the domestic challenges we face or the success on which we can build.

Energy matters to the UK. Our companies invest around £18bn per year in the economy, almost 14 per cent of all private sector investment. Energy projects make up a large part of the National Infrastructure pipeline with estimates that £140bn needs to be invested in new generation capacity by 2030 along with a further £40bn investment in enhancing the network.

The sector generates employment in every corner of the country, directly employing 137,000 people and supporting over 500,000 jobs. As the UK prepares to exit the EU, energy companies stand ready to deliver what the country needs. However, if we are to plan with confidence for greater investment, the industry needs a clear policy framework.

Attention will be focused on the continuity of the EMR programme and the scope and ambition expected in early 2017. With the right policy framework, we could be on the cusp of a golden age where we see not only massive and necessary investment in established technologies but the digital reinvention of our industry as a more flexible, demand-responsive sector. We need this golden age of investment and innovation if we are to meet the

goal of a low-carbon energy sector and low-carbon economy.

So far, the power sector has done the majority of the heavy lifting when it comes to decarbonising our economy. It reduced its carbon emissions by 13 per cent in 2015 and was the largest single contributor to the decrease in UK emissions between 2014 and 2015. But, as Energy UK made clear in our Pathways to 2030 report, the emissions reduction plan must take a whole system approach that looks hard at cutting carbon emission in heat and transport.

When the Competition and Markets Authority began its review in 2014 there were 24 active suppliers. At the end of 2016 there are over 50. Numbers of switches have increased, complaints against suppliers have fallen and the BEIS energy consumer tracker has shown the highest levels of trust and confidence since it began.

The period of the CMA investigation was one of falling wholesale prices, a fertile market for new suppliers leading to a 15 per cent shift from the major suppliers. But we agree with the CMA's conclusion that improving consumer engagement further is key to ensuring a competitive and vibrant retail energy market.

Energy UK will work with Ofgem and BEIS to speed up the implementation of the CMA remedy package. We are committed to working with suppliers, Ofgem and BEIS to go further, and where possible, drive forward reforms, including the faster switching programme and to make it even easier and quicker for customers to switch suppliers.

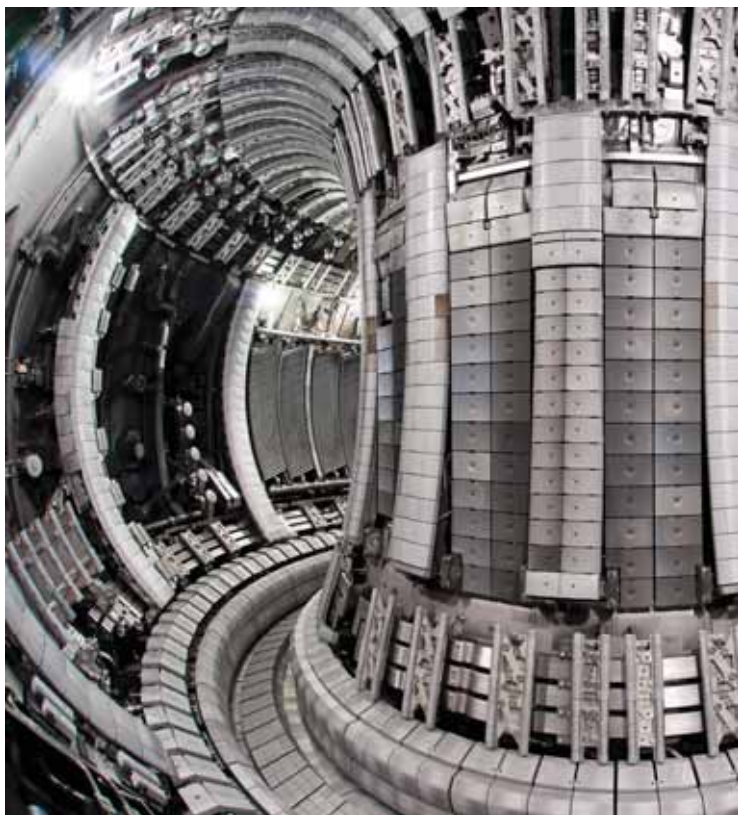
Ofgem have confirmed that switching is at a four-year high. Energy suppliers do more to support vulnerable consumers than any comparable commercial sector. But we need to do more across the board.

It is often said that you must not let the best be the enemy of the good. The big challenge for industry, regulators, government and others is to understand what good looks like and have a common purpose to achieve a market that works for everyone.

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Fusion – fuelling our future?



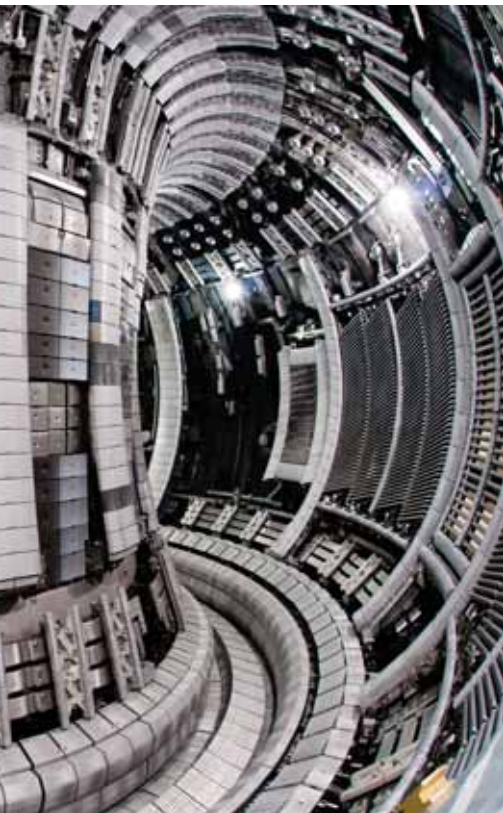
The UK can help solve the world's long-term energy needs if we invest now, writes **Professor Ian Chapman**, chief executive of the UK Atomic Energy Authority

Imagine an energy source that generates no carbon emissions and has fuel for millions of years just in the water that surrounds us. Sounds too good to be true? Maybe not. A world-wide research programme is making good progress on developing just such a process – nuclear fusion, the power source of the sun and stars – into a viable electricity source for the years after 2050. And the UK Atomic Energy Authority's fusion lab at Culham, in the science hotspot of South Oxfordshire, is leading the world in this highly promising field.

The fusion, or sticking together, of the nuclei of hydrogen isotopes has long been known to release huge amounts of energy. It is an inherently safe process and only produces short-lived radioactive waste. Perfecting fusion is one of the most enduring – and elusive – quests in science. Getting it to happen is very difficult – temperatures ten times hotter than the core of the sun (a staggering 150-200 million degrees Celsius) are needed in the gaseous fuel or 'plasma', before the nuclei fuse and unlock their energy. The most promising route to harnessing the power of fusion

is using strong magnetic fields to control and confine a ring-shaped body of plasma at these temperatures inside a machine known as a 'tokamak'. Among the forty or so tokamak experiments working collaboratively worldwide, two of the most important are at Culham.

UKAEA operates the world's largest tokamak, JET, on behalf of European fusion researchers. JET is the only fusion experiment capable of using the optimal fusion fuels, isotopes of hydrogen – deuterium and radioactive tritium. It routinely heats and holds plasmas at the temperatures required for fusion. Indeed, JET holds the world record for fusion power produced, at 16 megawatts; though this was only 70% of the power needed to heat the plasma. Progress on JET has enabled the design of its successor, ITER – a collaboration between Europe, Japan, China, USA, South Korea, India and Russia, which is currently under construction at Cadarache in the south of France. Bigger and more powerful than JET, ITER will when started in 2025 produce 500MW of fusion energy (approaching powerplant scale) and tackle some of the engineering



Two of the world's most important reactors are in the UK

challenges – such as advanced materials, robotic maintenance and superconducting magnets – standing in the way of commercially viable fusion power stations.

The UK's own fusion experiment, MAST, is also answering vital questions. With a more compact and efficient 'spherical tokamak' design, MAST is presently undergoing a wholesale upgrade. When MAST Upgrade starts operation in late 2017, it will further explore the spherical tokamak as an innovative reactor design for a second or third generation fusion power plant. In the shorter term it will start to test technology for the power stations that will directly follow ITER; for example an innovative exhaust system designed to extract hot waste from the plasma without damaging its surfaces. Successful experiments on MAST Upgrade in this area could have a big impact on the design and economics of the first fusion power plant – the 'DEMO' reactor currently being designed in the EU.

Whilst creating artificial stars for energy may seem difficult, the science is now well understood. The largest challenges on the path to realising economically viable fusion power stations lie in advanced and very demanding engineering: building the box to put the star into. Developing and integrating these engineering systems will ultimately determine whether fusion is putting electricity on the grid in the years after 2050 or remains a plot line in science fiction films. Two brand new UKAEA facilities – the Remote Applications in Challenging Environments (RACE) centre and the Materials Research Facility – are working with industry and academia on some of the most pressing challenges. RACE exploits JET's expertise in robotic maintenance and is working with UK consortia to develop remote handling systems for ITER and DEMO, enabling UK plc to win contracts worth well over £100million so far. Meanwhile the Materials Research Facility specialises in materials testing at the nanoscale – key in

developing reactor structures that can withstand the very high energy neutrons produced by fusion reactions.

Both are vital for the future of the international fusion research programme, but also for Culham as a world leading research centre. JET is the only major European science project on UK soil, and with two thirds of UKAEA's funding coming directly from the European Commission to operate JET, the UK's decision to leave the EU is felt more keenly at Culham than almost anywhere else. Whilst funding is secure until 2018, further vital work on JET to prepare the way for ITER is less clear. Detailed discussions with UK Government are just starting to find a way for the UK to remain fully within Euratom (Europe's nuclear research treaty, which is outside the European Union Treaty) and hence secure JET operation well into the 2020s.

Sooner or later, JET will close, but the investment in MAST Upgrade and in Culham's robotics and materials facilities will ensure Britain remains an important player in the programme to develop commercial fusion. In addition, UKAEA intends Culham to become a design centre for the first fusion power stations, ensuring that the UK and its industry capitalises from this multi-billion energy technology of the future.

The benefits to the UK extend beyond fusion. RACE's design expertise and testing facilities are supporting the much wider robotics and autonomous systems community, which includes space, deep sea exploration and the nuclear fission industry. Similarly, the Materials Research Facility's capabilities are deliberately synergistic with the testing of fission materials; vital in areas such as advanced reactor design activities and lifetime extension of existing nuclear plant.

These technology growth areas at Culham will ensure that we continue to be a pioneer in fusion research and help the UK to benefit from the nascent nuclear renaissance – vital for the low-carbon economy we all strive for. [@fusionenergy](http://www.gov.uk/ukaea)



**We are an energy and services company.
Everything we do is focused on satisfying
the changing needs of our customers.**

We're committed to delivering on the basics, bringing our customers affordable and reliable energy with great service. And we bring our customers more than just energy, with major investments into service and repair, and giving our customers more control and peace of mind through Hive.

We're also investing over **£1.2bn** globally into a new energy future for homes and businesses that will be smarter, greener and cheaper.

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To find out more, go to www.centrica.com/cornwall



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