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OVERVIEW

Power play is an energy shake-up

Energy supply is not only being stripped of carbon emissions, it is being digitised in a shake-up that isn't over yet

JIM McCLELLAND

It would be big news for any country to invest $50 billion in renewable energy to generate 10 gigawatts of wind and solar power by 2023. However, when the nation concerned is Saudi Arabia – the Gulf State that possesses nearly one fifth of the planet's proven reserves of petroleum and ranks as the largest global exporter – the story takes on another dimension.

It should not, though, come as such a surprise. In the era of the grand energy transition, we have entered a world where renewable is now the new normal and, to some extent, we have Paris to thank for that.

Much has happened since 195 countries adopted the first universal, legally binding climate deal to limit global warming below 2C, as signatories to the COP21 Paris Agreement, 2015. The normalising effects are far reaching, says Michael Liebreich, founder of Bloomberg New Energy Finance.

"Perhaps the biggest impact of the Paris Agreement is that the shift to a low-carbon economy is now seen as inevitable over some extended timeframe, not pie in the sky," he says.

"So now, completely mainstream investors are asking companies about climate risk and stranded fossil assets. And in industry after industry, right through the supply chain, it is clear a lower environmental or climate impact can be a source of competitive advantage, driving a surge of innovation."

There is resilience to this shared vision for renewables and upwards trajectory, despite Brexit and President Trump, observes Damian Ryan, acting chief executive of The Climate Group. "We're not seeing any evidence of business losing confidence. In fact, businesses recognise the need to be more vocal in their support for climate action in light of political instability. They know signalling their intent to use renewable power sends a strong message to policymakers," he says.

To date, almost 700 businesses and investors have made climate commitments through the umbrella coalition We Mean Business, where they can sign up to sourcing 100 per cent renewables (RE100) and doubling energy productivity (EP100).

Collectively, such corporate commitments are already achieving volumes at country-scale, says Frances Way, co-chief operating officer at CDP (Carbon Disclosure Project), working in partnership with The Climate Group on RE100. "Business learns fast. We are working with 87 companies committed to 100 per cent renewable power; together they are creating demand for approximately 107 terawatt-hours annually, around the same amount of electricity as consumed by The Netherlands," she says.

Geoffroy Van Der Hasselt/Anadolu Agency/Getty Images

Paris celebrated the ratification of the COP21 climate change agreement which entered into force last November

Numbers are big and names impressive. CDP has identified 613 corporations, such as Anglo American, Bank of America, Delta Air Lines, Iberdrola SA and Johnson Controls, which are all factoring Paris into their business plans. They boast combined market capitalisation of $12 trillion.

More strategic approaches also see companies setting science-based emissions targets, integrating carbon pricing and tackling impacts downstream. Ms Way adds: "Supply chains are responsible for up to four times the greenhouse gases of direct operations and therefore present ample opportunity to lower emissions."

No fewer than 89 of the world's largest purchasers, including BMW, Johnson & Johnson, Microsoft and Walmart, are engaging their suppliers through CDP, wielding purchasing power of $2.7 trillion, equivalent to the entire UK economy. Supplier emissions savings of 434 million tonnes were disclosed in 2016, more than the annual total of France.

With big impact, however, comes big responsibility. Human rights concerns and associated reputational risk may become more of an issue for renewable energy, argues Phil Bloomer, executive director of the Business & Human Rights Resource Centre (BHRRC).

"The Paris Agreement clearly placed the future of energy in the hands of renewables, but we need a transition to a low-carbon economy that is not only fast, but also fair. As demand increases for energy from land-intensive wind, solar and hydropower projects, firms cannot afford to overlook poor communities who depend on that land for life and livelihood," he says.

When BHRRC surveyed renewable energy companies on human rights and community engagement, they found an alarming lack of transparency, awareness and implementation.

To imagine the future of energy, though, as merely a face-off between fossil fuels and renewables for market share, would be to underestimate the breadth and depth of technological change. Disruptors come in many guises.

January witnessed the San Francisco launch of an innovative utility-driven clean-energy incubator, called Free Electrons. What differentiates this particular offering is its market muscle. As a consortium of leading utilities, it covers more than 40 countries, with $148 billion in net income and 73 million end-customers worldwide.

According to programme manager Hendrik Tiesinga, partners are preparing for the future and reinventing themselves in the process. "The utilities come from very different frameworks and markets, yet see themselves faced with the same challenges of deregulation, rapid adoption of renewables, the internet of things and digitisation of energy. They are more worried about the next startup from Silicon Valley, than Trump or Brexit," he says.

Reinvention has ramifications. New priorities call for new practices plus new people, argues Graeme Edge, co-founder of Calgary-based executive search firm McLaren Chase, and chief instigator of energy disruptors. He says: "Oil and gas companies have an abundance of technical talent. However, the energy company of the future will be increasingly digitized, marrying hard engineering with software skills."

As the industrial internet of things (IIoT) rolls out, Mr Edge predicts fresh faces in the C-suite.

"We are going to see larger exploration and production companies start to retool their boards and executive teams with greater emphasis on former manufacturing and technology leaders. Another key area will be big data analysis and management skills. It will be essential to have a well-developed IIoT strategy and associated talent," he says.

Post-Paris, therefore, the power game is not only becoming decarbonised, but increasingly digitised and disrupted, too. The future of energy might be many things, but it won't be dull.

$90trn
investment needed over the next 15 years in infrastructure where emissions are currently concentrated
United Nations

195
countries were involved in the COP21 Paris Agreement in 2015
United Nations

$13.5trn
investment needed in the energy sector alone
Ceres

RENEWABLES

Fears for UK green targets after Brexit


Andrew Aitchison/In pictures via Getty Images

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Climate campaign group 10:10 covered Parliament Square with more than 1,000 whirling pin wheels, calling for government funds to be urgently redirected away from fossil fuels and to the development of clean energy


Simon Dawson/Bloomberg via Getty Images

02

02
Planning dead-ends for onshore wind and solar farms have held back progress in renewables

Progress of renewable energy has suffered recent setbacks in the UK, but green alternatives to coal, oil and gas still offer long-term promise

JIM McCLELLAND

Renewables in 2016 had a tough act to follow. The previous year culminated in the Paris Agreement, with coal overtaken as the largest source of global power capacity. Around half a million solar panels were installed worldwide every day in 2015, plus China put up wind turbines at the astonishing rate of two an hour.

Sure enough, full-year investment figures for renewables from Bloomberg New Energy Finance show an 18 per cent drop for 2016 to $287.5 billion. However, wind and solar installations were up. Job creation also continued to impress, with more people in the United States employed in solar than traditional coal, oil and gas combined.

In Continental Europe, renewable energy accounted for 86 per cent of all new power installations, according to Wind Europe. Portugal even ran entirely on renewables for four days in May. Against this backdrop of highs and firsts, you might expect UK government to be banging the drum for renewables. You would be disappointed.

For the third quarter of 2016, the share of UK electricity generation from renewables rose to exactly 25 per cent, meaning one in every four kilowatt hours nationwide was clean and green. However, signals from Parliament remain decidedly mixed.

As recently as 2015, the UK was the only G7 nation notably to increase fossil-fuel subsidies, seemingly hedging its bets on renewables and the low-carbon economy. Doubts, fuelled by "dash for gas" rhetoric, were reignited by the pro-shale lobby overturning local government objections to fracking. Then there is the elephant in the room – the new £18-billion nuclear plant at Hinkley Point.

The road to renewables has been so fraught with policy twists and turns, the only "green" feeling left may be one of motion sickness. Major incidents have included the head-on crash of feed-in tariffs, planning dead-ends for onshore wind and solar farms, brakes put on solar thermal and biomass slammed into reverse by renewable heat incentive changes, plus combined heat and power blindsided by subsidy cuts, days before the Department of Energy and Climate Change was abolished.

The ride has been more than bumpy. Confidence in policymakers is severely damaged, perhaps beyond repair, with industry feelings of incredulity and injustice summed up by Solarcentury and SolarAid founder Jeremy Leggett.

He says: "When even the National Audit Office points out that solar and onshore wind are the cheapest options for new power, and the government ploughs ahead with nuclear anyway, why bother to engage in a debate about the economics of energy ever again?

"Many of us in renewables are learning the hard way that we do not live in a rational world, and are not dealing with fair-minded people in most of Westminster and Whitehall."

With the UK likely to miss EU targets of 15 per cent energy from renewables by 2020, longer-term legislative goals still offer hope of an ongoing framework for transition. Under the Climate Change Act 2008, the UK unilaterally committed to cutting carbon emissions 80 per cent by 2050, with five-yearly carbon budgets set in law up to 2032. This carbon safety net is helping allay fears around Brexit.

Group chief executive and co-founder of Sindicatum Sustainable Resources Assaad Razzouk sees three reasons not to worry: "First, solar prices are tumbling like Jenga blocks worldwide to levels unimaginable three or five years ago. Renewables therefore will succeed on merit, Brexit or no Brexit," he says.

"Second, the UK has more robust carbon and climate legislation than most of the EU. Third, everywhere in Europe, explosive growth in renewables is, on balance, driven by country-specific considerations rather than EU initiatives."

Beyond European borders, enormous opportunities also exist in emerging world economies, which may carry added appeal post-Brexit. In Africa, demand for renewable energy expertise and investment is high and rising, says Richard Munang, co-ordinator of the Africa Regional Climate Change Programme, United Nations Environment Programme.

"Africa holds the best solar resource on the planet," he says. "A mere 0.3 per cent of the sunlight that shines on the Sahara could supply nearly all Europe's energy needs. Other renewable sources include hydro potential at 1,852 terawatt-hours annually, 1,300 gigawatts of wind and 15,000 megawatts of geothermal. Yet, amid this abundance, an estimated 621 million people have no electricity."

Potential to create an agro-industry worth $1 trillion by 2030 will be one of the biggest drivers and prizes for renewables, says Dr Munang. "The key will be targeting Africa's need areas. Appropriate technologies specifically to power agro-industrial zones represent a promising niche for foreign investors. Leveraging such as The Commonwealth, the UK could lead through bilateral and multilateral agreements with African countries in clean energy tech for industrial applications," he says.

> Many of us in renewables are learning the hard way that we do not live in a rational world

As well as geographic diversity of opportunity, technological innovation continues to create fresh markets and business models.

London startup Bio-bean is the first company in the world to industrialise recycling waste coffee grounds into advanced biofuels and biochemicals. With products including carbon-neutral Coffee Log briquettes, partnership with high-street giant Caffè Nero will see it repurpose waste from 122 stores.

Scalable and entrepreneurial, Bio-bean combines circular economy thinking and green energy, explains chief executive and founder Arthur Kay: "Coffee Logs reduce carbon emissions by diverting some of the UK's 500 kilotonnes of waste coffee grounds from landfill, displacing fossil fuels like coal. The future of energy is a diversified one and advanced, second-generation biofuels are an important addition to that mix," he says.

From the African continent to the London coffee shop, UK renewables remain a hot prospect for 2017 – just not, it seems, in the House of Commons.

COMMERCIAL FEATURE

There's no such thing as a 'green building' anymore – every building must be green

Growing pressure from government and consumers is forcing organisations to ensure their buildings are environmentally friendly. Those who regard this as an opportunity rather than a burden are seeing benefits in their bottom line as well as their reputation

Kingston Heights in south-west London stands just 200 metres from the River Thames, but attractive walks along the riverbank are not the only benefits that the Thames offers the residents of the development's 56 affordable homes and 81 luxury apartments. It also provides them with heat.

Using advanced heat pump technology developed by Mitsubishi Electric, the community heating scheme harvests renewable energy from the sun that is stored in the river water and boosts it to the temperatures required for underfloor heating and hot water in bathrooms and kitchens.

The development also links to the 142-bedroom hotel next door and uses excess energy from the commercial air conditioning to supplement the apartments' domestic heating in what is known as an energy loop.

"A heat pump can deliver renewable heating for an individual home, an apartment block, a network of buildings or even a whole community scheme," explains Deane Flint, joint managing director, Mitsubishi Electric. "At its core, a heat pump uses a similar heat transfer process as a very familiar item, the kitchen fridge, so it is a proven, reliable technology."

The scheme at Kingston upon Thames is estimated to save around 500 additional tonnes of carbon from being released into the atmosphere each year and heats a one-bedroom flat for about 18 per cent less than it would with conventional gas heating.

Increasingly government and regulators are demanding that companies cut their CO2 emissions and comply with stricter environmental regulations, such as the Minimum Energy Efficiency Standards (MEES), which will affect commercial properties from the end of 2018.

DEANE FLINT
JOINT MANAGING DIRECTOR
MITSUBISHI ELECTRIC

01

Emissions from homes and commercial properties need to be completely removed by 2050 for the UK to meet our national targets. Kingston Heights offers an example of how green tech can both satisfy environmental requirements while saving money – and what works for a residential development is also highly applicable to commercial buildings.

INCENTIVE PAYMENTS

As well as legislation, government is backing renewable technology, such as heat pumps through the Renewable Heat Incentive (RHI), which pays for every kilowatt of renewable heat a system produces. The domestic RHI runs to seven years of payments, whereas the commercial version entitles the business to 20 years of RHI payments.

In addition to carrot and stick from government, there is a growing popular demand for action to reduce CO2 emissions. According to a survey by the Carbon Trust, published in November, more than half of consumers (56 per cent) say they would feel more positive about a company that has reduced the carbon footprint of its products and 37 per cent say it's important for them to know businesses they buy from are taking action.

"Whether businesses see all this as a burden is neither here nor there in some ways as legislation such as MEES will force their hand before too long," says Mr Flint. "The most forward-thinking companies though have already embraced low carbon technology and taken this as an opportunity.

"When you consider the challenges the world faces to deal with climate change and manage fuel security and affordability, we believe everyone has a part to play, whatever their role in constructing and managing building stock. But it goes beyond simply increasing the efficiency of the fabric of buildings, important though that is – new technologies and new ways of thinking are needed. Collaboration and dialogue are key."

To this end, Mitsubishi Electric developed its Green Gateway philosophy as a forum in which everyone involved in the construction and maintenance of buildings can share ideas and learn about new technologies. In keeping with the Green Gateway principle of doing the right thing, the company is practising what it preaches as it refurbishes its own headquarters in Hatfield, Hertfordshire.

Over the last eight years, for instance, it has installed an air conditioning system that allows it to cool and heat different parts of the building at the same time. Heat rejected from the server room can be used to keep staff warm in other parts of the building. When the gas boiler needed replacing the building managers made a case for removing gas from the site altogether and adding a heat pump boiler to the air conditioning to use rejected heat energy to supply hot water for the kitchens. Photovoltaic cells on the roof supply the building with electricity and sell any excess back to the grid. As a result, the building's energy rating has now improved from E to B.

SOUND BUSINESS CASE

Mr Flint is keen to point out that the changes it has made have been on an incremental basis. It takes a practical approach, exploring the low carbon, energy-saving opportunities that every routine refurbishment throws up. Most importantly, the company ensures it can make a sound business case for every green initiative.

"There's no such thing as a 'green building' anymore – every building can and must reduce its CO2 emissions," he says. "The technology needed to do this is more widely available, more affordable and cost effective than ever before. Every new building project and even a routine refurbishment or replacement offers opportunities to benefit from new technology to make a better building."

02

Mitsubishi Electric has a mission to make it easier than ever for organisations to ensure their buildings are as environmentally friendly as possible. Its Ecodan Selection Tool, for example, is an app that offers an illustration for any project of carbon and cost-savings, along with the potential earnings from RHI.

"The standards being set over the next few years will be even more challenging than those currently facing industry and organisations are going to have to rethink some fundamental principles of their business," says Mr Flint. "However, we believe these demands also present opportunities for those who are willing to embrace them and reap the rewards they offer."

01 Mitsubishi Electric headquaters in Hatfield, Hertfordshire

02 Hotel in Kingston that supplies excess energy to the apartments next door

Mitsubishi Electric has developed a new website, which includes a detailed explanation of energy loops, for anyone involved in energy use within buildings www.thehub.mitsubishielectric.co.uk contains useful and informative articles from industry experts on issues affecting the built environment

CASE STUDY

GREEN RHINOS

Royal Zoological Society of Scotland

The rhino pool at Edinburgh Zoo is proof that every building can benefit from a low carbon, green technology approach. Edinburgh Zoo worked with Mitsubishi Electric to replace a less efficient gas boiler that was coming to the end of its life with an Ecodan renewable air source heat pump system, which is helping to reduce both running costs and emissions by around a third.

OIL AND GAS

How energy will play out in the future

Energy guru Ged Davis has made a career of peering into the future. What does he think the oil and gas industry will look like in 2060?

ROHAN BOYLE

In the early-1970s, the Department of Energy developed a computer model to help it "guess" how Britain's energy industry would develop over the next 25 years. The results, published by the *New Scientist* in 1975, correctly predicted that oil would continue to dominate (thanks to the discovery of the North Sea reserves) and, somewhat less accurately, that the coal industry would continue to be sustained by government spending.

The only mention of renewables was a salutary warning, delivered by none other than the UK branch of the International Solar Energy Society, about the limitations of this new technology. "Do not be misled by extravagant claims such as 'solar heat can provide nearly all your domestic hot water requirements'. This would be true only if you drastically altered your way of life and only took hot baths in the summer months," it cautioned.

The energy landscape has changed relatively little over the last 40 years. The latest data published by the International Energy Agency shows that fossil fuels – coal, oil and natural gas – supplied 81.1 per cent of total global energy in 2014, down from 86.7 per cent in 1973. Low-carbon sources – mainly nuclear, large-hydro, biofuels and waste, plus other renewables – saw their share grow by 5.6 percentage points to 18.9 per cent by 2014, with renewables accounting for just 1.4 per cent of that total.

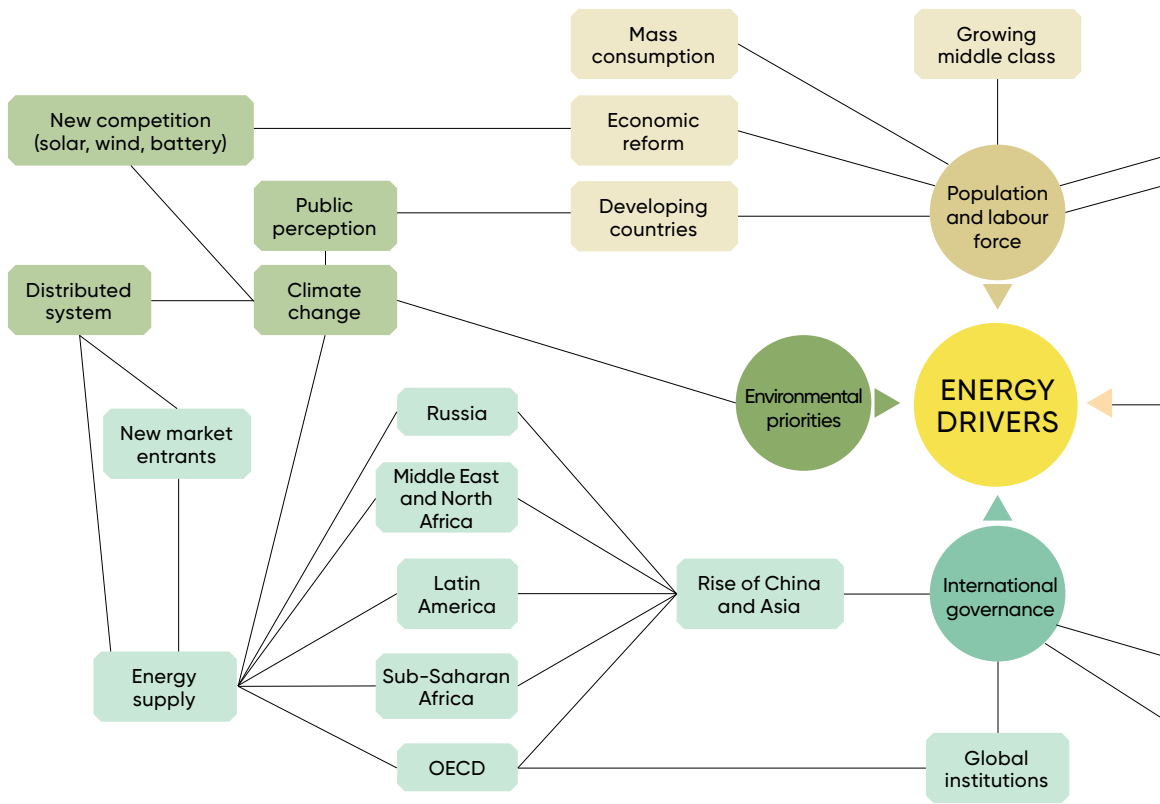
Will fossil fuels still dominate 40 to 50 years from now or will the transition to cleaner fuels completely transform the industry? The job of predicting where we will get our energy from and how we will use it has become considerably harder. An explosion in renewables and digital technologies is changing the way we generate and consume power, ownership has become fragmented, with international investors buying and selling energy assets, and policy is being shaped by a pressing need to tackle climate change.

Ged Davis has devoted much of his career to thinking about our changing relationship with energy. Formerly head of Shell's scenario planning team, he now leads the World Energy Scenario study group at the World Energy Council (WEC), a UN-accredited global network of energy leaders and practitioners. Last October, at the organisation's World Energy Congress in Istanbul, Ged and his team, in partnership with Accenture and the Paul Scherrer Institute in Switzerland, unveiled *The Grand Transition*, their vision of the future to 2060.

The study was the culmination of three years' work, involving input from around 70 WEC member organisations in more than 25 countries. Ged says: "We are trying to understand the longer-term implications from the perspective of government, business and the public. We are also trying to understand energy from the perspective of many different parts of the world. What might be viewed as negative in Europe might be seen differently in China or the US."

Historically, discussion has focused on "peak oil" and its implications. The WEC report's key finding

FACTORS SHAPING WORLD ENERGY



that assumption on its head with the prediction that global per capita energy demand will peak before 2030, thanks to efficiencies created by new technologies and more stringent energy policies. However, it also expects demand for electricity to double by 2060, and that the "phenomenal" rise of solar and wind will continue.

The WEC study group built three scenarios based on three distinctive narratives that dominate the energy world today. Each of these was given a musical theme. The first, modern jazz, represents a digitally disrupted, innovative and market-driven world. Unfinished symphony depicts a world in which more intelligent and sustainable economic growth models emerge as the world drives to a low-carbon future. And finally, hard rock explores the consequences of a more fragmented international system, weaker economic growth and inward-looking policies.

Fossil fuel's share of primary energy is predicted to fall to 70 per cent by 2060 under the hard rock scenario, to 63 per cent under modern jazz and 50 per cent in the unfinished symphony. More specifically, oil consumption will peak by 2030 in the latter two scenarios, but will carry on rising for at least another decade under hard rock. "The future of crude oil is tied to the structure and future of transport," says Ged. "This is beginning to change with the development of electric and hybrid vehicles, but it will take time to change the structure of the car fleet and associated infrastructure."

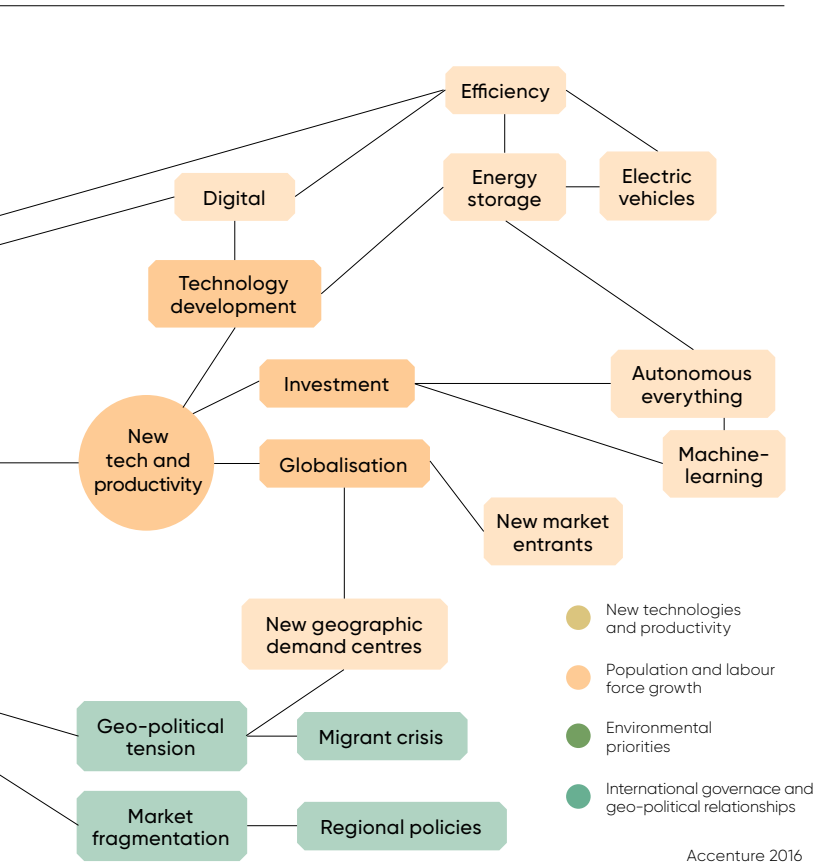
> Carefully weighed exit strategies need to come to the top of the political agenda or the destruction of public and private shareholder value is unavoidable

Coal use is predicted to peak even sooner, from 2020 onwards under the modern jazz and unfinished symphony scenarios, while hard rock sees a much longer life for the fuel. Falling demand for coal and oil could also spell economic disaster for the industry, the report warns. "Carefully weighed exit strategies spanning several decades need to come to the top of the political agenda or the destruction of vast amounts of public and private shareholder value is unavoidable," it says.

In contrast, the share of natural gas is predicted to increase by 2060 under all three scenarios, albeit at different rates. "Gas has a set of drivers that will allow it to expand well into the middle of the century," says Ged. "It will continue to be used in power stations, perhaps eventually as a back-up for intermittent solar and wind supply, and it has potential to replace crude oil and petrochemicals."

Oil and gas majors may find their greatest assets over time will be their transferable skills. He says: "They understand the importance of having a reserve base, they understand how to bring in on time very large infrastructure projects and how to deal with different governments, plus they have generally a good appreciation of the importance of meeting the needs of the public and customers."

If, as the WEC's *Grand Transition* study predicts, the energy industry is in for a period of upheaval, those companies that adapt to changing patterns of energy consumption, while staying on the right side of policy and regulation, will be best placed to weather the coming decades. Some are already doing so – Shell, for instance, bought British gas company BG Group for some £40 billion last year.



Accenture 2016

If machines could talk

Unlocking the hidden value of critical assets through the internet of things

centrica

Last month analysts at global IT research firm Gartner predicted a 30 per cent year-on-year increase in "connected things". No surprise then that an increasing number of businesses are looking to harness the power of technological advancements in a growing world of connected devices.

This explosion in connectivity is a trend that energy and services company Centrica has already grasped firmly in their hands, using the internet of things to enhance their offer to business customers across a wide range of industries.

The company's Distributed Energy & Power business uses their Panoramic Power wireless sensor technology to turn virtually any energy-consuming device into a smart device. Their approach is to give users real-time visibility of their energy use and insights to help them boost performance. Panoramic Power managing director Yaniv Vardi believes their offer is about more than just understanding how much energy businesses are using.

Mr Vardi says: "We're making it possible for devices and machinery to tell our customers how they're doing: whether they're performing badly, about to break or putting way too much energy into simple tasks. We do this by gathering device-level energy data in real time and that's where the value really comes."

Panoramic Power is a global pioneer in energy management and has rolled out wireless sensors across 1,000 sites worldwide. It's a technology that's already being applied to a growing number of industries from restaurants and retailers to manufacturers and universities.

Self-powered and wireless, the tiny orange sensors "snap and fit" on to the outgoing electrical wire at the circuit breaker, tracking energy consumption and sending it to a cloud-based analytics system every 15 seconds.

From here data is sent to an easy-to-use app that can be accessed from both smart devices and computers, bringing actionable insights straight to the customer's fingertips. At a fraction of the price of a traditional energy management system, the system can also report on and send real-time alerts on anomalies, helping users to avoid breakdowns.

> Self-powered and wireless, the tiny orange sensors 'snap and fit' on to the outgoing electrical wire at the circuit breaker, tracking energy consumption and sending it to a cloud-based analytics system every 15 seconds

Manufacturers have been reaping the rewards of this approach, calling on Panoramic to bring down maintenance costs and prevent downtime, often seeing savings upwards of 50 per cent.

One of Mr Vardi's stand-out examples of this approach in action is among the world's largest building materials suppliers and cement producers. The company approached the team as they were looking to track, manage and report on asset performance at the equipment level.

"They were looking for something user friendly that their plant managers could use to track their critical machines at remote quarries and identify system performance issues in real time," he says.

Sixty Panoramic Power sensors were installed on monitoring pumps, conveyers and crushers at three locations within one of the company's manufacturing sites. Using data from individual devices, the team was able quickly to identify inefficiencies in system performance and make recommendations to improve maintenance schedules and operations.

Mr Vardi adds: "Their investment paid off in just one month and resulted in a massive saving of over £200k that year, just by identifying issues with one of their conveyor motors and some out-of-hours demand from some of their buildings and plant."

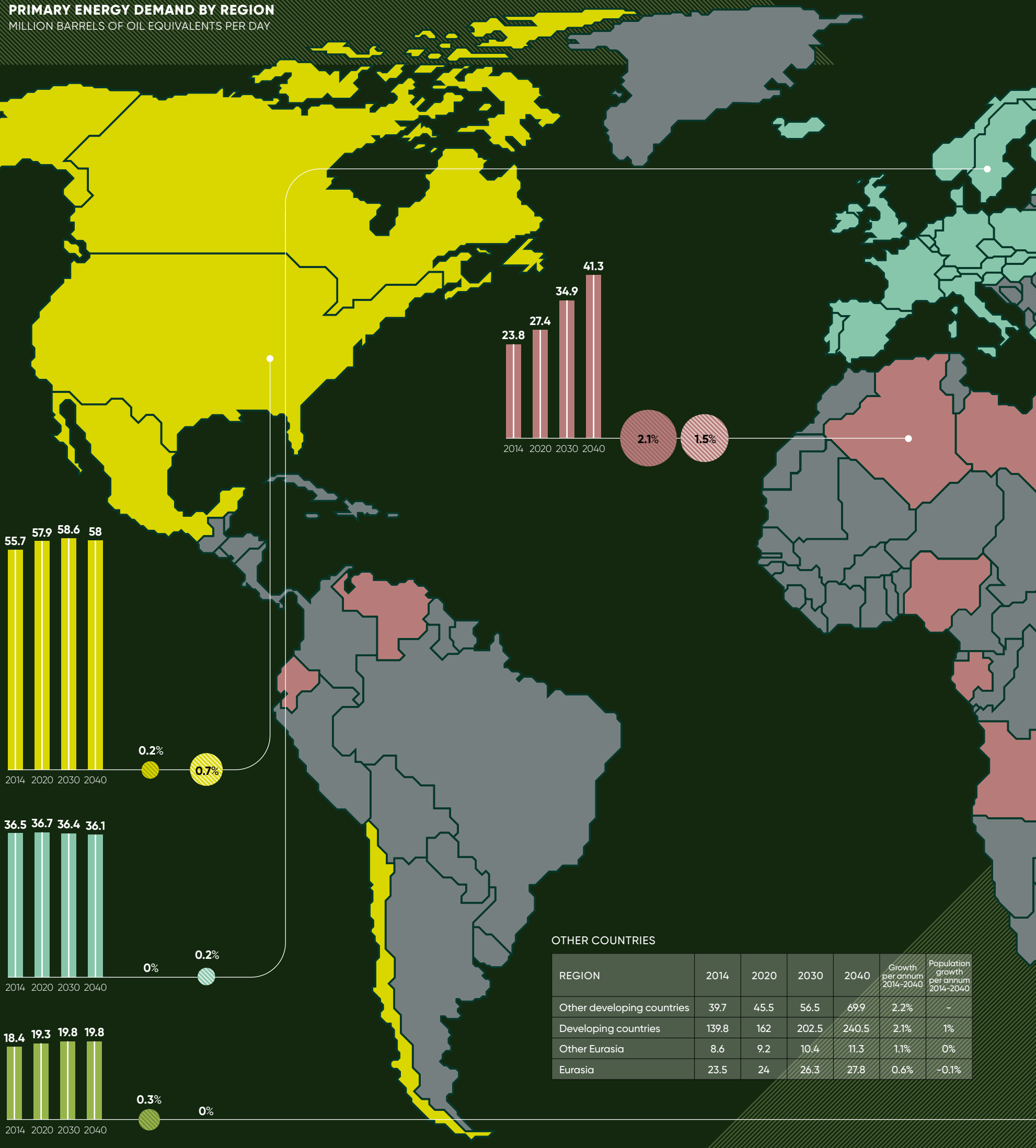
The business has now deployed sensors across 70 global sites including a number of UK quarries.

"By monitoring their assets at a device level, we're giving customers the tools that put them in real, proactive control of their facilities with a level of visibility that simply couldn't have been achieved before. That visibility gives insights that will positively impact the whole organisation, inspiring better ways of working and informing fast, confident, business-building decisions," Mr Vardi concludes.

For more information please visit www.centrica.com/takecontrol

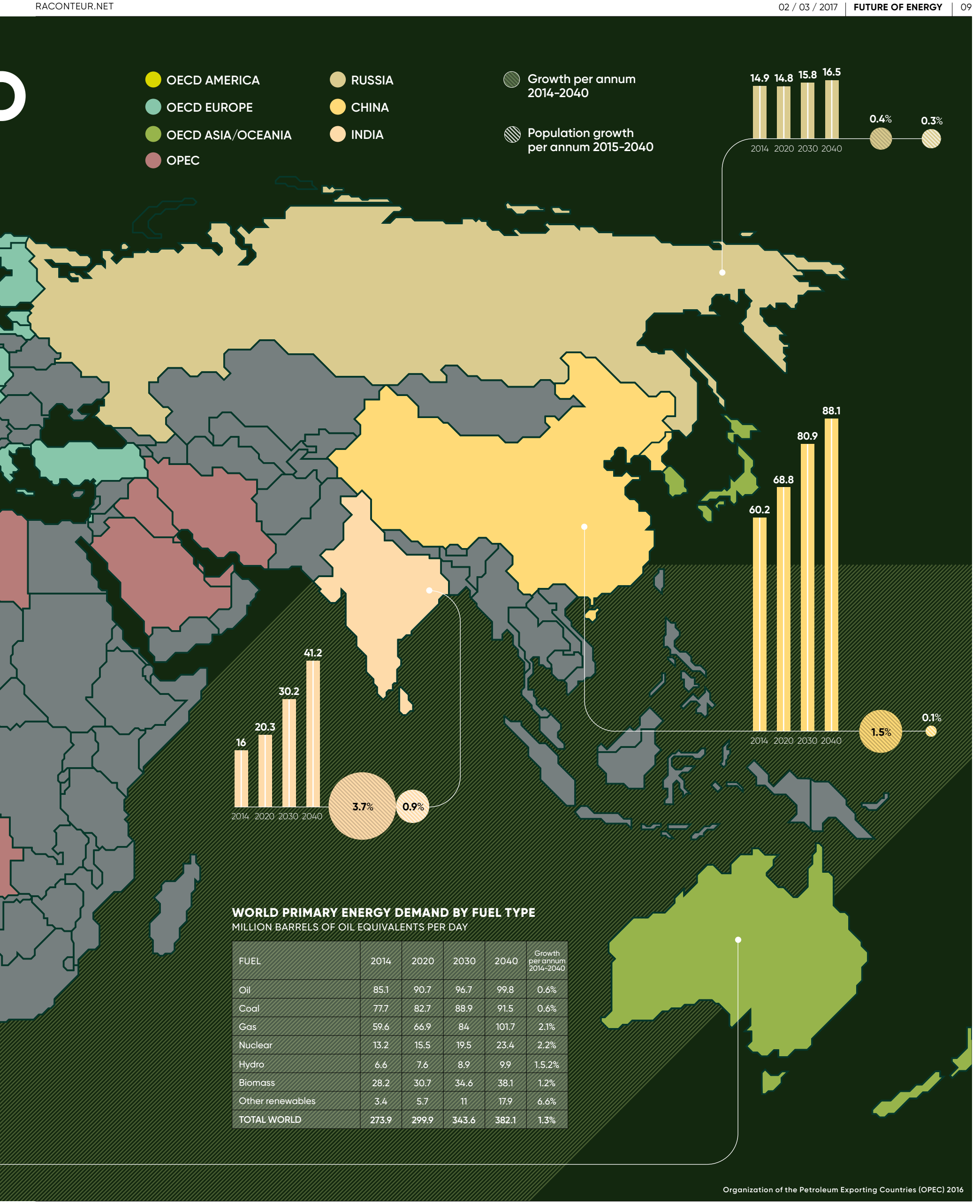
FUTURE OF ENERGY DEMAND

PRIMARY ENERGY DEMAND BY REGION
MILLION BARRELS OF OIL EQUIVALENTS PER DAY



OTHER COUNTRIES

REGION	2014	2020	2030	2040	Growth per annum 2014-2040	Population growth per annum 2014-2040
Other developing countries	39.7	45.5	56.5	69.9	2.2%	-
Developing countries	139.8	162	202.5	240.5	2.1%	1%
Other Eurasia	8.6	9.2	10.4	11.3	1.1%	0%
Eurasia	23.5	24	26.3	27.8	0.6%	-0.1%



WORLD PRIMARY ENERGY DEMAND BY FUEL TYPE

MILLION BARRELS OF OIL EQUIVALENTS PER DAY

FUEL	2014	2020	2030	2040	Growth per annum 2014-2040
Oil	85.1	90.7	96.7	99.8	0.6%
Coal	77.7	82.7	88.9	91.5	0.6%
Gas	59.6	66.9	84	101.7	2.1%
Nuclear	13.2	15.5	19.5	23.4	2.2%
Hydro	6.6	7.6	8.9	9.9	1.5.2%
Biomass	28.2	30.7	34.6	38.1	1.2%
Other renewables	3.4	5.7	11	17.9	6.6%
TOTAL WORLD	273.9	299.9	343.6	382.1	1.3%

Organization of the Petroleum Exporting Countries (OPEC) 2016

SMART TECHNOLOGY

Cars that run on sunlight and kites high in the sky

Innovative and emerging technologies could impact the energy sector by boosting alternative supplies at affordable costs and cutting demand. Here are five to watch

TOM IDLE

1 HIGH-ALTITUDE WIND POWER

Although still early in development, high-altitude wind power systems – more than 500 metres above the ground – can take advantage of stronger winds. Many companies have been developing prototypes, including aerodynamic kite designs. That major energy firms, including E.ON and Shell, have injected £5 million into Kite Power Systems (KPS), which is hoping to commercialise a 500-kilowatt onshore power system in Scotland this year, is testament to the excitement building for high-altitude wind energy. The KPS system uses two kites that are flown at around 450 metres and tethered to a winch system. Reaching flight speeds of up to 100mph, the tension in the tether line causes rapid uncoiling from a base drum, which turns the generator producing energy.

2 DEMAND-SIDE RESPONSE

Balancing the supply and demand of energy across the National Grid is a constant game of careful planning and skillful execution. Add the intermittent nature of wind, solar and tidal energy into the mix and the picture becomes evermore complex. The need to smooth out spikes of demand has seen many new software and analytics companies spring up, as well as a growing band of large-scale manufacturers willing to play a more responsible role in how they use energy. Road materials business Aggregate Industries is one of those businesses. At its site near Heathrow Airport, it stores bitumen in giant containers. These can be stored at temperatures of between 130C and 185C. Should an increase in demand for later in the day be predicted by its data analytics, the company is advised to heat the bitumen to the maximum temperature and then turn off the power until the demand, and price, falls away again. Crucially, the company is being paid to use its assets more flexibly throughout the day. Also, when there is plenty of wind power being generated, the company is alerted and rewarded for using the energy that might otherwise have gone to waste, in the absence of effective energy storage.

3 SOLAR ROOFING

"We need to make solar panels as appealing as electric cars have become," says Tesla chief executive Elon Musk. But when you promise to "make solar sexy", you had better come up with something good. The American tycoon entrepreneur didn't disappoint when he took to the stage at Universal Studios for the launch event of his new range of glass roofing tiles with integrated solar cells, making them almost indistinguishable from conventional roof tiles. Using a special coating akin to that used for laptop privacy screens, the tiles appear almost opaque, giving architects and planners greater licence to integrate the technology like never before. Made of quartz, making them stronger than clay or slate, the tiles require very little cleaning or maintenance. Of course, the real win is in the efficiency gains on offer. In operation, the new solar panels will have efficiencies in the 22 to 24 per cent range, an improvement over more traditional panels that commonly convert 10 to 15 per cent of light into electricity.

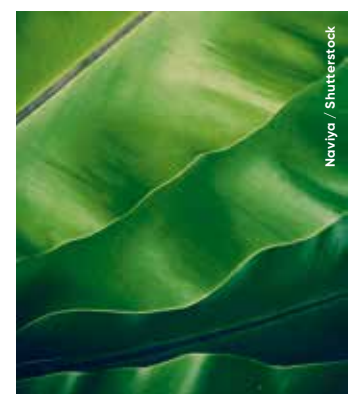
STORING ENERGY

Creating clean energy is all well and good. But you're going to need somewhere to store it. It is little wonder then that energy companies are pouring huge sums of money into batteries and power storage systems. "It's potentially very disruptive," says Hugh McNeal, chief executive of the trade body for the wind industry, RenewableUK. Around a quarter of the group's 420 members are said to be investing millions of pounds thanks to battery costs falling by around 50 per cent in the past six years. Many of the big manufacturers have upped the ante too. Tesla's second iteration of its Powerwall product, bright white, rectangular and flatter than the first version, costs $5,500 for 14 kilowatt-hours of storage and 7 kilowatt-hours peak power draw. That's enough to power a four-bedroom house for a day. Meanwhile, the Japanese electronics giant Sharp has poured plenty of effort into its software and controls business, enabling users of solar storage batteries in homes to sell the energy they don't use back to the grid when the demand, and price, are high. The company says it expects such systems to pay their way without subsidy by at least 2018.

4

5 ARTIFICIAL PHOTOSYNTHESIS CARS

Researchers are working up plans to make fuel for cars using the same science that plants use to feed themselves. A laboratory-scale device has already been created at the California Institute of Technology (CIT) which converts 10 per cent of sunlight into fuel, compared to a plant which typically converts 1 to 2 per cent of sunlight into sugars and carbohydrates. Artificial photosynthesis would make use of solar energy to split water and carbon dioxide into hydrogen, oxygen and carbon. A catalyst would then recombine the molecules to create a liquid fuel like methanol, which works perfectly well in internal combustion engines found in existing cars everywhere. While there remain question marks whether making fuel in such a way could achieve price parity, it is a technique being experimented across China, with taxis and buses now running on high-level blends of 85 per cent methanol. And the commitment being shown by the US Energy Department, which recently renewed its $75-million grant to CIT's artificial photosynthesis research programme, suggests a bright future for the technology.



COMMERCIAL FEATURE

Shaping a new future for energy

The energy world is undergoing seismic changes, with traditional power and gas companies facing significant competition and disruption from renewables, digital solutions and distribution technologies

Pressure to reduce the environmental impact of the energy we all use, allied to factors such as advances in alternative power sources and smarter, more integrated energy technologies have created an energy landscape that is practically unrecognisable from as recently as a decade ago.

These changes underpin the decision by E.ON to grasp the nettle and drastically transform its business. In response to a fundamentally changed market, E.ON has divided into two distinctly focused and financially strong publicly listed companies. The new E.ON focuses on the new energy world, while the conventional generation and energy trading businesses were combined into a distinct company, Uniper, which focuses on the classic energy world.

Johannes Teyssen, E.ON's chief executive, says: "I'm firmly convinced that E.ON has every chance to play a key role in shaping this new future of energy, with local energy networks that serve as a smart platform for the new energy world, with more and increasingly affordable electricity from renewable sources. And with customer solutions that make it possible for households, companies and communities to have an individually tailored, digitally controlled energy supply.

"Our vision is to improve the quality of people's lives. We're already thinking about our customers' future needs, in tomorrow's homes and tomorrow's cities, and developing innovative solutions to meet them."

As well as generating energy through renewables, E.ON now plays a major role in meeting the challenge of managing the supply of electricity from a huge array of sustainable sources increasingly owned by businesses and householders looking to play a more active role in their energy use. The company can draw upon its vast experience and technical ability to help organise millions of feed-in and consumption sites, and address issues such as under and over-consumption.

Tony Cocker, chief executive at E.ON UK, adds: "2016 was a landmark year for the company. We moved away from the integrated business model of many of our large competitors and separated our coal and gas power stations plus the trading business into an entirely new company, independent of E.ON. We were the first major European energy company to take this path and we will look different from them in the future, because we are different."

Mr Cocker says the reorganisation of E.ON's operations means the company will be free to find new solutions for customers, who are facing significant energy challenges of their own, without having to consider the impacts on other parts of its business. He explains: "We will be able to spend more time listening and working with and for our customers. And by doing so we will be able to put our customers first and help create a better tomorrow."

E.ON's change in focus is to connect software, power, heat and mobility in one digital ecosystem. The group is already providing its household and business customers with tangible benefits. Last year, they brought to market in Germany the E.ON Aura, an all-in-one domestic solar system that combines PV panels with an installed battery storage device, energy app and green electricity tariff for householders. More recently, E.ON has worked with the Radisson Blu chain on a groundbreaking fuel cell-based low-emissions hotel in Frankfurt.

Elsewhere, E.ON has partnered with venue operator ACC Liverpool Group to help to make significant improvements in energy efficiency across its three venues and to generate its own renewable energy on-site, making substantial savings on its power bills. Gerald Andrews, finance director at the group which operates the interconnected Echo Arena, BT Convention Centre and Exhibition Centre Liverpool, says: "Being a sustainable venue has been vital to us from the outset and it's one of the reasons we're with E.ON. We've been with them for eight years and they've always provided us with a total energy package rather than simply supplying energy.

"E.ON's expertise and insight have helped us cut our energy costs and improve our environmental credentials significantly, by managing our energy consumption in a smarter way and installing a wide range of energy-efficiency measures. Now they're even helping us to generate our own renewable energy with solar panels. As a result, we'll save around £20,000 off our energy bills and lower our carbon emissions every year for at least the next 20 years. That's an incredible saving and a huge step forward in terms of being a truly sustainable venue, demonstrating our commitment to the environment, clients and visitors."

The group also wants to play a leading role in the transition to e-mobility. The development of charging networks in the UK, Sweden and Germany to offer local authorities and private customers a range of e-mobility products and services, which include charging systems and bespoke pricing scales, has already started. Together with CLEVER, the Danish e-mobility service provider, E.ON has established a platform to drive the development of a rapid charging infrastructure across Europe. The initiative is currently being discussed with car manufacturers and the operators of motorway services and filling stations.

> 66 E.ON has every chance to play a key role in shaping this new future of energy, with local energy networks that serve as a smart platform for the new energy world

> 66 We're already thinking about our customers' future needs, in tomorrow's homes and tomorrow's cities, and developing innovative solutions to meet them

In Denmark, one of the world's best developed e-mobility markets, E.ON is the owner and operator of 2,500 charging points which saw more than 300,000 charging transactions in 2016. Using customer data, E.ON is developing new services and pricing models for the markets of the future.

E.ON also offers smaller businesses an Energy Toolkit which gives customers the opportunity to analyse their energy consumption patterns in greater detail and identify specific areas where action can be taken and savings can be made. Businesses can also qualify for discounts on energy-saving products such as LED lighting and can track the impact of investment in energy-saving equipment.

E.ON has reacted to the changing energy world by taking the bold step to focus on the renewables revolution. The good news for E.ON's business customers in the UK is that the company is now in an ideal position to help them overcome their own energy challenges.

For more information please visit www.eonenergy.com

JOHANNES TEYSSEN
GROUP CHIEF EXECUTIVE
E.ON

TONY COCKER
UK CHIEF EXECUTIVE
E.ON

2.5k
charging points owned and operated by E.ON in Denmark

300k
charging transactions in 2016 from E.ON charging points in Denmark

£20k
saved by ACC Liverpool Group through renewable energy

E.ON

MOON MINING

Next step is a giant leap for mankind

Science fiction has a habit of becoming science fact and mining on the Moon, establishing a lunar colony even, could yet become reality

CELESTINE CHEONG

No longer confined to science fiction, with the likes of Nasa and privateers SpaceX considering tentative steps towards setting up long-term colonies on Mars, landing a man on the Moon was only the beginning. Mining below the lunar surface for the Moon's natural resources could be a next step and hold the answer to Earth's looming energy crisis.

One company that intends to land on the Moon this year, with a view to mining it for its natural resources, is America's Moon Express, a finalist in the $30-million Google Lunar XPRIZE competition.

Company founder Naveen Jain says his team considers the Moon as an eighth continent of the Earth, rich with natural resources that have been collected over the years with all the asteroids hitting it.

Moon Express's ultimate goal is to create a multi-planetary society, as it believes it is a matter of time before an asteroid hits Earth.

The private company was granted permission to travel to space by the US government in 2016 and has now raised sufficient funds to carry out its mission.

No one has been to the Moon for 45 years and, even if a successful lunar mission landed, the equipment needed to mine on the Moon would present an engineering and logistical challenge which is quite literally out of this world.

There are also the political issues to negotiate, notably who owns the Moon's mineral wealth?

What the Moon has is an abundance of helium-3 (He-3), which is rare on Earth as our magnetic field prevents solar winds from blowing it into the atmosphere. Where He-3 is present on Earth, it easily escapes gravity for space because of the tiny molecules it binds with.

He-3 is an attractive component in nuclear fusion because it is non-radioactive, does not produce problematic by-products and cannot be used to make nuclear weapons.

Tritium, which is also thought to be on the Moon albeit in smaller amounts, by contrast is used in the fusion reactors at Culham, Oxfordshire, and ITER, in France, and requires specialised shielding for its high radiation dose rates. It is an essential ingredient in creating a nuclear blast.

However, should He-3 suddenly become plentiful in supply, there could be fundamental issues in the way of building new He-3 fusion reactors. This would be highly unlikely when there are already major

> “The equipment needed to mine on the Moon would present an engineering and logistical challenge which is quite literally out of this world

Hal Bergman / Getty Images

obstacles for conventional nuclear projects to overcome.

According to nuclear expert Mark Liddiard at Mott MacDonald: "A question for any such developer of He-3 mining is how are they going to link this to reactor design and gain investment for novel nuclear technology when there are investment issues already affecting conventional reactors, small modular reactors and the funding of existing fusion programmes.

"Finding project finance will be challenging for anything this novel related to nuclear and with long pay-back periods."

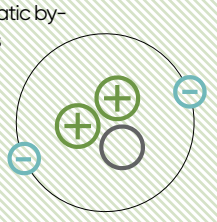
Despite the UK's leadership in fusion research, the appetite for any new nuclear technology is miniscule.

Even Hinkley Point, which the government approved last year, could still be in doubt because a new French government, after elections in May, could decide subsidies to the state-owned company hoping to build the nuclear reactor are unsustainable.

FACTFILE

HE3

Helium-3, or He3, is an attractive component in nuclear fusion because it is non-radioactive and does not produce problematic by-products



Additional uncertainties surrounding Brexit and departure from the Euratom Treaty could also see funding being pulled and an end to operations at Culham, which would be a massive blow to fusion science.

Until such hurdles are overcome, He-3 mining on the Moon could still just be a "pie in the sky" project.

COMMERCIAL FEATURE

Green is good for the environment and for business

As the UK moves towards a greener future, businesses are seizing control of their own energy supply, says the world's first green electricity provider **Ecotricity**

ecotricity

Faced with the threat of climate change and a rapidly changing energy system, a growing number of UK businesses are revolutionising the way they access and use energy.

For Dale Vince, founder of the world's first green electricity company Ecotricity, the trend for greater efficiency is one that will dominate the energy landscape going forward.

"Businesses are responsible for one third of the UK's energy consumption; switching to green energy is the single biggest thing a business can do to fight climate change and is the first step towards becoming part of the smart energy system of the future," says Mr Vince.

He speaks from experience as Ecotricity has been at the forefront of bringing green energy to businesses and homes since its inception in 1995 and boasts a growing portfolio of success stories. Among Ecotricity's almost 200,000 customers across the UK are a growing band of small and medium-sized businesses on green energy tariffs and large businesses on bespoke prices.

The company's vision for the future is to create a green UK, a place in which ethical and sustainable business is the norm. Ecotricity supply some of the greenest and most ethical companies in the country, whatever their size, including companies such as Universal Music UK, Lush, Friends of the Earth, Greenpeace, Enterprise, Vivienne Westwood and Ben Ainslie Racing.

"Tackling climate change and reducing the UK's carbon emissions will be as much about smaller businesses and households as the big companies. The realisation among individuals and companies of all sizes of the role green energy will play in powering our future is gathering momentum, and the way we produce and pay for energy is undergoing a huge transformation with smart technology," says Mr Vince.

DALE VINCE
FOUNDER
ECOTRICITY

For many businesses, the next step towards sustainability, after switching to a green energy supplier, is to employ energy efficiency measures. Forward-thinking businesses want even greater control of their energy supply. An increasing number are also looking to generate their own energy on-site, in turn cutting costs, increasing energy independence and reducing their carbon footprint.

As part of its drive to help customers make energy where they work, Ecotricity launched its pioneering Merchant Wind Power scheme in 2001, providing dedicated windmills built on the industrial and commercial sites of some of the country's biggest household names, such as Sainsbury's, Michelin, B&Q, Ford and, more recently, RSPB and Pinewood Studio, Wales. To date, Ecotricity has planned and built one in ten of all the UK's wind projects and its unique approach means it takes full responsibility for the construction, operation and maintenance of the turbines at no cost to the customer.

"We have an innovative but simple proposition for businesses – we provide them with a green energy supply that provides both environmental and economic advantages. It allows businesses to meet both their environmental goals and energy needs, while demonstrating their green credentials to their customers," says Mr Vince.

"Environmental awareness is on the rise, especially among the younger generations, and businesses need to be seen to be taking greater responsibility. Not only can energy efficiency measures boost a business's bottom line and protect them against future energy price fluctuations, they can also increase competitiveness and attractiveness as well as offer new business opportunities."

Unsurprisingly, on-site energy generation projects across the UK have more than doubled in the past four years and Ecotricity expects this trend to continue.

Mr Vince says: "The traditional top-down model has had its day and the future energy system is one that will be off-grid and decentralised."

The trend towards decentralised energy will see the UK undergo something of a green revolution, with on-site generation from the wind and the sun, and an explosion of smart devices enabling a nation to become more self-sufficient and less reliant upon global energy markets, he says.

"We are witnessing the transformation into an unparalleled modern energy infrastructure, and we and our customers plan to be at the vanguard of that change," Mr Vince concludes.

To switch your business to green energy please visit business.sales@ecotricity.co.uk

ENERGY DEMOCRATISATION

Power to the people

Success of the peer-to-peer economy, from Airbnb to Uber, paves the way for the democratisation and disintermediation of the energy market, aided by advances in technology

FELICIA JACKSON

Technological developments are already blurring the line between producers, distributers and consumers. Companies are increasingly looking for opportunities to become power producers in the new urban energy rush and could become significant contributors in the future.

According to Arup, transactive energy systems will enable prosumers – those who design things for their own needs – to respond to triggers such as energy price and grid frequency in real time. As Alan Thomas, head of global energy systems at Arup, points out however: "It's what you do with this that counts, without a surrounding ecosystem it's like having an iPhone without any apps."

Research by Arup and Siemens indicates that the value to end-users of distributed energy systems investment is significant. Operational cost-reductions ranging between 8 and 28 per cent and a return on investment between three and seven years were observed, based on a series of modelled case studies around the world. The revenue potential is also high.

The National Grid urgently requires more flexibility to manage the grid and its ancillary services market, with different types of capacity required to deal with demand and supply imbalances, is expected to be worth around £2 billion by 2021.

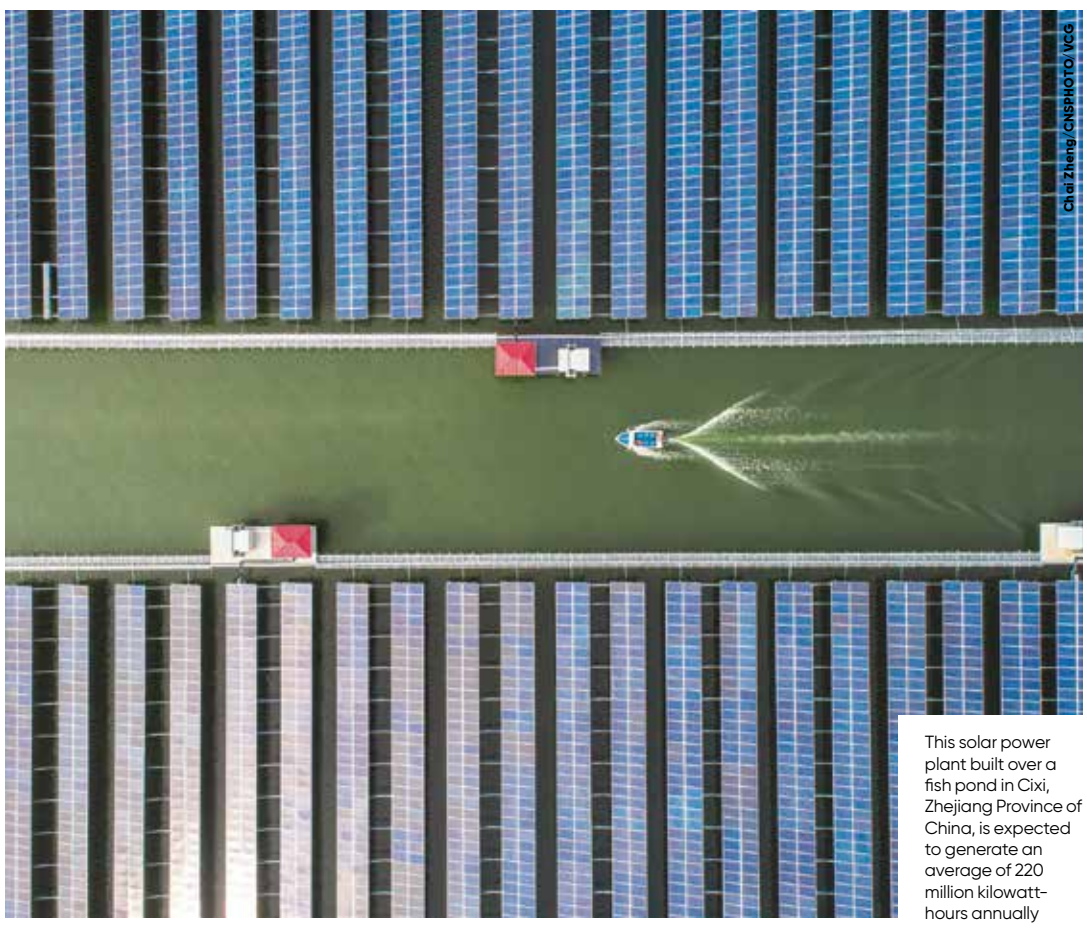
Getting the transformation to a democratised energy market right is going to require fundamental changes, notably increased use of renewables at a commercial and residential level, energy storage, and demand-side management as well as an architecture which enables the development of secure, transparent and open trading networks.

John Hartley, head of propositions at Centrica's Distributed Energy & Power business, says: "It can be a tricky road to navigate, which is where we come in. The first step for many is to get to grips with exactly how much energy you are using and where." Centrica is currently managing more than 500 megawatts-worth of back-up generators and helping customers to unlock revenues by making those generators available in the flexibility market.

"Operators are aggregating small-scale renewables and other power sources, and creating virtual power plants which can serve the grid-balancing market. But only a fraction of back-up generation is being used in this way and that's a missed opportunity both for customers and for the stability of the grid," says Mr Hartley.

He believes storage is going to be a rapid growth technology. Louis Shaffer, distributed energy segment leader, Europe, the Middle East and Africa, at Eaton, agrees. "Investing in energy storage can save businesses costs, generate additional revenues, and often critically ensure resilience. With storage, by working with aggregators, businesses not only protect themselves and reduce electricity bills, but additionally the

> Getting the transformation to a democratised energy market right is going to require fundamental changes



Qiao Zheng/CNSPHOTO/VCG

This solar power plant built over a fish pond in Cixi, Zhejiang Province of China, is expected to generate an average of 220 million kilowatt-hours annually

investment is profitable, because they can now sell grid ancillary services, thus opening up a whole new revenue stream," he says.

Where things gets really interesting is in asset optimisation, using what companies already have, be it back-up generation, batteries, a commercial fridge or a gas generator. This requires in-depth data analysis and sensor networks to assess usage and demand. Combining this with an understanding of business process, aggregators can manage a client's internal power networks, turning down usage without impacting productivity.

Demand-side management will play a fundamental role in the democratisation of the grid. Louis Burford of REstore says: "In the 'new energy world', as markets unbundle and digitisation further increases, there is a real opportunity and need to empower energy consumers so they can minimise their energy costs without any negative impact."

David Hill, business development at Open Energi, says: "Demand-side management enables the grid to manage the challenges of excess capacity, renewable energy and needed network upgrades. And it will have huge importance in transferring value from the generator to the consumer of power, as economic agents."

There are challenges with extending this opportunity to the domestic market. As Mr Hill explains: "The cost of integration isn't the barrier, but rather the flexibility of the assets. Heat is mostly gas-driven for example." Although he does see the domestic market opening up, with increasing amounts of solar panels with storage, heat pumps, fuel cells for central heating and electric vehicles.

Francisco Carranza Sierra, director of battery and energy services at Nissan Europe, says: "Ninety per cent of the time vehicles are not in use, so it's about having an asset that can be made available." While Nissan is currently working mostly with fleets, it has started a vehicle-to-grid trial using 100 cars as a virtual power plant of 4 megawatts. What makes this exciting is the potential for scale – cities could have central energy hubs that double as car parks for example.

Then it becomes a data science problem in understanding usage patterns, and when and where there'll be capacity. Companies such as Hortonworks are helping to find solutions to this as a precursor to an autonomous distributed energy ecosystem. As Kenneth Smith, general manager of energy at Hortonworks, says: "It's not just about managing data, but building predictive analytics for real-time data."

The final requirement for true democratisation of the grid is a transparent, secure and effective trading system. Joanna Hubbard, chief operating officer at Electron, believes blockchain could provide this last piece of the puzzle. She says: "Not only would it facilitate the entrance of new players into the market but, being designed on the blockchain architecture, it would be completely secure."

OPINION COLUMN

'Energy is about to become expensive and there is little the government can do about it'

RUPERT REDESDALE
Chief executive
Energy Managers Association

The recent rises in energy prices by around 10 per cent have led to consumers gnashing their teeth and calls for tighter controls on the energy companies' profits.

Politicians at this point make vocal cries that consumers should switch supplier. This has been a traditional refrain, but the reality is that energy supply and costs are entering the perfect storm bringing a headache for British business. Many have been raising this point for years, but always the argument has moved to the best price for consumers without addressing the fundamental problems the industry faces.

There are immediate issues that have raised costs, but these are exacerbated by a failure of all governments over the last 30 years to invest in generation. The first reason for price increases is Brexit and adding to the recent increase in commodity costs, this means that next year most companies will pay 10 to 20 per cent more for their energy. Scaremongering will be the immediate response, but the increases are already built into the system.

The post-Brexit collapse of sterling effectively raised commodity prices. The delay in the price rises is simply due to energy being purchased a year ahead and the increases taking time to come into effect.

Commodity price rises have also been brought about by producers reducing supply. The recent glut in supply, mainly caused by the Saudi Arabia increasing supply to drive down costs to destroy the shale oil industry, resulted in a crash in the price of oil from $110 a barrel to around $45. This has caused pain to all producers, especially as the glut has hindered a bounce back in price. An agreement to cut production has increased prices since and a steady increase is predicted.

These external factors are having the most immediate pressure on price, but there is a more worrying element that affects the cost of energy generation. Britain is facing a massive bill for building new generating assets and rebuilding the aged grid infrastructure to guarantee security of supply. Over the last couple of decades we simply forgot to build almost any power stations. The privatisation of the sector has led to competitive prices for consumers mainly due to lack of investment in replacing our aged power stations that are knackered. We have sweated the generating assets and now have to pick up the deferred bill.

Consumers are waking up to the majority of their power bill being the cost of all the measures needed to finance to assure the lights stay on. Last minute measures such as paying two coal-powered plants, Eggborough and Fiddlers Ferry, for cold standby this winter, for an eye-watering £76 million, show how stretched the system is. These short-term fixes are costly and high carbon, so there must be a plan in place to reduce these costs, but there really is not.

The backbone of power generation in the UK since the war has been coal. Indeed almost half of our electricity power plants, up to a couple of years ago, were coal fired. These plants, while polluting, have provided a reasonably cheap and secure method of generation, but soon they will all be decommissioned. This is often blamed on the EU pollution controls, but in reality most of them are around 50 years old and uneconomical.

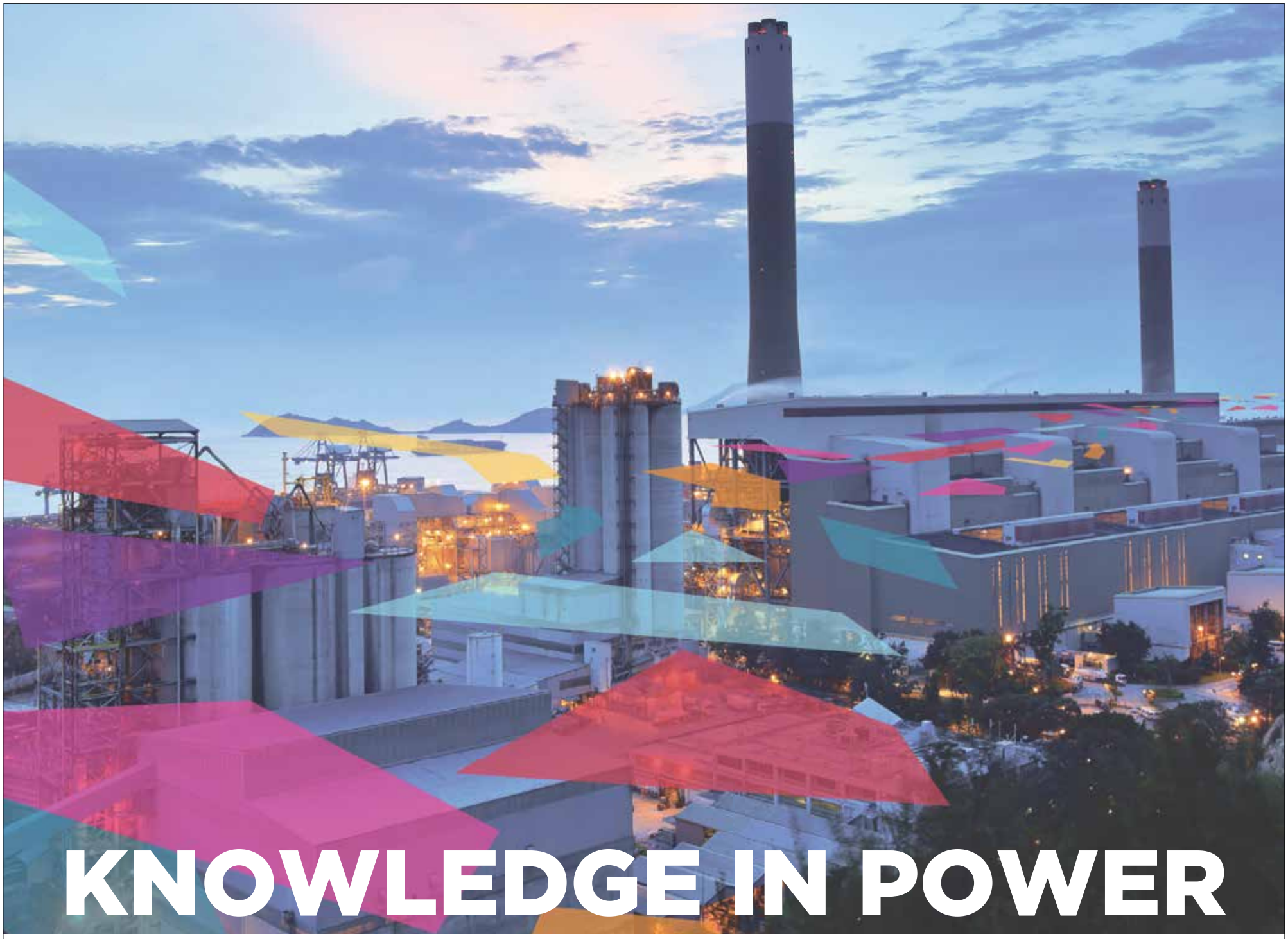
Gas plants will generate the greatest proportion of our power for the next decade, but this will come at a price. The UK is running out of gas and becoming dependent on supplies from producers such as Qatar. Competition is putting pressure on price, and in all likelihood there will be a decoupling of oil and gas prices leading to a steady increase in the global price of gas.

Despite a growing dependence on gas, the economics of the UK marketplace and subsidies have meant it has been uneconomic in recent years to build gas plants. Several plants have been decommissioned and the available assets have been falling steadily.

Nuclear power was planned to take up any slack. Hinkley Point C was to come on line before 2020 and was to be followed by four other plants. There is a great deal of debate whether, despite assurance, Hinkley will be built. Even if work starts, it will be the late-2020s or early-2030s before realistically it will start generating.

In theory, with the move to a low-carbon economy, considerable investment should be going into renewables. The costs of wind and solar installation have steadily decreased and, once subsidy is deducted, it will become cheaper to buy renewable power than power from fossil fuel plants. The problem is the government has cut rapidly the subsidies causing schemes to be cancelled or delayed.

A solution to higher costs is changing the focus from energy's best price to reducing use. Electricity and gas regulator Ofgem has estimated we waste 40 per cent of the power we consume, thus there are substantial savings to be made. Hiring or training an energy manager will help most companies to cope with the rapid energy price rises.



KNOWLEDGE IN POWER

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As leaders in the market place and shaping the future of energy procurement and management, Inspired Energy specialises in Energy Procurement, Market Analysis, Bureau Services, Historical Auditing, Energy Management and Compliance, Renewable Energy Projects, Site Operations and Public Sector Procurement.

Established relationships with all the key energy groups enables us to achieve the best energy strategy which is bespoke for each customer.

Our innovative market leading solutions, along with our wealth of knowledge, experience and dedication to our customers has resulted in a 100% retention rate, phenomenal client base and an impressive group of investors.

At Inspired we are passionate about Energy and are here to help you with independent advice in order drive savings in your business and improve your green credentials.

Inspired Energy Plc is listed on the London Stock Exchange (AIM:INSE).

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