the energyst

“It is worth remembering that ‘nearly’ is ‘didn’t’ – ie, we didn’t run out of gas last winter” – p56

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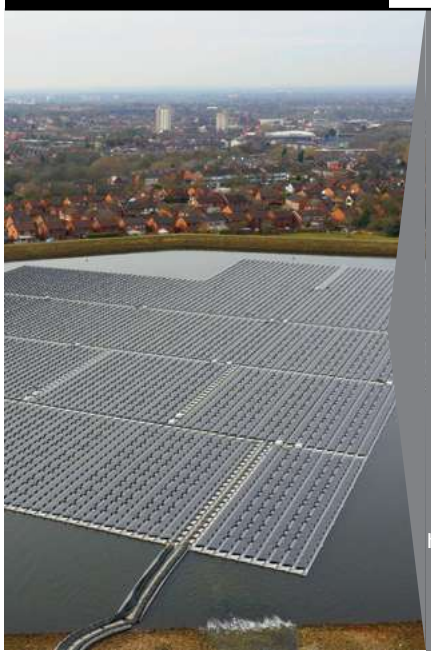

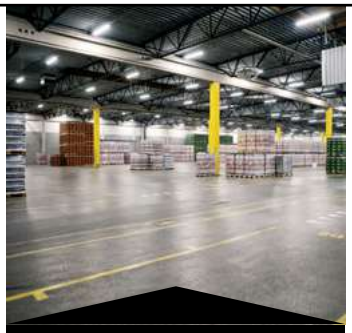

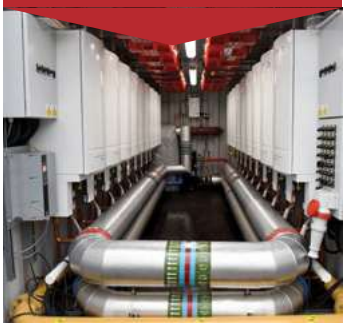

> ***'Nearly' running out of gas means we did not run out of gas'***

Timing is everything

Effective policy, like good comedy is all about timing. Some industry experts believe energy managers will also become fleet managers as electric vehicles replace combustion cars and vans. Energy firms also spot an opportunity, with many now looking to transport as the next frontier. Total Gas & Power's reseller agreement with Chargepoint is the latest example. The energy company believes it can sell its thousands of energy supply business customers EV charging infrastructure as well as the commodity that will underpin it.

> ***In contrast to this ambition from MPs, the Government is kicking the can down the road for 15 years***

MPs themselves have urged government to be more ambitious about phasing out petrol and diesel cars. They said its current target of 2040 should be tightened up and brought forward to 2032 to give industry and consumers sharper signals that the tide is turning.

The recent Beis Select Committee report includes evidence from the energy and automotive industry and recommends a national push on charging infrastructure to help address the 'chicken and egg' aspect of range anxiety. The report follows analysis by Dieter Helm's consultancy Aurora that suggests up to £6bn investment in publicly available charging infrastructure will be required by 2040 to handle high penetration of EVs.

However, Aurora's report found that electrifying cars could reduce emissions by 90% and suggested owners of such charging infrastructure – industrial and commercial companies – could turn a profit by charging just a few pence per kilowatt hour above retail rates. It also suggests using EVs to help balance the grid could enable higher deployment of renewable generation.

In contrast to this ambition from MPs and the opportunity it presents, the Government is effectively kicking the can down the road for 15 years, having told the CCC a body statutorily obliged to give it advice on climate change targets, that carbon budgets out to 2032 are out of bounds.

Any halfwit knows that to reduce emissions at the required speed, and not continue to offshore them, a massive push on energy efficiency is immediately required, i.e. in 2018, not 2033.

Policy that combines financial incentives with sharp teeth would be a good start for the non-domestic sector. Domestically, incentivising utilities, housebuilders and equipment manufacturers to work together to deploy low carbon solutions – to passive house standards – would be sensible.

Decarbonisation at the scale prescribed by the world's scientists will be extremely hard and expensive. But dressing up delay as action is disingenuous. We don't need more advice. We need action on advice given many times already, or risk casting ourselves into a comedy of errors.

the energyst

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Winter margin fine, says National Grid, but prepare for price volatility

National Grid has forecast ample headroom on the power system this winter of 11.7%, but it has warned businesses to prepare for price volatility due to weather effects on renewables generation and changes to cashout prices in the Balancing Mechanism (see page 32).

The latter aspect is because rule changes agreed some years ago come into effect from 1 November. They mean that participants in the Balancing Mechanism that put more or less power into the system than they contracted to have to pay higher penalties – or cashout prices – for creating system imbalances.

From November, the cashout price will be based on the most expensive megawatt hour bought to balance the system (called PAR1, in industry jargon) instead of the most expensive 50MWh.

> ***Sharpening of cashout arrangements in combination with weather effects could result in some interesting prices to load manage against this winter***

The maximum penalty rises from £3,000 to £6,000 per megawatt hour. These penalties apply for every half-hour period of every day.

That creates greater price risk for generators and suppliers, which will be absorbed into standard fixed energy contracts or passed through to businesses on flexible contracts.

While volatility presents risk, it also presents opportunity for businesses that can quickly react by adjusting load or generation output (demand-side response).

"Sharpening of cashout arrangements in combination with weather effects could result in some interesting prices to load manage against this winter," according to Ørsted managing director, sales, Jeff Whittingham.

Should big price spikes occur, he thinks it will attract more businesses into DSR.

National Grid said businesses should be prepared for a "modest" rise in balancing costs as a result of steeper imbalance penalties, but suggested these would decline in the medium to long term as "efficiency savings" from the new rules kick in.

Meanwhile, National Grid expects there to be "sufficient" gas to meet winter peak demand. It anticipates demand will be lower than last year, when the UK came close to running out of gas.

National Grid's confidence is based partially on rising gas prices, which will likely mean coal becomes more economic for power generation. If more coal is burnt, less gas will be used to generate power, leaving more to go around, it suggested.

Renewables almost a third of total power

UK renewable generation capacity reached 42.2GW in the three months to 30 June, up 10% year-on-year, according to government figures.

Renewables generated 31.7% of all power generated, a record as a percentage of total generation, if not total output.

Offshore wind boosted renewable generation

Offshore wind drove more than half of the increase in capacity, and as a result, generation from offshore wind rose almost a fifth (19%), or 0.8TWh year-on-year.

Biomass increased 0.6TWh or almost 9% as output for the same quarter in 2017 was affected by an outage at Drax, which generates most of the UK's biomass-derived power by burning wood pellets shipped from Georgia.

Output from onshore wind fell 12% of 0.7TWh due to lower wind speeds.

The figures show bioenergy (mostly from burning wood) had the largest share of generation (3%), 22% came from onshore wind, 20% from offshore wind, 19 % from solar PV and 3.6% from hydro.

Big Five: SSE-Npower merger clears competition hurdles

SSE and Npower's retail businesses will merge following the nod from the Competition and Markets Authority (CMA), bringing an end to the era of the 'big six' suppliers.

The CMA had indicated in August that SSE-Npower deal was in the clear. On 10 October it granted official confirmation.

The CMA's investigation centred on whether customers on Npower and SSE's most expensive tariffs would be adversely affected by the merger. The watchdog found they would not, because those switching tariffs tend to go to other suppliers, where cheaper deals via fixed and aggressive acquisition tariffs can be found.

The two companies have hired key management and aim to conclude the transaction by the end of SSE's financial year (31 March).

The deal will see SSE keep its business-to-business customers, while the new retail company will combine SSE's domestic customers and Npower's domestic and business customers.

SSE's shareholders approved the merger in July.

● SSE expects profit for the six months to 30 September to be half that of the prior year. In a trading update, the firm blamed high gas prices and weather effects on renewables output. In July, SSE said it anticipated taking an £80m hit. That now looks more like £190m.

Government funding for power-to-gas study

ITM Power has been given government funding to commence feasibility studies for a 100MW power-to-gas storage project in Cheshire.

Project Centurion aims to demonstrate an energy storage system that helps deliver decarbonisation across heat, transport and industry. It explores hydrogen production via electrolysis, transportation and salt cavern storage as well as gas grid injection at industrial scale. The aim is to prove hydrogen can deliver other cross-vector benefits, including security of supply and enabling increased amounts of renewable energy on the UK system.

The Innovate UK-funded feasibility study will explore the system design and costs and will assess the business case for deployment.

Project partners include Inovyn, Storengy, Cadent and Element Energy. They hope to determine the feasibility of siting a 100MW proton exchange membrane (PEM) electrolyser at Inovyn's Runcorn site, which already produces hydrogen for onsite use as a co-product of the chlor-alkali process.

The site has an existing 420MW supergrid connection, power electronics and planning consent for industrial scale hydrogen production.

The transport of hydrogen by pipeline to salt caverns near Lostock, where it can be stored pure or blended with natural gas, will be explored, along with the feasibility of injection into the local gas network.

Other potential demands for the hydrogen will be assessed, including industrial and transport use which will support existing studies in the area such as Cadent's HyNet project.

● ITM Power has opened its seventh public hydrogen refuelling station in Swindon. An eighth will follow at Gatwick before the end of the year. The Swindon station, funded under European and UK initiatives, uses renewable electricity and water to generate hydrogen on site, negating the need for gas deliveries. It is sited at Johnson Matthey, which makes fuel cell technology and believes its catalysts can help enable large-scale production of hydrogen.

Ceres Power to build template for fuel cell manufacturing

The facility will produce 2MW worth of fuel cells annually

Ceres Power is to build a fuel cell manufacturing facility in Redhill, Surrey. Manufacturing capacity will initially be 2MW, expandable to 10MW. The firm said it would act as a template to develop larger plants with international partners under licence, growing to 100MWs per year capacity.

The company's strategy is to generate revenues through licensing its technology to partners in the development phase, and generate royalties through manufacturing partners when full-scale commercialisation is achieved, rather than be a large-scale manufacturer itself.

One existing partner is Bosch, which took an equity stake in the summer, investing an initial £9m for a 4.4.% share.

Other partners include Nissan, Honda, Cummins and Weichai Power. Ceres said increasing demand from these partners drove its decision to invest in the Redhill facility.

It is working on applications with those partners including a range extender for electric buses with Weichai Power, small power stations with Bosch, EV range extenders with Nissan and data centre power with Cummins.

Ceres said the £7m facility will create 60 new jobs.

Chief operating officer James Falla said it would "show that we can scale up to significant volumes efficiently in an appropriate capital investment profile to match increasing customer demand".

CEO Phil Caldwell recently told *The Energyst* that the company is working on 10kW modules that are stackable. Running on natural gas, he said they "achieve 60% efficiency from gas in to power out". Running in CHP mode, "they can run at 85-90% efficiency".

While the company initially focused on the residential market, Caldwell said demand from the industrial and commercial sector is growing, as fuel cells can deliver onsite power with no emissions.

"People need to understand what this technology can do," said Caldwell. "Fuel cells are coming, more rapidly in other parts of the world [than in the UK]. That's because it makes perfect sense. You can generate power from most conventional fuels all the way through to future fuels like hydrogen. Because it is a fuel cell, not combustion, there is no NOx, SOx or particulates, and it is the most efficient way to generate power from fuel," he said.

"People get excited about batteries but fuel cells can be part of the solution, across vectors. They can be used to balance and distribute power as the energy system changes, they can help to decarbonise heat using existing gas infrastructure, and they can be used to extend the range of electric vehicles; batteries give you very rapid performance and fuel cells give you range and time."

Inspired Energy buys energy bill validation firm

Inspired Energy has acquired Professional Cost Management Group (PCMG) in a deal that could be worth up to £700K in cash.

PCMG provides utility bill validation, whereby it audits bills and works out if firms have been overcharged. If so, it can help recover those charges from suppliers backdated up to six years, and claims to have recovered about £100m for clients in the past 18 months.

It also helps customers, including FTSE100 businesses, ensure they are on the most cost-effective tariffs

While Inspired already provides bill validation, the acquisition brings a specialist into the fold.

Announcing the deal, Inspired Energy disclosed that PCMG turnover stood at £2.84m for the year to 31 December 2017.

While it made net loss of £190,000 and a loss of £25,000 the previous year, Inspired's board believes it will contribute to group profits in year one of ownership.

It will relocate the Blackpool-based outfit to its Kirkham offices when PCMG's lease expires in November.

Managing director Martin Hook will remain with the firm and he and other senior employees will be incentivised with group share options.

Under the deal, PCMG shareholders will be paid an initial £150,000 with up to £550,000 to follow if the company hits performance targets.

Inspired Energy chief executive Mark Dickinson (pictured) said the firm was "delighted" to conclude the acquisition of a "well respected" brand and team.

The acquisition is Inspired's second in as many months, following a £1.4m deal for TPI Squareone in August.

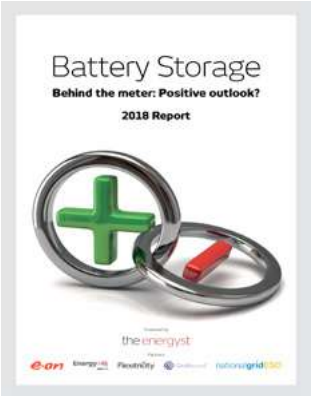
New, free battery storage report

The Energyst's 2018 Battery Storage report is now available as a free download.

Based on the views of 50 public and private sector organisations considering battery storage, the report also contains insight from suppliers, aggregators and electricity system operator, National Grid.

The survey finds significant appetite for storage, largely behind the meter, often to be used in conjunction with other forms of generation, such as solar PV, back-up generators and CHP.

However, barriers to deployment are the same



as those cited in our 2017 survey: insufficient visibility on revenue streams and unstable policy and regulation. While the 2018 survey is largely based on a different sample to 2017, concern about these aspects appears to have increased over the last 12 months.

Despite ongoing market change, suppliers and aggregators that sponsored the report believe the direction of travel is positive and that revenue opportunities are emerging that potentially outweigh those that are being removed or that are under review.

The report is sponsored by ESO National Grid, Eon, Flexitricity, GridBeyond and Npower. Download it free of charge at the energyst.com/storage

Leadership change as Inenco hires new CEO

Inenco, one of the UK's largest third party intermediaries, has hired Richard Harrison as chief executive. He replaces Gary Stokes.

Harrison was CEO of boiler installer Help Link until May this year, following its integration into Homeserve, which bought the business in 2017.

He has held senior positions at reputation.com (as managing director) and webuyanycar.com (as chief operating officer). Harrison also had a stint as SME sales director for telco O2.

Inenco chairman Patrick Macdonald welcomed Harrison to the firm and thanked Stokes for his stewardship of a "transformational change" programme over the last two years.

Budget kills off ECAs, keeps carbon high

The Budget contained plans to kill off Enhanced Capital Allowances for energy and water efficient technology. The schemes will end on 31 March 2020 for companies and 5 April 2020 for unincorporated businesses.

The news met disapproval from the Association for the Conservation of Energy, which said it "opens up another policy hole" and bemoaned "yet another call for evidence for a Business Energy Efficiency Scheme".

Meanwhile, Treasury will maintain the carbon price support mechanism at £18/tonne to 2021. This provides some certainty for businesses, but high EU ETS prices mean the current carbon tax stands at around £36/tonne.

Firms covered by the Climate Change Levy (CCL), which taxes business energy use, will see electricity rates fall from 2020, but gas rates rise significantly.

However, Treasury did outline potential good news for intensive energy users, a £315m Industrial Energy Transformation Fund.

National Grid to trial same day frequency response auction

National Grid is to trial same-day frequency response procurement from June 2019.

The two-year trial is "for a small volume of frequency response" but will enable less predictable technologies, such as wind, to participate, and give those with demand-side response a clearer picture of what may be required of them and when – as the first delivery window will be 23:00 hours the same day.

National Grid said the auction will be held every Friday morning, with results published by early afternoon.

It will procure high frequency dynamic response, low frequency dynamic response, high frequency static response, and low frequency static response.

National Grid will publish its requirements for the following week ahead of the auctions. It also stated that the auction will aim to drive down prices and bids will be accepted in price order regardless of size.

Firms invited to bid for £90m to help build UK smart grid

Companies are being invited to submit proposals to help energy network firms build a smarter grid.

Energy networks are allowed to experiment with smarter approaches to managing the UK's power and gas grids under Ofgem's Network Innovation Competition. They submit plans to the regulator detailing how they can deliver innovation in managing the network to provide benefits to consumers and make the energy system work more intelligently in a shifting environment.

Ofgem decides which projects are given funding.

The networks are asking for input from other parties before submitting their bids via a call for ideas led by the Energy Networks Association (ENA).

Successful companies will then work with networks to deliver those projects.

The ENA said proposals have to demonstrate clear cost and environmental benefits and genuine innovation.

They must also fit with network priorities or cross-sector areas such as 'whole system planning', such as provide benefits to energy and transport sectors, for example.

Up to £70m is available for electricity-based projects and up to £20m for gas.

Hackney to launch energy company

Hackney Council is planning to launch an energy company. The council says it "will supply clean, affordable energy, generate our own renewable electricity, and plough profits back into the heart of our borough".

Keen to address both fuel poverty and environmental concerns, the plan is to sell "price-competitive renewable energy for customers both within and beyond the borders of Hackney".

Hackney is likely to partner with a supplier rather than obtain its own supply licence. Neighbouring Islington, for example, white labels through Nottingham City Council's Robin Hood Energy, which recently committed to supplying 100% renewable power.

Council powers

Hackney is one of a number of councils that have pledged to move to 100% renewable electricity, and is implementing energy efficiency and renewables generation projects across its estate.

It has begun to investigate the feasibility of deploying ground and water source heat pumps in its parks to heat council-owned buildings and the borough is also home to what is thought to be the UK's first energy trading community using blockchain.

While some municipal energy companies have received negative press around cost, resource and risk, others have started to generate a trade surplus. Nottingham, for example, was in the black in the third year of trading. The council also operates a commercial energy services company that generates income for frontline services.

Bring forward zero emissions car targets to 2032, say MPs

System operator could 'absolutely' cope with the extra demand on the power system

MPs have urged government to be more ambitious about phasing out petrol and diesel cars. They say its current target of 2040 should be tightened up and brought forward to 2032 to give industry and consumers sharper signals that the tide is turning.

The Beis Select Committee report includes evidence from the energy and automotive industry.

During its inquiry, National Grid told the committee that the electricity system operator could "absolutely" cope with the extra demand on the power system if sales of new petrol and diesel car were phased out by 2030.

Electricity network operators were less bullish, but said electric vehicles, if charging is controlled – or made 'smart' – could help balance their systems.

Car and battery manufacturers also told MPs that providing balancing services using EVs is feasible and will not drain car batteries.

The report recommends a national push on charging infrastructure to help address the 'chicken and egg' aspect of range anxiety. It called for more technical and financial support for local authorities – which government has previously suggested have been slow to take up charging infrastructure funding.

The report follows analysis by Dieter Helm's consultancy, Aurora, that suggests up to £6bn investment in publicly available charging infrastructure will be required by 2040 to handle high penetration of EVs.

However, Aurora's report found that electrifying cars could reduce emissions by 90% and suggested owners of such charging infrastructure – industrial and commercial companies – could turn a profit by charging just a few pence per kilowatt hour above retail rates.

It also suggests using EVs to help balance the grid could enable higher deployment of renewable generation.

Beis to investigate gas security

MPs will investigate UK gas security following pressure from major energy users.

The Gas Security Group had been pushing for government to quantify the consequences of a lack of gas storage even before the cold snap in March forced National Grid to issue a warning that the UK was close to running out of gas.

Some of its members believe the UK was lucky not to have entirely depleted gas reserves when the 'Beast from the East' hit.

While the market delivered despite severe pressure last March, major energy users have long voiced concern about the UK's reliance on imported gas and lack of gas storage. They have become increasingly worried since the closure of Rough, which represented about 75% of the UK's gas storage. Fears have been compounded by a lack of certainty about UK-EU market cooperation post-Brexit.

Willing to pay?

Given the damage a crash stop can inflict upon large manufacturers' equipment, some see "a small increment on gas bills" to pay for new gas storage as a "better outcome" than being forced off the system or at the mercy of massive price spikes.

Gas Storage Group (GSG) spokesperson Clive Moffat, welcomed the inquiry announced by Beis Select Committee chair, Rachel Reeves.

"Gas has a major role to play in providing heat and power in the foreseeable future and ensuring continuity of supply at an affordable price is critical to the future well-being of the UK economy and consumers," he said.

"Gas security is an issue that requires the immediate attention of policy-makers and the GSG is looking forward to the opportunity to present evidence to the select committee."

National Grid said it expects there will be 'sufficient' gas to meet demand this winter.

Government to end subsidies for urban biomass

The government looks set to end subsidy under the Renewable Heat Incentive (RHI) for biomass in 'urban' areas from January 2019.

Beis has set out its thoughts in a consultation. Under its proposals, domestic and non-domestic biomass in towns and cities will no longer receive support.

The government says air quality concerns are behind its moves to cut subsidies.

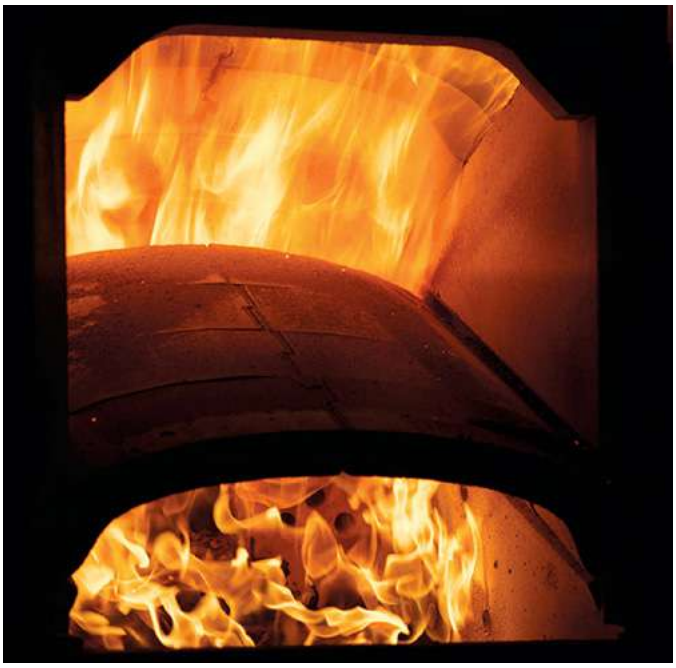
According to government estimates, the RHI is set to cost taxpayers £23bn by 2042. Biomass has taken the vast majority of subsidy under the scheme, which has been criticised as underperforming and delivering poor value by the government's own auditors.

The National Audit Office suggested overpayments could be much higher than scheme administrator Ofgem calculates, citing "weaknesses" in the regulator's estimate.

The NAO also said the extent of 'gaming' (ie cheating to earn more money by oversizing equipment or venting heat) was unknown, though consultants and technology providers have privately suggested it is not uncommon.

Government plans to change the rules from January 2019. Under the proposals, urban areas are defined as any town above 10,000 homes.

Existing biomass plant that have been accredited will still receive RHI payments over the life of the scheme.



Air quality concerns are behind moves to cut biomass subsidies

Drax to spend £700million on 2.6GW of Scottish Power's generation assets

The Cruachan pumped storage plant. Pic credit: Creative Commons/ Raining girl

Drax plans to spend £702m on about 2.6GW of of pumped storage, hydro and gas-fired generation assets from Scottish Power parent Iberdrola.

The proposed transaction includes the Cruachan pumped storage hydro (440MW), run-of-river hydro locations at Galloway and Lanark (126MW), and four CCGT stations: Damhead Creek (805MW), Rye House (715MW), Shoreham (420MW) and Blackburn Mill (60MW). The Daldowie sludge drying plant is also part of the package.

Selling those plants effectively sees Scottish Power exit fossil-fuelled generation.

Drax has bridging finance in place to do the deal, and thinks the plants will deliver earnings of between £90m and £110m per year. Most of that would come from non-commodity services such as subsidies and grid balancing, said Drax.

The transaction, when complete, will mean Scottish Power's generation portfolio is 100% renewables. It has 2,700MW of wind power capacity (installed or under construction) plus a project pipeline in excess of 3,000MW, of which 2,900 MW in offshore wind.

Iberdrola chairman Ignacio Galán said the deal forms part of the company's "standard rotation of assets".

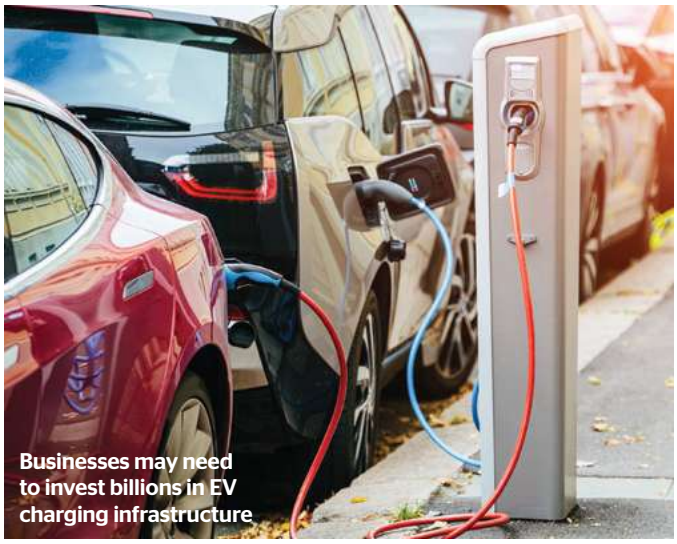
He added that "the world is changing" and that "energy companies should be part of the solution to climate change and not part of the problem".

Total partners with Chargepoint in bid to sell firms EV charging infrastructure

Total Gas & Power and Chargepoint have struck a deal to try to sell electric vehicle (EV) charging infrastructure to UK firms.

The announcement follows a recent report by Aurora that suggests industrial and commercial (I&C) businesses will need to invest billions in EV charging infrastructure to accommodate the switch from fossil fuels – but found they could make a good profit by charging a few pence above retail power rates.

"Chargepoint is pleased to partner with Total Gas & Power to increase the availability of necessary charging solutions for EV drivers across the UK," said Mark Kerstens, vice-president, strategic accounts, Chargepoint.



Businesses may need to invest billions in EV charging infrastructure

"The transportation landscape is evolving at a rapid pace and partnerships like this are essential to provide immediate, widely accessible charging solutions to support the ever-growing number of EV drivers on the road."

Industry conferences have recently outlined the convergence of energy and transport, and that energy managers will also become fleet managers.

Funds invested in energy take a similar view and Total Gas & Power is now acting upon the opportunity that presents to energy companies.

General manager Sion Roberts, said the deal "recognises that the energy requirements of businesses had progressed well beyond the simple supply of gas and electricity" and that the reseller agreement meant it could also sell transport solutions to its energy customers.

Chargepoint has 55,000 charging stations worldwide. Last month it committed to increase that by 45x to 2.5m within seven years.

Solar drives renewables output to record high

UK renewables output as a percentage of the total generation mix hit a record high this spring, government figures show.

Dukes data for April to June shows renewables contributed 31.7% of power generated, up from 30.6 in Q2 2017. This was driven by a higher level of sunlight hours compared with the same period last year, and higher solar capacity.

While wind generation capacity also increased (see page 6), it was offset by "very low" wind speeds, according to the data, remaining flat in output terms. Less rain meant hydro also contributed fewer gigawatt hours.

Coal's share of the generation mix fell from 2% to 1.6%. Due to outages, nuclear contributed less, 21.7% versus 23.1% the previous year. Gas picked up the slack, contributing 42% of total generation against 41.3 % in Q2 2017.

Final consumption of electricity fell by 1.0% to 69.5 TWh. Domestic use fell by 2.9 % to a record low for Q2, from 23.4 TWh to 22.7 TWh, largely driven by warmer weather. Dukes data suggests improved energy efficiency also factored.

Industrial use of electricity, including iron and steel, increased by 1.5 %, to 22.5 TWh. Consumption by commercial and other users decreased by 1.4 % to 23.2 TWh.

Large and medium sized firms pay highest power prices in EU

Large and medium sized companies in the UK have paid more for their electricity this year than any other EU 15 nation, according to latest government figures.

Figures for a year earlier show medium sized firms in Germany and Italy were paying more, but that has since changed.

Data for the six months to June shows UK power prices including taxes rose 8.4% for medium sized companies.

The average price rise across the rest of the EU 15 was 1.8%.

Medium-sized firms are now paying 11.25p/kWh including environmental taxes and levies, but excluding VAT.

Excluding taxes, prices for medium consumers were some 60% above the median price.

Large companies are also paying the highest prices in the EU15 – and of the 28 EU countries, only firms in Cyprus pay more.

Small companies are slightly less disadvantaged, though higher price rises than in other countries mean that only small firms in Ireland, Italy and Germany pay more for their power.

The data follows recent warnings from National Grid that volatility may affect energy prices this winter, while suppliers including Npower have warned that incoming price rises will also bite.

Yü Group shares nosedive as hole in accounts wipes out profits

Business energy supplier Yü Group has revealed a hole in its accounts that will lead it to post a loss for the current year. Its share price plunged 80% on the news, though made a partial recovery within days of the announcement in late October.

In September, Yü posted 57% year-on-year profit increase for the six months to 30 June. Revenue increased 73% to £35.8m, up from £20.8m. Adjusted profit before tax stood at £1.8m, up from £1.15m.

The company predicted a strong full-year result, but in October announced that it had looked at aged accrued income and realised that much of it cannot be recovered.

Aged accrued income balances totalled £4.2m in the annual accounts for the year ended 31 December 2017 and £4.3m in the interim results as at 30 June 2018.

The company also re-examined its trade debtors and concluded that what is recoverable is less than its provisions.

As such, the company will post a loss for the year, stating the combined adjustments will reduce profits by about £10m

Yü Group said it expects to return to profitability in 2019, but at a much reduced level.

"Nobody is more disappointed in this development than me," said Yü Group CEO Bobby Kalar, who is founder and majority shareholder.

"Our booked revenue from new sales remains strong and contracted revenue for 2019 is already £67m as at the end of September 2018. We have improved internal controls around working capital management and the board is absolutely focused on restoring the profitability of the business."

The company said it has £11.5m in cash reserves and no outstanding debt.

Meanwhile, the share prices at third-party intermediary Utilitywise hit a new low in October as the company continues to feel the effects of its own overstatements of profits due to miscalculating how much energy its clients were consuming.

At the end of October, shares in the company were trading at around 15p compared with 72p at 31 October 2017. Utilitywise shares peaked at 370p in April 2014.

United Utilities builds new floating solar farm, plans 24MW

United Utilities is building a second floating solar farm. The water company said the 1MW project, at Langthwaite reservoir near Lancaster, will ultimately provide all the power needed by Lancaster Water Treatment Works.

United Utilities' first floating scheme, the 3MW plant at Godley reservoir, was completed in 2016. The company is planning to invest in a further 22 solar PV projects totalling 24MW over the next two years.

While none of these will be floating solar plants, the new PV plants will take its total spend on renewables projects towards £100m over the five year spending period to 2020.

Lancaster floating solar farm under construction

The company's current renewables portfolio totals 45MW, most of it solar. In conjunction with energy generated from CHP, hydro and biogas, the company generates about a quarter of its power needs.

United Utilities recently reorganised its energy function to deliver an integrated approach to procurement, management, flexibility and resilience.

However, rather than export its solar to the grid (flexibility) United Utilities said it aims to use all the solar power it generates in-house to minimise bills and exposure to price volatility.

See p36 for further details

UK Power Networks to trial self-balancing technology

UK Power Networks is to trial new technology that aims to create intelligent, self-balancing power grids.

The distribution network operator has signed a deal with Faraday Grid, which set up shop in the UK late last year. Its mission is to create "fit for purpose" energy systems that can accommodate large volumes of decentralised, intermittent generation without collapsing, according to chief executive Andrew Scobie.

That vision of the future revolves around an energy grid that uses its Faraday Exchangers – power flow control devices that autonomously maintain voltage, frequency and power factor efficiently. The company is trying to convince grid operators that these 'smart' exchangers – which it says will automatically smooth intermittency and volatility – will help balance their networks at lower cost while enabling greater levels of decentralised renewable generation.

UKPN will deploy the exchangers for live testing in spring 2019.

The network operator's head of innovation, Ian Cameron, said: "Faraday's technology has the potential to be transformational for distribution networks and the wider energy system," with the company now moving from theory to real world testing.

"The technology is aligned to our ambition to become an energy platform business," added Cameron.

Faraday Grid is backed by Canadian renewables developer and investor Amp.

GET THE CIRCULAR EDGE

As energy powers the transition to a low carbon economy, tomorrow's customer will live in a world where every unit of energy is used and reused as productively as possible through innovative energy solutions. Where one company's waste material will become another's resource, or a renewable biofuel that trims down operating costs and harmful emissions. Where products have many lives, not just one.

Today's world is coming under unprecedented commercial, regulatory, environmental and societal pressures. These in turn are throwing into question the linear economic model our businesses have relied on to drive profit and growth. How we respond will shape the future of business. These challenges are only set to get bigger. The global population is growing fast, urbanising faster. Indeed, the middle class is set to double by 2030. So, there will be higher demand for the same dwindling resources and even greater levels of harmful waste.

The rise of sustainability

Responsible businesses and their leaders have been doing their bit to address these challenges. They're putting sustainability at the heart of their business strategy. Indeed, many are already taking strides toward practices that are more people- and planet-positive. Added to that, since the turn of the millennium, the supply of finite resources that our profits rely on have been getting more costly, rare and volatile.

It's time to draw the line. And it's circular.

Businesses are making circular happen, right now

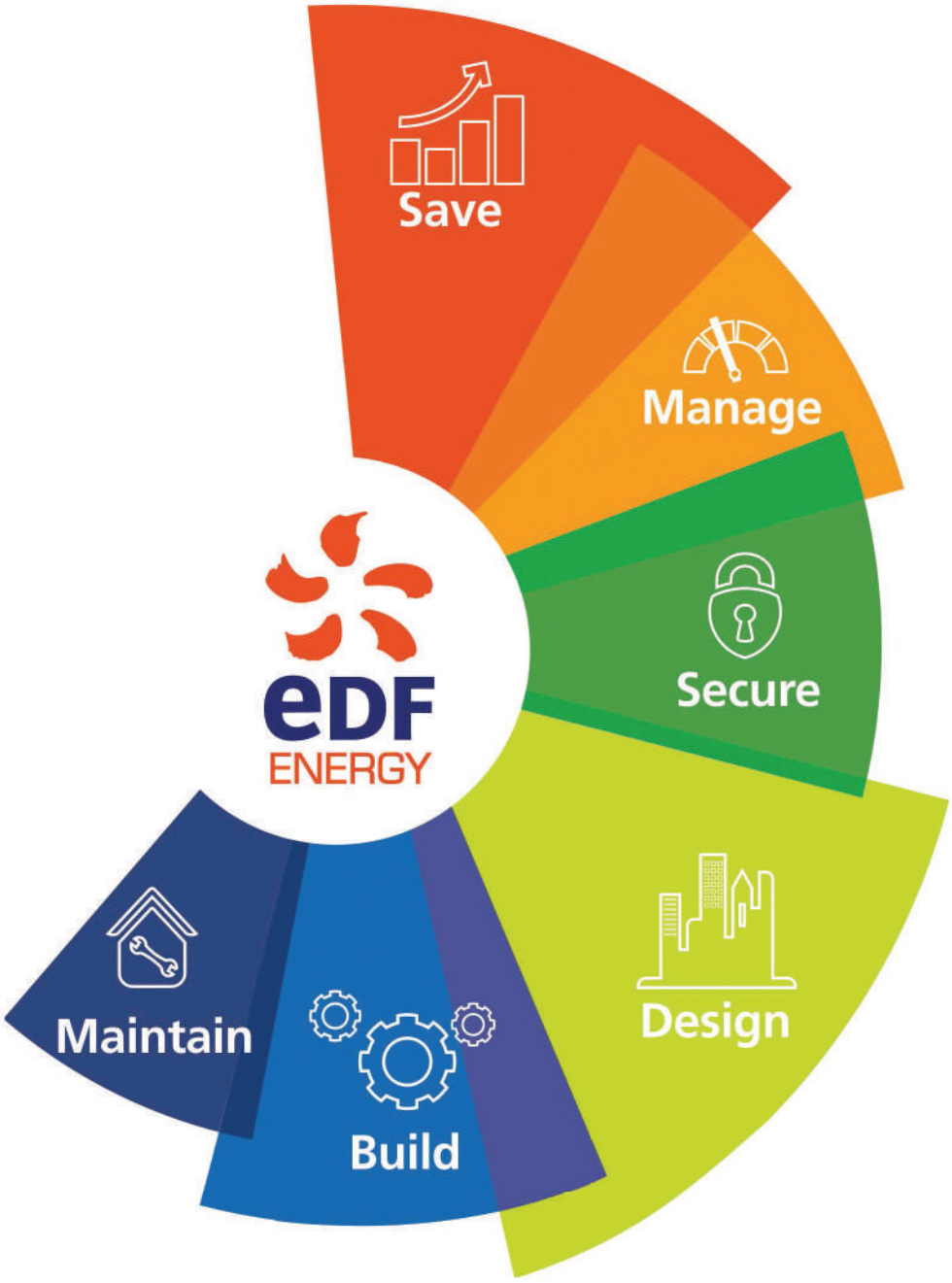
Getting down to business, the circular economy is a sound business case for reducing our reliance on increasingly scarce and expensive resources, meeting obligations to protect the environment and achieving new growth.

The emerging circular business models delivering value today

Putting the new business models, technologies and capabilities into play doesn't just have benefits for the planet and the preservation of natural resources. It's good for the bottom line too, as many businesses are already discovering. Through applying circular thinking, your business can drive down resource costs, build operational resilience, achieve sustainability targets, grow through diversification, gain competitive advantage, benefit from regulations and incentives. As the UK economy has already gone 20% circular, businesses on the front foot are already beginning to see real returns.

They're making a series of changes to how much productivity they can drive through efficient use of resources, changing to new business models that gain maximum value from these resources and their assets, and changing the way they work to build new capabilities.

The question then becomes not so much theoretical, "Should I make change?", but something much more actionable. **"How can I make a change?"**



Energy is a great place to start making your business circular

For every business, energy powers every activity, every cycle and every interaction that creates value. So for any business, it's the ideal first step in the journey towards a circular business model.

Take product manufacture. Energy is needed to deliver materials, process them and convert them into components. It's needed to assemble those components into products, finish them and pack them. It's needed to transport those products to the sales point. And then, on the other side of product use, it's needed to recycle them for a second life. Through every cycle, every product has more energy invested in it, and if that energy's source is a fossil fuel, it has more carbon invested in it too.

So, every small, achievable change you make to how you purchase, use or generate energy will flow through your entire value chain, creating multiple opportunities to bring greater resource, cost and carbon efficiency to every stage of the product's multiple lifecycles.

Those companies taking a circular approach to their energy are driving down their operating costs, increasing their supply resilience, developing

POWER YOUR BUSINESS BY DOING ENERGY DIFFERENTLY

To help you think about energy differently, not just as a commodity but a value-generating resource, EDF Energy has developed this proprietary decisioning tool, the 'Energy Solutions Wheel'.
It simplifies the energy solutions available to six things we can do to together take a more sustainable and profitable approach to your business' energy: save, manage, secure, design, build and maintain.
What's reassuring is that EDF Energy helps you choose which energy change to do next. Then they do the full implementatation for you.
EDF Energy has the end-to-end energy solutions, capabilities and expertise to partner your business on your end-to-end energy journey.
One change at a time.

new revenue streams, creating more sustainable production methods and cutting harmful emissions.

Powering tomorrow

But they're not just choosing to improve their own businesses today, they're choosing to help create the energy system of tomorrow – one that's decarbonised, decentralised and digitised – for a cleaner, more efficient, more agile system that's capable of powering a new circular economy.

After all, an energy system that's better suited to powering Britain, is better for every business too.

And going circular is more achievable to all businesses than most managers realise, thanks to advances in energy technology, service and commercial models available right now.

Going circular starts with energy solutions that are ready, no risk and no disruption

Like every business leader, you have business-as-usual to get on with, operational problems to resolve and quarterly targets to reach. So while you and your leadership team may commit strategically to adopting a circular business model, and readying your business to take its share of the circular economy, you'll also know only too well the challenges of managing growth and change at the same time.

That's why it's best to think of 'going circular' less like an action, more like a journey. And that's also why it's best to start that journey with the resource that powers your whole business: energy.

By changing the way you power your business, you can get greater efficiency with reduced operating costs. You can get value-optimised assets with reduced carbon emissions. You can earn more profit with additional revenue streams. You can make your business leaner, cleaner and a lot more attractive to your investors, customers, and staff. And you can start your changes with no risk and no disruption.

Energy is primed for change

The energy industry shares the same ambitions and challenges as many of our customers. So, it would come as no surprise that EDF Energy, as one of the most trusted energy partners to British business, has been deeply invested in creating solutions to make better use of energy.

In the spirit of partnership, we've embraced new energy technologies, innovated with the latest energy solutions, forged joint ventures and acquired companies, like Imtech, so we can combine strengths and offer our customers truly end-to-end energy solutions capabilities.

Action-ready energy solutions

So, right now EDF Energy has a suite of energy solutions and the expertise to help you unlock greater value from your operations. From trimming down your costs by re-purposing waste heat; to gaining zero emissions status with low carbon supply; or creating a new revenue stream through Demand Side Response. There's a change every business can make. And an energy solution that can help you make it.

So, what change will you make today?

Re-shaping a circular business is not done in one overnight transformation. By partnering with British businesses of different sizes, and through driving our own transition at EDF Energy, we've learned an important thing about effective transformation: it's best done one change at a time.

One change makes it easier to business case. One change makes it easier to get stakeholders to listen. One change offers more certainty in decisioning. One change means less hassle and more speed in implementation. And one change makes the next change that much simpler on your journey to powering a circular value chain.

Of course, no two businesses are the same. And no two businesses are at the same point in their journey. That's why EDF Energy partners with customers to identify the right 'one change' to make.

One change at a time

As you begin to consider the next change your business can make in how it powers its operations, it's helpful to consider the benefits you can deliver in three key areas. You can boost your business' energy efficiency to trim down costs. You can lower your business' carbon emissions to hit sustainability goals. And you can flex your assets to turn energy to an additional revenue stream.

Opportunities to change the way you power your business are constantly emerging. As innovation in energy accelerates, new technologies, systems and models are being developed, tested and made available all the time. Meanwhile, EDF Energy's R&D department and Blue Lab are working to find ingenious ways to unlock their - sometimes hidden - value for businesses like yours.

So, what changes could you plan in for your business' future?

For some, the journey of change is paying off already

Building innovations into our energy solutions offering while they're hot, EDF Energy's ongoing aim is to deliver cutting-edge energy solutions, underpinned by an expertise in commercial, operational and market expertise, to give your business the circular edge - one change at a time.

But more importantly, EDF Energy is committed to avoiding built-in obsolescence by ensuring that every change we help your business make, lays down the foundations for the next change, and the next … with a view to achieving your business' long-term goals.

Conclusion

Uncertain times call for new ways of thinking about, and doing, business. We know. We're already applying our own energy solutions to our business.

Join us. And together let's make progress on the journey towards sustainable profit and profitable sustainability.

Make your change today

If you'd like to talk about what change is right for your business, get in touch with me at **Vincent.DeRul2@edfenergy.com**

To find out more about our energy solutions, visit: edfenergy.com/energysolutions

Come and see us on stand E20 at Emex

Can the Balancing Mechanism offset FFR price erosion?

Firm Frequency Response, traditionally one of the highest sources of value for fast responding assets, has seen price declines in recent years. What can replace it? Brendan Coyne reports

Interviewed for *The Energyst*'s 2017 DSR report, Eamonn Boland, senior manager at Baringa Partners, suggested FFR price erosion would mirror that of Short Term Operating Reserve, which has settled at about a quarter of the peak rates paid in 2010. He stands by that forecast.

"Our central view remains similar to previous predictions," says Boland. "We have seen the price trajectory decreasing quite steadily."

Eamonn Boland: Big assets without FFR contracts create more price pressure

In 2015-16, prices for dynamic FFR stood at about £22/MW/hr. In 2016-17, prices paid were between £15-£18/MW/hr. This summer, bids averaged around £12/MW/hr, with some bids well into single digits.

Competition

Boland says that is the result of new market entrants disrupting pricing. The knock-on effect is incumbent asset owners bidding more aggressively to ensure they win a contract. That creates further downward price pressure.

"It is not that we have a bearish view on FFR prices, the only thing we think about is supply and demand economics, and the market is capped, which naturally creates pricing tensions," says Boland.

"Now we are potentially seeing quite large assets being built that do not yet have FFR contracts, which creates another threat to pricing."

Tom Harper works alongside Boland at Baringa. He says while the FFR price trajectory over the next couple of years is downward, "the gradient is tricky to predict".

"It requires assumptions on when people enter the market with larger non-contracted assets and also when the big assets step out."

He uses pumped storage station Dinorwig as an example. "It may choose to stick in the market at lower prices, or it may chose to leave, which has a temporary blip on clearing prices for other technologies," he says. "So there is some uncertainty in the next two to three years as to when we will hit the [price] floor."

Tom Harper: Price trajectory depends partially on whether big assets stick or twist

Balancing Mechanism

Given falling FFR prices, many market participants are looking to the Balancing Mechanism (BM) for income. But Boland believes "a bit of a correction may be required in terms of appreciation of [the BM] as an income stream".

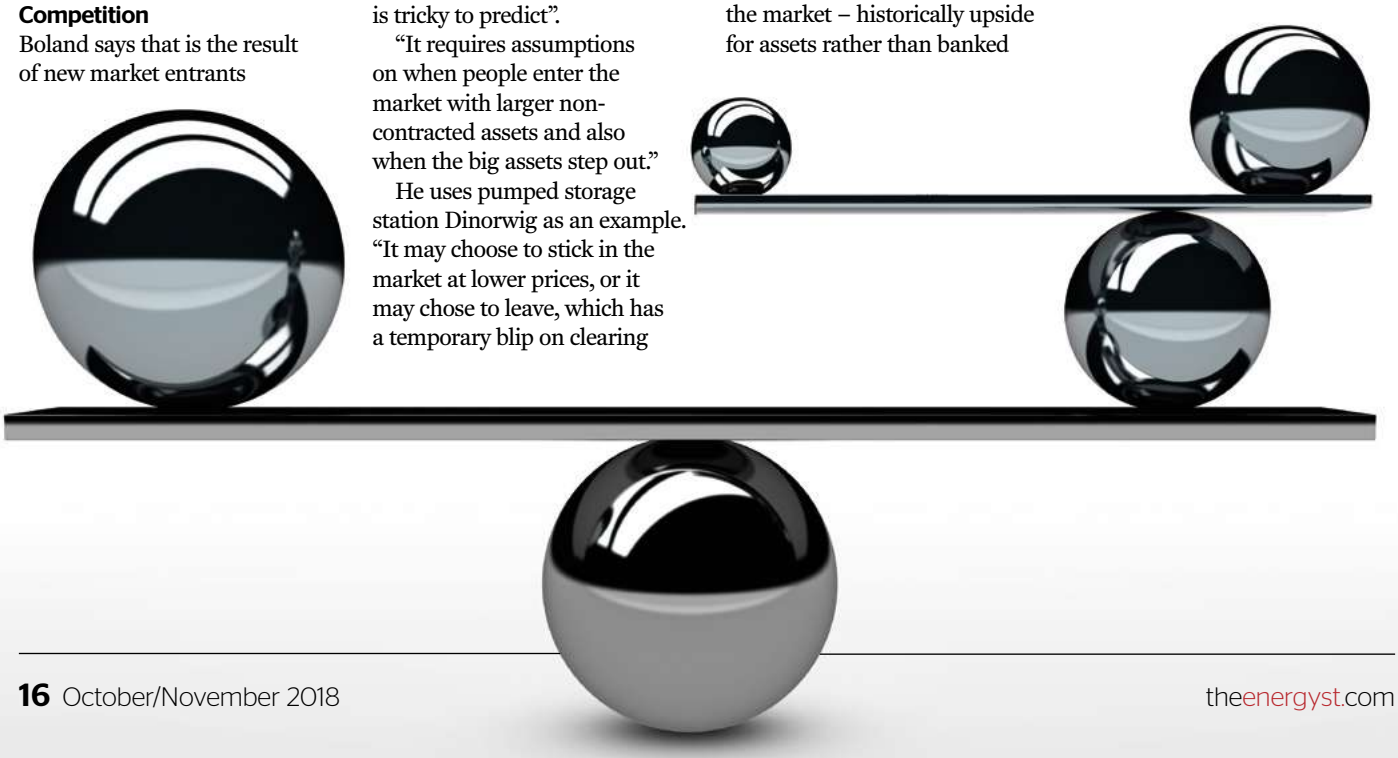
"[The BM] has had quite a lot of attention but I don't think people appreciate the nature of firstly how they in practice access the BM and secondly what are the nature of those earnings," he says.

"It is the last residual tool in the market – historically upside for assets rather than banked business cases. It is not new, it has been in the market since day one and while the value of the BM has increased a bit, it is not by orders of magnitude."

Boland says the Balancing Mechanism will certainly be a component income stream for many types of asset; "storage and engines and flex fit neatly into the BM's requirement for short-term, fast response".

But he says it is "challenging to see the BM being the primary income stream of assets of the future."

Eamonn Boland and Tom Harper were interviewed for *The Energyst*'s 2018 DSR report, which you can download free of charge at theenergyst.com/dsr

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Making flexibility more flexible

SES Water has participated in 'traditional' DSR to date, but is now mulling how it might capitalise on emerging opportunities, such as the Balancing Mechanism. Brendan Coyne reports

SES Water delivers flexibility through load assets such as pumps and motors, as well as generation. The Medium Combustion Plant Directive will take its back-up generators out of the equation, while flattened DUoS rates will also erode savings. But to mitigate those changes, energy and carbon manager Henrietta Stock says the firm is starting to look beyond the traditional approach to DSR.

Henrietta Stock

"To date we have taken part in fairly standard mechanisms such as STOR, DUoS red band and Triad avoidance, which are mature, reasonably well-defined and quite straightforward," says Stock.

"But the future is responding throughout the day; smaller reductions more of the time, rather than big 'clunky' responses at defined periods," she adds.

"There are lots of suppliers and aggregators looking at the Balancing Mechanism and I think that is where we are heading."

Risk versus reward

The company is tendering for a new energy supplier and Stock believes within-day opportunities for flexibility will likely be offered as part of the agreement.

But the nature of market-based opportunities, where nothing is certain, could pose challenges for a regulated utility.

"The business is rightfully cautious when it comes to risk; there is value in budget certainty around costs," says Stock. "If we play in the Balancing Mechanism, an element of that will be uncertain. Getting people comfortable with the nature and level of that risk and what it means in terms of energy costs will be tricky."

But changes to network charging regimes and legislation such as MCPD are driving the company to consider how to manage that risk.

"We know there will always be value in flexibility; the grid needs balancing and there are more renewables coming on to the system," says Stock. "It is just a case of where that value lies.

"If the value is not in Triad or red band avoidance, where is it? It looks like the Balancing Mechanism, which is why we need to consider moving away from simplistic forms of DSR and looking more at that opportunity."

> ***The business is rightfully cautious when it comes to risk; there is value in budget certainty around costs***

Battery storage

SES Water is considering battery storage but has concerns over predictability of revenue.

"We've had conversations with different companies that might be willing to provide and/or finance a battery and we have support internally, but it is still in the very early stages," says Stock.

Our sites sometimes experience network power quality issues so we could build a business case around using batteries for resilience. The battery technology and configuration is really important though because there's likely to be some kind of trade-off needed between using the battery for resilience and using it to maximise DSR revenues. The grid services business case is less clear.

"The revenue streams are continually changing – FFR prices, Triad – which is a challenge if they are part of the proposal," says Stock.

"But if we can find an appropriate contract structure that is suitably de-risked it is something we will seriously consider." te

Henrietta Stock was interviewed for the 2018 DSR report, availale at the energyst.com/dsr

Why 'merchant' DSR is coming to the fore

Peak network cost avoidance, both for distribution charges (DUoS) and transmission network charges (Triad), are traditional forerunners to DSR. Larger companies can avoid Triad costs by reducing demand during winter evening peaks. National Grid bases charges on the power companies take from the grid during the three highest peaks, at least 10 days apart. Companies wishing to reduce their bills turn off or switch to onsite generation when the system looks tightest over winter, flattening the peak. However, Triad in its current form is likely to change over the next few years, which will require a different approach from businesses, and a change in how their transmission charges are applied.

DUoS charges have been 'flattened' since 1 April this year, so that the highest evening peak charges, red bands, are now less expensive, while amber and green bands for other periods cost more. That has reduced the benefit of loadshifting to avoid red periods.

Meanwhile, more people providing STOR have reduced its value significantly from peak prices paid in 2010-12. The same price erosion is now taking place in frequency response services. That is leading companies to look at exploiting price spikes in wholesale and imbalance markets in a bid to maintain or increase what they can earn for helping to balance the system.

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Breedon Cement's Hope Works future participation in DSR remains uncertain with the closure of the FCDM scheme. Brendan Coyne reports

Cementing a strategy

Breedon Cement's Hope Works in Derbyshire has been providing DSR for about 20 years, according to optimisation manager Spencer Green. It can shed about 14MW of load via four large motors participating in Frequency Control by Demand Management (FCDM).

However, says Green, the "Damoclean sword" hanging over FCDM – the scheme is set to close at the end of this year – places a question mark over Breedon's future DSR participation.

"FCDM has worked well for us in terms of the level of forecasting required and the amount of revenue it generates versus the inconvenience to production plant," says Green.

"We are trying to determine whether the newer frequency products still fit for us."

Flex versus production

Green thinks the company, while it cannot deliver bi-directional flexibility, can still provide some value. But Green is concerned that if auctions move closer to real-time, it could prove too difficult to balance flex provision with core production needs.

"If the auctions become weekly, daily, or even half hourly, it reaches a stage where it is either a full time job for somebody – which is not the game we are in – or it is time to leave it to the professional demand-side responders," says Green.

"That would be a shame, but ultimately we have to make a quality product. Starting and stopping a continuous process heightens the risk for us, in terms of meeting quality criteria."

Green says the firm could look at letting an aggregator control the flex within Breedon's industrial boundaries, but he thinks intraday markets may prove too challenging given that unplanned events do occur on manufacturing sites.

"It would depend on the level of autonomy we would have. Right now, we can simple say we are not available. In the new schemes it would depend on the penalty regimes, how non-availability penalties would affect us."

Capacity Market

As a seasoned Triad avoider, Green is confident that Breedon can avoid racking up Capacity Market (CM) charges over winter. In terms of CM participation, the company signed up last year but will not offer capacity over the coming winter due to the low clearing price.

"It wasn't worth the production pain," says Green. "We'll miss the revenue but it wasn't ingrained into our finance plan and we will take a view [on participation] year to year, depending on the price."

Arbitrage?

Green says Breedon has discussed with energy suppliers the possibility of making money from flexibility in the wholesale markets, or "taking National Grid out of the loop", as he puts it.

"With a supplier you have more of a relationship and understanding about what you can and cannot achieve. We are looking at some of those options, but it tends to be something you can only do with your incumbent supplier, so it depends how far down that road they are," he says. "But I imagine they are all starting to work on those propositions."

How could market participants help convince those with flexibility that they are not wasting their time?

"Just provide some clarity on what we can and cannot do," suggests Green. "Explain a means of valuing our offering in comparison with others so we know where we sit in the market."

That would enable I&C firms to determine a "realistic evaluation of what we can contribute to system stability and performance", he says.

DNO flexibility schemes

Green suggests DNOs have a role to play as they look to start procuring flexibility, especially if they can provide some certainty with set services and requirements, but he says engagement would be a useful start point.

"Are we in a geographically advantageous position, or does it make no difference whatever we do? Understanding the local situation as opposed to national schemes would be of some benefit," he says.

"Some DNOs seem to be more proactive than others. We've not had contact from ours regarding anything of that nature." te

Battery storage?

Breedon Cement's Spencer Green says the company has looked at battery storage "at a high level", but adds that any investment would hinge on threats to security of supply.

"The only way we could justify [a battery] is in terms of resilience. If we start to see a greater degree of grid instability due to all the changes, and it starts to impact production, that argument may come into play."

Should Breedon decide to buy a battery, the company would not overlook revenue opportunities, says Green, "but [grid services] would never make a business case on their own".

‘Seller beware’ of the Balancing Mechanism:

Companies with onsite power generation are advised to be cautious before committing

Companies with onsite power generation need to be cautious before committing to the Balancing Mechanism as they may overcommit power capacity needed to run their own operations and could end up paying a premium for importing energy to cover the shortfall.

This is the advice from EnDCo, an independent licensed electricity supplier, which is advising ‘caveat venditor’ (seller beware) before committing to the Balancing Mechanism under current rules.

The market for onsite power generation available through the UK Balancing Mechanism is estimated to be worth £500m. Independent businesses with onsite power generation currently supply National Grid with 14% of UK generation capacity.

The Balancing Mechanism provides a very attractive offer for operators of large-scale onsite power generators, with payments occasionally reported as high as £3,000 per MWh and frequently at the £2,500 per MWh mark.

However, for businesses that rely on their own generated power capacity to run operations, the Balancing Mechanism could prove to be restrictive, with onerous penalties for non-delivery.

Les Abbie, chief executive officer at EnDCo, explains: “For companies that can generate electricity, either at a single site or at multiple locations, we think the Balancing Mechanism can offer rich pickings where there is surplus capacity, but companies with marginal capacity should be mindful of their own operations and its own energy needs.”

The Balancing Mechanism, which has been in operation almost as long as the UK’s competitive energy market, is rapidly becoming a hot topic for businesses with any kind of electricity generating capacity. It is the means by which the National Grid can ‘balance’ supply, especially during periods of peak demand, by taking energy supply into the grid from businesses with onsite power generation.

EnDCo believes the mechanism works well for businesses with excess generating capacity and which have the ability to be flexible when diverting power without affecting their own operations.

In the next 18 months the Balancing Mechanism will change, with new rules making it easier in principle for smaller players to participate, but much work remains to be done and the practical impact of these changes is hard to predict.

The way ‘system’ or ‘cash out’ prices are currently calculated is changing in November, making forecasting of revenue streams extremely difficult when deciding whether to enter the Balancing Mechanism.

Continuing developments in battery storage technology will further complicate business planning around selling the surplus capacity of onsite generation. te

A copy of EnDCo’s latest white paper, *The Balancing Mechanism – Why it’s a risky high-wire act for onsite power generators*, can be found on the EnDCo website at endco.co.uk

Batteries make unsubsidised solar stack up for Kingfisher

Kingfisher's head of carbon and energy, Jeremy Parsons, outlines the company's progress in cutting carbon and costs via energy efficiency, solar and storage. Brendan Coyne reports

Kingfisher, which owns B&Q and Screwfix brands in the UK, has just started using solar and battery storage to provide grid services. While making money from helping to balance the grid is a bonus, it comes a distinct second to the firm's ambition to cut carbon, consumption and cost, says head of carbon and energy Jeremy Parsons.

Kingfisher installed a 756kW battery system at its Swindon distribution centre this summer, while adding a further 600kW of rooftop PV. It already had 1.2MW installed under the Feed-in Tariff regime, but Parsons says the battery made Kingfisher's new PV viable without subsidy.

"The building was built to take solar – and distribution centres naturally have large roofs. But the site was exporting a lot of power due to the way demand shifted during the day," says Parsons.

Jeremy Parsons

By installing the battery, the firm can store solar power generated during the day, use the battery for evening peaks and recharge overnight at cheap prices so that the batteries can contribute to the morning peak.

"So the battery enabled us to justify adding the extra solar," he explains.

The result, in tandem with an ongoing energy efficiency programme, is significant savings on its energy bill.

The battery also enables Kingfisher to "test the concept, the technology and the revenue streams" of co-locating solar and storage, adds Parsons.

"I can already see future projects where we can roll this out," he says.

"My ultimate dream is to use batteries to create a net zero distribution centre – given the amount of power they use, that is quite exciting."

By 'net zero', Parsons means across the year as a whole, given solar generation will peak in the summer, leading Kingfisher to export, and decline over winter, leading it to import from the grid.

"In my mind, that is about as far as the model takes us. But there will be a point where we can get those distribution centres very low [in terms of net consumption from the grid]," he says.

"I'd like to get them off the grid altogether; whether or not we do, we will have to see."

Grid services

Kingfisher started to provide Firm Frequency Response (FFR) in September via

Kingfisher installed a 756kW battery system and a further 600kW of rooftop PV at its Swindon distribution centre

an aggregator, plus some day-ahead trading through its energy supplier.

Parsons says demand-side response was only a "tiny" part of the solar-storage business case. As a result, "there is potentially quite a bit of upside" from providing grid services.

"We are participating [in grid balancing] because it is quite interesting, rather than anything else," says Parsons. "Trading and making money [from balancing markets] is not our primary aim. But there is a benefit; it will generate additional revenues and learning that help drive interest in, and viability of, other projects."

Grid services revenue will also help mitigate changes to distribution network charges. "The trading revenues are probably much bigger than I modelled, because we built a very conservative business case," says Parsons.

"So while we probably lose something [on flattened DUoS red bands], we can make them up from trading."

Board level buy-in

Parsons says that while change is constant, Kingfisher's sustainability strategy is ingrained within the business "right up to board level".

"That means [the board] accepts a good rational and buys-in, even if there may be changes to revenue streams, because there are always pluses and minuses. As long as we understand the risks, this is where having an organisation that is committed to sustainability really helps," says Parsons. "It would be a lot tougher to try and do this at a different retailer."

Flex and flux

Kingfisher operates in other European markets and while some business lobbies bemoan a lack of regulatory and policy certainty, Parsons thinks the fundamentals are strong. "It sounds slightly contradictory, given all the change going on, but the UK is still a good place to invest in energy," he says.

Meanwhile, he believes the end of subsidy regimes will drive innovation and reduce administration.

"My priority is determining what works commercially for Kingfisher and delivering it," says Parsons.

"Getting to a subsidy-free world is brilliant, because you can then do what you like without having to submit multiple pieces of admin to the government [to make your business case stack up]." te

> *My ultimate dream is to use batteries to create a net zero distribution centre – given the amount of power they use, that is quite exciting*

EVs and second-life batteries

Kingfisher is installing EV charging points that will run off the battery at Swindon and is starting to develop its EV strategy.

Parsons thinks EVs will create "significant pull" on battery volumes to the extent that there may be a supply-demand imbalance in the short term. But he thinks second-life batteries may address that issue.

"Second-life batteries are really interesting and we are poised and ready to put second life batteries into Swindon," he says.

"If that reduces the cost, I don't mind that they are less efficient, because we can model around it."

The four pillars of Kingfisher's plan

In 2014, Kingfisher committed to cutting its carbon footprint 25% by 2020, and in 2015 earmarked £50m to invest in renewable energy. Parsons, who previously spent 15 years at Centrica, played a key role in securing those funds. He's now writing the firm's 2025 carbon reduction targets.

"Our energy strategy is fourfold," says Parsons. "First is to be frugal and efficient in the energy that we do use. At store level that means LED lighting across all outlets and we have building management systems (BMS) going in to better monitor and manage our stores. We are also developing blueprints around how our stores should be built for maximum efficiency and sustainability."

"Second is how we buy energy: All our power is renewable and 100% REGO-backed so that it can be traced to the source of generation," he adds.

"Third is onsite renewables: deploying air source heat pumps, PV on roofs, biomass, battery storage, whichever technologies are right for the site and that are commercially viable."

The fourth pillar is around innovation. "It's important to set out a future path. For example, we recently developed a 'zero energy' concept Screwfix store (pictured) that generates more power than it consumes from the grid," Parsons explains.

"Hopefully that is something we will start to roll out at greater volume."

Solar+storage+DSR = less risk?

London Luton Airport believes a solar plus storage solution will cut power bills and enable it to supply electricity to retailers operating from its terminal. Brendan Coyne reports

Michael Nagle, utilities manager at London Luton Airport, has looked at demand-side response from both load and generation but is more likely to install battery storage alongside solar PV.

The airport has a fleet of back-up generators, but even before new generator controls legislation came to light (the Medium Combustion Plant Directive), Nagle was unconvinced about using them for DSR.

"It's not that I have no confidence in an aggregator taking over the asset, more because it is used in case of low visibility lighting on the runway. The fear is giving up the asset at the wrong time and having no recourse," says Nagle.

"As I understand it, you can't take back control without incurring financial penalties – and we are an airport, it is our only available back-up, so that is a concern."

The airport has load that it can shift. Nagle has recently upgraded half of its air handling units to cut consumption by about 27% and will install CO_2 sensors that will enable greater flexibility.

There is also some flexibility within lighting, which can be dimmed, though the airport is not allowed to have any black zones.

Solar plus storage

Nagle is working on a business plan to deploy a 5MW battery in conjunction with a 10MW solar farm. He thinks that can deliver about 28% of the airport's annual consumption.

The plan is to "ring-fence around 1MW of the battery to deal with emergency requirements, leaving me with 4MW of battery to store, generate and utilise through red and amber zones and to discharge to DSR programmes", says Nagle.

As well as cutting the airport's bills, Nagle says a solar plus storage solution would enable it to supply retailers within the terminal.

Nagle is looking at a third party fully funded model, with a ballpark total cost of about £30m. He is considering either a shared cost model or a fixed price model for the term of repayment. The latter would give the airport total control of the asset following the repayment period.

After investigating the market for the past 18 months, Nagle believes the airport "will be in a position to go out to tender next summer, and hopefully find a solution by the end of 2019".

Communication failure

Nagle thinks the flexibility industry needs to raise its game when it comes to communication: "I've worked with various brokers over four years at this site. We work with a major supplier for gas and electricity. I've attended numerous conferences – but it is not until somebody sends out a survey that we talk about our [DSR] potential. Nobody seems to be actively approaching people to discuss these opportunities."

Given aggregators are scrapping for market share, that is surprising. But Nagle thinks Luton is not an isolated case.

"I chair an aviation utilities forum, where 20-30 UK airports get together twice a year. We've held five meetings since kicking off the forum. Not once has there been a serious discussion [about DSR].

"You would likely find similar concerns around ceding control of assets [at all the other airports], but there is a real lack of understanding of what options are out there for us," says Nagle.

"There is a need for better communications all round." te

Independent guide to DSR required

Dan Fernbank is energy & sustainability manager at the University of Reading. The university has a seven-figure annual electricity bill, significant load and generation assets including solar and CHP, but it does not participate in DSR. Fernbank cites concerns around disruption and ceding control over kit.

In his response to *The Energyst*'s DSR survey, he suggested aggregators or suppliers could collaborate on a straightforward guide to DSR participation. Asked to elaborate, Fernbank said: "To me, DSR is a maze. There are so many different schemes (Capacity Market, Firm Frequency Response etc.) which seem to change all the time that it's very hard to navigate your way through them and time consuming to consider doing so. The questions I'd like to see addressed are:

- Which asset(s) do we have that may be suitable for DSR-type solutions (how to assess this and prioritise them)?
- Which asset(s) are eligible for which scheme?
- What are the different schemes and the relative benefits of each?
- What will the different schemes expect? Are you handing over control of your buildings/plant?
- Common considerations, pitfalls and common Ts&Cs to consider
- Different types of contract and shared savings etc
- Steps to setting up an agreement

Fernbank added: "I think DSR tends to sit in the 'too time consuming to understand' box for many and it would be good to support businesses getting out of this mindset."

University meets flexibility challenge

The University of Edinburgh expects significant uplift in DSR revenues in 2019

The University of Edinburgh should earn £90,000 in revenue and savings by providing DSR in 2018. In 2019, that is anticipated to hit £200,000 as it adds further megawatts to the 5.7MW of generation currently in place.

"We could see that we were paying more in certain parts of our bills to support market changes so similarly we should benefit from the opportunities generated too," says university energy manager David Jack. Hence getting involved in DSR back in 2015.

"The process is worthwhile. It shows that we are exploring every available avenue to make our energy as low priced as possible and that we are engaging with the energy supply chain in every way that we can."

The university initially partnered with Edinburgh-based aggregator, Flexitricity, for short-term operating reserve (STOR) delivery and triad management, following a tendering process via the Crown Commercial Service (CCS) framework.

Last year it also made assets available to the Capacity Market and Flexitricity's Footroom (or demand turn-up) service.

The university is also connecting up new CHP assets to complement its existing portfolio of diesel generators.

Jack says Triad rebates in excess of £50K per annum are good to see, "especially in the knowledge the process could be repeated in other areas of the campus".

Meanwhile Footroom makes use of excess wind power – paying participants to increase consumption or reduce generation at their sites, so that National Grid doesn't have to pay wind farms to shut down. It is a a win for the environment and a win for the balance sheet, according to the firm.

The university is investing in energy efficiency across their estate and re-engineering much of their infrastructure whilst expanding the CHP networks. In parallel, they are also investigating alternative solutions that are likely to replace the CHP networks in the future.

As the university is increasing its solar PV capacity in the near future, the energy management team is also looking at battery storage, which would open the door to participation in frequency response and the Balancing Mechanism.

The University of Edinburgh is investing in energy efficiency across its estate

Charging changes bust business case

Council leisure centre operator says DCP228 changes to network charges 'killed DSR plan'

Sean Midgley, deputy head of estates at SIV, the operational arm of Sheffield City Trust, looks after 17 of the city's sports and leisure venues.

Midgley has examined the business case for DSR but says changes to network charges, under DCP228 "have killed it".

He says the same of storage.

"We did speak with an aggregator but the benefit dropped from around £25K a year to about £5K a year. When we looked at the contract structure, we could see we actually stood at risk of losing £10K a year – they could have come back to us for any losses."

Midgley instead built a business case for a building management system to control costs and potentially provide DSR. That stacked up, and showed savings per site, "until DCP228 and DCP161 came along".

DCP228 flattens distribution network charging differentials: red band rates are reduced but amber and green band rates have increased.

Midgley says the council-run leisure centres are significantly worse off, "and the budget for DSR was sunk into the energy budget to cover the increases as a result of DCP228".

He says SIV has generation with export potential but "the capacity connections the DNO will give you are nowhere near what is required to run in island mode or with excess capacity, because the DNO does not benefit from you not using the grid".

Midgley says paying for grid upgrades creates a first mover disadvantage. "You can get the capacity but it comes with a caveat – the cost of grid reinforcement. So the first person that wants the capacity has to pay for that, and then everyone else can use it."

He says there may be potential to provide flexibility through its energy supplier, though he has struggled to speak with the appropriate technical people at that supplier.

Midgley thinks a supplier-led solution may also reduce potential risk of gaming by aggregators, which could potentially take place in the Capacity Market (CM) to take advantage of availability payments, "as there is no checking mechanism, to see which MPANs have been included in the CM and which period they cover". te

Sum Sheffield City Trust risked losing each year under DSR contract

Resilience and guaranteed savings required

Hospital trust seeks storage as a service

Imperial College Healthcare NHS Trust "looked at DSR quite closely a few years back", using standby generators for STOR. However, Vikas Ahuja, energy projects manager at the trust, says the business was already marginal due to the age and condition of the generators and the cost of enabling the assets to participate – and then STOR prices collapsed.

Risk versus reward

Ahuja says the trust was not confident it had sufficient manpower to manage switchovers from mains to standby or vice versa during the periods when STOR events are likely to take place, typically between 5pm and 6pm on a winter weekday.

There was also a question mark over increased maintenance and running costs, "plus the view that standby generators should be really used for what it says on the tin, ie standby generation when it is most needed – after all it's a hospital supply", he says. Once STOR prices came down, the idea was shelved.

However, the trust is now looking at battery storage.

"We are looking for a fully-funded solution that includes maintenance," Ahuja explains.

"We are extremely interested in improving resilience of our electrical infrastructure and that is indeed the driving factor. A share in the revenues that can be achieved from arbitrage, FFR and other options would be a very welcome bonus."

The trust hopes to find an energy performance contract structure that guarantees savings or revenue share over an eight to 10-year period.

Boxes ticked

Ahuja has conducted high-level feasibility studies with parties to try and find a suitable solution, but so far he says providers have not ticked all of the trust's boxes with business plans that detail the revenue share or split, or the guaranteed savings.

"We are looking for a minimum risk package," says Ahuja. "Recent conversations [with one provider] have been promising."

If the trust is successful with its storage solution, it may be able to combine the battery with its 2MWe CHP. To date, Imperial has not been able use the power generated by the engine due to historical network constraints in the area. It has had to export all of its power.

However, Ahuja says that "a project currently being undertaken should help to rectify that situation and thereby enable us to displace at least a third of consumption or import with the CHP generated electricity by the end of this financial year". te

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Harnessing the connected site

Engaging in Industry 4.0, commonly referred to as the fourth industrial revolution, is no longer a choice but a necessity for industrial and commercial sites, reckons GridBeyond

The measurement, monitoring, automation and control of energy are imperative to streamlining and optimising processes, as well as enhancing profitability and sustainability.

The interoperability of machines, devices, sensors (and humans for that matter) is unavoidable in every area of industry, and energy is no different. From m2m communication, to artificial intelligence, machine learning and big data, the connected organisation is here. So, how can your site benefit from this evolution today?

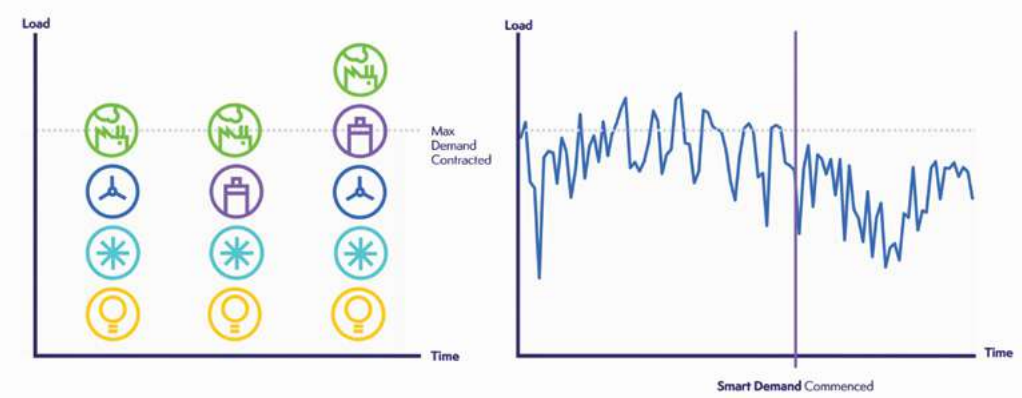


Figure 1: Energy intensive production site that consistently exceeded its max demand

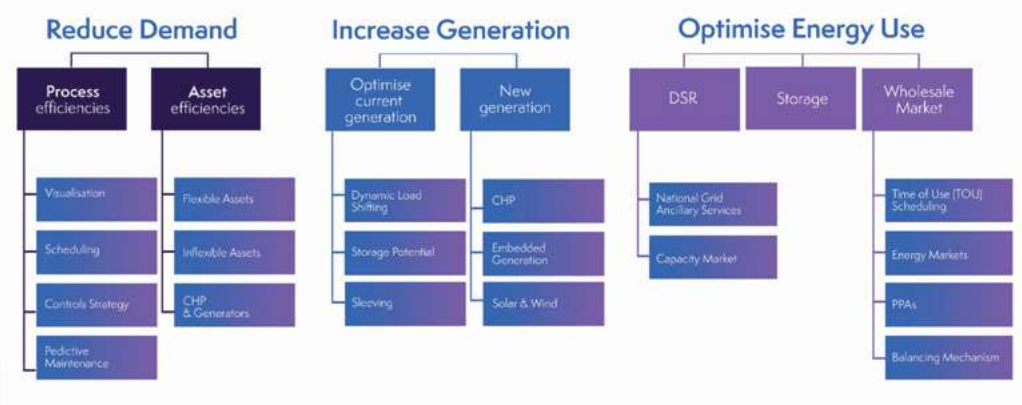


Figure 2: GridBeyond's three key principles for intergrating demand-side response

The connected site reduces costs

Due to peak operational requirements, sometimes it is near impossible for industrial businesses to stay within their maximum demand parameters, incurring significant penalties. Connecting all energy-intensive assets to an energy technology platform means the control and rotation of energy consumed by an asset can be fully automated within its set parameters, and operational schedules can be automated in accordance to eliminate maximum demand charges.

Saving achieved by one client since adding and automating peak avoidance with an onsite battery

Figure 1 is an example of an energy-intensive production site that consistently exceeded its max demand. Once Smart Demand was implemented as part of the overall platform connection, its costs were significantly reduced and penalties were no longer incurred, while ensuring business continuity.

Similar technology is applied for Triad and DUoS avoidance, and to reduce overall energy consumption. When paired with storage, the benefits and automation can be stepped up further for significantly increased savings. One GridBeyond client has seen a 65%-plus increase in savings since adding and automating peak avoidance with an onsite battery.

The connected site works smarter, not harder

GridBeyond works on the basis of three key principles when integrating demand-side response and intelligent energy technology into an overall energy strategy (see Figure 2): reduce demand, increase generation and optimise energy use.

Connected assets benefit from automation capabilities, while analytics, benchmarking, machine learning and predictive maintenance become accessible too.

High-end technology platforms enable automated participation in the most valuable demand-side response programmes and avoid peak electricity charges, integrating seamlessly with and enhancing the overall energy strategy. By boosting energy performance and optimisation with dynamic load shifting, scheduling, sleeving, storage and embedded generation, an industrial site becomes financially and operationally more resilient.

The patterns emerging from machine learning technologies are used to improve onsite overall equipment effectiveness (OEE) and predictive maintenance. Predictive maintenance is often overlooked but is becoming more prevalent

from a financial and operational planning perspective, as well as ensuring further business resilience. It ensures adequate visibility to take action and provides the automation, alerts and thresholds required before a key process fails. The data gathered from a connected network of assets means highly accurate automation in this sense, as well as key insights for benchmarking and analytics.

The connected site is one step ahead

Price optimisation and energy trading are other areas of energy underpinned by automated decisions. Day-ahead and intraday electricity purchasing from the wholesale market are automated to ensure energy is being bought and optimised at the cheapest rate.

The decision to purchase at any given point is based on an accumulation of data, including site and grid data, demand and cost data for the same period the previous day, week, month or year and weather conditions. While not yet available in the UK, this is a service GridBeyond has developed and enhanced over a period of years for the Irish market, which will be critical as National Grid in the UK moves towards a model of purchasing electricity closer and closer to the time of consumption.

The connected site is key to the building of smart cities

The smart-factory of Industry 4.0 is one puzzle piece in the building of smart cities – a vision that fully encompasses a shared energy economy. The intermittent nature of renewable power means that something has to give – it is the age-old story of supply and demand. Automated purchase, consumption and management of flexibility will be the norm, and as they come to the forefront, businesses will increasingly take control of their participation in the energy market.

Digitalisation, decarbonisation and decentralisation are less about overhauling but about finding and embracing exciting opportunities.

Looking at the bigger picture, these opportunities present themselves through innovation and technology as new ways to reduce our carbon footprint.

For businesses, the opportunity is to streamline resource, increase profitability, boost their green credentials, and automate process scheduling. te

A cast iron opportunity?

Cast-iron bar manufacturer United Cast Bar (UCB) is a good example of how GridBeyond's hybrid approach – joining up existing load flexibility with a battery – can deliver strong commercial outcomes at lower cost. United Cast Bar has worked with GridBeyond to cut network charges, optimise energy and provide demand-side response since 2014. Last year the company added a 500kW battery in order to unlock further flexibility and boost resilience at its Chesterfield site.

The fully funded installation meant UCB could participate in dynamic frequency response and enable greater peak avoidance without upfront cost.

The aggregator's platform takes the flexibility from UCB's existing processes and equipment – exhaust fans, induction furnaces, sand mixers, dust extractors, compressors etc – and combines it with the battery to extract greater value.

James Brand, managing director (Foundries) at United Cast Bar, said the result is that the firm "has been able to earn large sums, generate significant savings, and meet our commitment to the environment without any impact on operations".

Upload your data to grow DNO flexibility markets

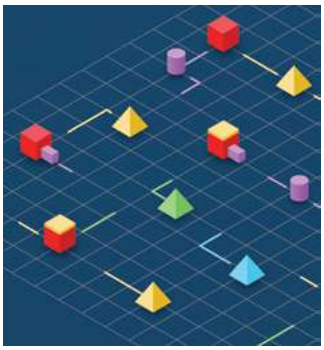
Five of the six GB distribution network operators are trialling the Piclo platform, which aims to become an online marketplace for buyers and sellers of demand-side flexibility. Brendan Coyne reports

Piclo CEO and co-founder James Johnston says the emergence of new buyers of flexibility and simultaneous growth of new sources creates the need for a common platform.

While Piclo is currently a 'matchmaking service', providing visibility of where flex is needed and where it is currently available, it also aims to add auction functionality. But Johnson is acutely aware of the need to "start basic".

"A lot of the industry is trying to run before it can walk but the first functionality is visibility," says Johnston.

"Visibility on where there is congestion and where DNOs are looking for flex in the near future provides value to sellers. For buyers, the value is around visibility on what flex assets are available and where – they currently do not have that information."



Piclo works with distribution system operators, energy suppliers and flexibility providers

Providing that visibility requires data. Aggregators have that data, as do some suppliers and other third parties. Piclo wants them to put it onto the platform.

While such data is commercially sensitive, Johnston says they can control the level of data they provide, it can be anonymised, and data is not shared with any other flex sellers – only buyers.

"Uploading your data allows you to participate in tenders – it is a requirement for prequalification," says Johnston. On the flip side, he says it is mutually beneficial for aggregators seeking new sources of revenue.

"DNOs need a bit of comfort that if they are going to be looking for flex, that it is actually out there and they are not wasting their time.

"If more people upload their data, it creates momentum [for more flexibility markets]."

While Johnston and others believe in the need for common platforms, he agrees it is too early to think about that now.

"It is very useful to have emerging platforms. Standardisation in a transitioning market will lead to bad results. But I believe there will be natural consolidation," says Johnston.

> ***A lot of the industry is trying to run before it can walk***

"Look at the stock market, it is not a regulated monopoly but there are only two in the UK. I think that will eventually emerge in flex. There are a small number of parties focusing on different niches, so let that play out," he adds.

"And if there weren't any other players, we would be quite worried." te

UKPR and Fluence tee up 120MW of batteries

Reserve power specialist orders a second 60MW tranche of battery storage from Siemens-AES joint venture

UK Power Reserve has chosen Fluence to provide the second 60MW tranche of battery storage it requires to meet Capacity Market commitments.

The reserve power specialist had already contracted Fluence, a Siemens-AES joint venture, to deliver 60MW of batteries to fulfil the 15-year Capacity Market agreements it secured in 2016.

By contracting the firm for the full 120MW/120MWh following two competitive tenders, Fluence said it represents the largest contracted energy storage portfolio transaction to date globally.

The projects must be commissioned before winter 2020 but UK Power Reserve said they would be delivered by end of summer 2019.

The first 60MW will be online by March 2019.

The company, now owned by Sembcorp, would not comment on how it will make money from the batteries in the interim, but it is likely to be a blend of contracted services, such as frequency response, as well as arbitraging price differentials in wholesale and balancing markets. te

Small firms have 'vital role' to play

Aggregator lands £500K in funding to bring smaller firms into DSR and seeks trial sites

Flexitricity has landed almost £500,000 of government funding in order to try and bring smaller companies – and smaller sites of larger companies – into demand-side response (DSR).

Most aggregators have traditionally focused on larger companies with megawatt scale load and generation assets due to cost of sales and market entry. National Grid's systems and procurement are also heavily skewed towards larger assets, making it difficult to bring in smaller assets, sites and businesses.

However, the aggregator's Quickturn project, where Flexitricity is partnering with the University of Edinburgh's Institute for Digital Communications, aims to improve communication speed and reliability and reduce the overall cost of setting up DSR dispatch systems.

Flexitricity chief strategy officer Alastair Martin said that "small businesses and eventually households will have a vital role to play in the long-term management of our energy system".

"The funding we've secured for this project will allow us to develop a cost-and time-effective solution that fits the requirements of National Grid as well as small sites," he added.

The Quicktrun trial will commence in the first half of next year.

Other aggregators, such as start-up GridImp, are also trying to bring small firms into DSR. te

Alastair Martin: Funding 'will allow us to develop a cost and time-effective solution'

National Grid seeks reactive providers

System operator calls for new reactive power providers in Mersey and South Wales

National Grid is looking for help to manage voltage levels in Mersey and South Wales and wants to hear what potential providers can do via a request for information.

The electricity system operator (ESO) intends to tender for services in 2019/20 and may also tender again the following year.

National Grid uses reactive power services to manage voltage stability on the network. As this is variable by location, it requires providers in specific areas to either absorb reactive power, which decreases voltage, or generate reactive power, which increases voltage.

The ESO said voltage control is harder to manage at demand extremes – both high and low. But it is currently planning to tender for services to manage only low extremes. Both the Mersey and South Wales documents state that providers must be able to deliver from 23:00 to 07:00.

The service will be open to both Balancing Mechanism (BM) units and non-BM units.

The ESO wants to hear from companies that can provide services in both directions (absorbing and generating reactive power), as well as those that can only do one direction.

Providers are free to do other demand-side response services, provided these do not interfere with reactive power.

Both availability and utilisation fees will be paid.

Any interested parties should respond to the RFI by 5 November. te

4MW of food for thought

Catering wholesaler Philip Dennis Foodservice outlines how investment in storage to generate revenues is panning out. Brendan Coyne reports

Philip Dennis Foodservice, based in Devon, has invested in storage. The company has a 3.75MW in-front-of-the-meter battery as well as a 256kW behind-the-meter Tesla Powerpack. The firm's Barnstaple headquarters also has a 250kW rooftop solar array and two 500kW wind turbines.

While the batteries are currently used for generating revenue, director Peter Dennis says the firm may ultimately use the smaller battery to offset energy costs. But for now, the company has a two-year FFR contract and a 15-year capacity market agreement, with the batteries linked via the latter agreement. The firm also plans to "do some Triad chasing this winter while the revenue is still good".

Flexible demeanour

Dennis admits some concern over falling FFR prices. "They are only going one way," he says, but its aggregator is already bidding batteries into the Balancing Mechanism and Dennis says the firm's assets may ultimately head in that direction.

However, he believes its contracted revenues will pay off 35% of its investment over the next 20 months, enabling it "to compete with new, cheaper entrants" bidding for frequency contracts.

Meanwhile, despite FFR prices "crashing" between building the business case (at £17/MW/hr) and securing a contract (at £12.5/MW/hr), Dennis says the company faced lower barriers than most due to a generous existing grid connection. With distribution network operators now tightening up on capacity, it made sense to use that capacity rather than lose it, says Dennis.

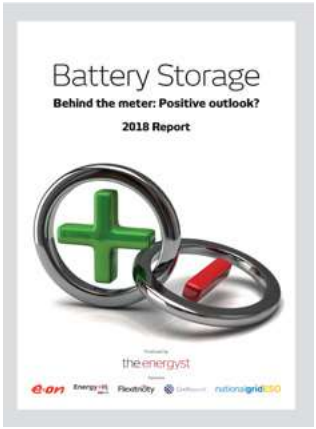
"WPD gave us [a] 1.4MW connection some years ago, so we had very good capacity, which meant that aspect was a very low cost. We already had the land and we had cash, so finance costs are zero," says Dennis. "So of all the people that invest in this market, we will be the last ones to lose money – and so far the returns are good."

Dennis is now turning his attention to flow storage, as well as considering how to decarbonise the company's fleet of 65 HGVs. te

Less risky than DSR?

The company considered doing traditional demand-side response, given its compressors could provide "quite a decent load", but Dennis says it was insufficiently attractive given the potential risk.

"Our compressors are quite old, they are not VSDs and the refrigerators, which use hot gas or liquid, don't like being suddenly switched off or ramped down," he says. "The revenue was small compared to the additional maintenance requirements and [risk of] possible outages, so we decided against it."



This article was first published in our new Battery Storage report, available at theenergyst.com/storage

Too uncertain to invest in storage

Vacuum maker shelves storage plan due to rule changes

Numatic, maker of the Henry vacuum, is the UK's largest commercial cleaning equipment manufacturer. As such, it has a significant electricity bill. Property & energy manager Andrew Smith spent "about 18 months" looking into storage to see whether it would help cut costs and boost resilience. It was not a straightforward exercise and the firm eventually decided to put it on hold.

Smith summarises how Numatic arrived at that decision: "At the outset we had the following objectives:

- To have a back-up system that could replace our main HHM supply (2,500kVA) in the event of a power failure. This was driven by concerns about national power security, not from local experience
- To use the system for Triad avoidance
- To avoid peak DUoS red bands
- To participate in DSR

"We had detailed discussions with seven different companies and they all had different versions of what size and type of installation we would need to achieve these objectives. Some said that the objectives were not all achievable, others said there were," says Smith.

"Finally, with DUoS red band charges due to go down, DSR rules changing almost daily and predictions of vast reductions in battery storage cost in the pipeline, we decided that the time was not right. The whole project would have cost around £1.5m and, depending on who and what you believed, would have had about a 4.5 year payback," says Smith.

"We will no doubt re-visit the subject at some future point." te

Depleting stupidity...

We need to change the way we think about energy efficiency resource if we are to achieve its full potential, writes EnergyPro's Steven Fawkes

I was glad to see that Amory Lovins returned to the subject of the size of the energy efficiency resource in a recent paper in *Environmental Research Letters*.

Amory mentions the oil and gas resource and reserve analogy that I wrote about again in May. The energy efficiency resource, just like other resources, is really found in the minds of people and the scale of the energy efficiency resource, just like oil and gas, is defined by our ways of thinking about them. Amory says in one of his brilliant phrases: "Energy efficiency resources are infinitely expandable assemblages of ideas that deplete nothing but stupidity – a very abundant if not expanding resource."

Steven Fawkes

My PhD back in the early 1980s, *The Potential for Energy Conserving Capital Equipment in UK Industry*, examined the viability of Gerald Leach's 1979 Low Energy Strategy for the UK and came to the conclusion that such a future was possible (in industry) even though it involved an improvement in energy efficiency of c.30%.

As I have written about before, we have practically achieved that future – a future that back then was regarded as impossible by the energy industry, the government and most analysts at the time.

My view is that the potential using proven technology, current economics and "standard thinking" about energy efficiency is always about 30%. Thinking about energy efficiency in a different way using the integrative design techniques long pushed by Amory and others, but still not widely adopted, increases the size of the economic potential to much higher levels, maybe 60-70%.

As is often the way, several ideas or conversations come together at once. I am currently reading *Zeronauts* by environmental business guru John Elkington. It highlights the power of the idea of aiming for zero – zero energy, zero emissions and zero environmental impact, and highlights leaders who have worked to turn this idea into reality.

Totally zero may not be possible in a particular situation but it is a powerful organising idea that opens up what may be possible. If leaders and decision makers don't set a target and simply accept for instance a building built to building regulations, the potential efficiency resource remains unidentified and unexploited. Setting a target of zero energy may not actually result in zero but it certainly expands the way the design team and others think.

At the AECB's recent conference, which was held in a community centre built to passive house standards, I visited some passive houses and the passive house technology is another example of how the mind defines the resource. passive house is a technology, a combination of thinking and physical technologies, that enables the construction of a house that uses much less energy than a house built to building regulations, as well as delivering better comfort.

If all new housing was built to passive house standards, the energy saving compared with houses built to code would be immense. Yet most developers don't even consider it, either because they don't know about it or they believe it will cost more, or they don't trust it.

It takes leadership, stepping out of the norm, to specify a passive house design as well as persistence often in the face of opposition.

> *Totally zero may not be possible in a particular situation but it is a powerful organising idea that opens up what may be possible*

Many large new developments are now being built with district heating to meet planning regulations. It would be much more cost-effective to simply build the development to Passive House standards, thereby eliminating the need for district heating with all of its central plant pipes, heat exchangers and control systems, all of which have ongoing maintenance requirements.

But again, unless leaders and decision makers consider the possibility, as well as the benefits, potential energy efficiency resource will not be exploited, locking in unnecessary energy use and complexity for many years or even decades.

To make another connection, I recently participated in the first advisory council meeting of the Horizon 2020 funded project, M-Benefits. This important project is developing tools to help decision makers incorporate multiple non-energy benefits into decision making about energy efficiency projects.

As I have said before, these non-energy benefits such as health, well-being, productivity, better learning outcomes etc, are far more strategic and therefore far more interesting to decision makers than simple energy cost savings.

We need to focus selling efforts for low-energy solutions on those benefits and regard energy (and consequent energy cost savings) almost as a bonus. Doing so will lead to better business cases, higher rates of approval for projects and higher investment into energy efficient solutions.

So for any situation – industry, commerce, domestic, or transport – we can continue to think about the energy efficiency resource in the old way – and we will achieve significant economic and environmental gains – or we can change the way we think about it, aim for zero, insist on integrative design and value non-energy benefits, and we will achieve far more, far more than the mainstream views on what is possible. te

Steven Fawkes is European lead on the Investor Confidence Project. This article was first published on his blog at onlyelevenpercent.com

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A united focus

United Utilities has reorganised its energy function to deliver an integrated approach to procurement, management, flexibility and resilience. Neil Gillespie, director of energy and market services, says the strategic shift enables the company to cut costs and carbon, adapt more quickly to a changing regulatory environment, and support the transition to a smarter, cleaner energy system

The UK energy system is in a period of unprecedented change. As we move towards a low-carbon economy and technological developments continue apace, the lines between generators and end users are becoming blurred.

More and more companies and individuals are installing technologies such as solar PV or battery storage to produce their own low carbon energy and take greater control of their energy bills. And regulation has been struggling to keep up... until now.

The stream of new consultations, roadmaps and strategies coming from Beis, Ofgem, National Grid and others is evidence of significant changes afoot in the industry. Perhaps one of the most significant is the sweeping reforms to network charges proposed by Ofgem.

As triad avoidance became more and more beneficial, and more consumers participated, it was always inevitable this system would eventually need reform. But as the potential options available to recover the costs of running the UK electricity network emerge, it looks likely that future charging could be even more complex than it is today.

This is just one example of increasing complexity for end consumers like United Utilities. It is an issue we have decided to meet head on. By refocusing our energy activities to seize on the emerging energy sector revolution we are formulating a strategy which is good for us, our customers and the UK.

A three-pronged approach

Operating water and wastewater treatment plants and distribution networks is a complex enough business without having to worry about managing the electrical infrastructure too.

At United Utilities we have taken away this additional complexity by delivering a complete energy service to our water and wastewater operational business. Our Energy Services model brings together the various energy

United Utilities' estate now has the capacity to deliver 40GWh of renewable power to its sites every year

functions from around the business into one team. This allows us to focus on providing a secure supply of low cost electricity to our operational sites so that managers are left to do what they do best – delivering high quality water and wastewater services to our customers.

Energy Services is focused on three main areas:

The Energy Infrastructure Services team is responsible for making sure incoming electricity infrastructure and back-up supplies to all of our sites are maintained to the required standards and provide the electrical resilience we need. This includes managing our relationship with the local distribution network operators for planned and unplanned interruptions. Put simply, their role is to keep the lights on, so we can keep the water flowing.

The Energy Performance Management team helps our site teams drive down their energy costs. We have embedded energy engineers into the operational teams, who work together to analyse energy performance and identify and deliver improvements to reduce consumption and cost of power. We have also developed our own energy portal, which provides detailed electricity consumption and generation data for every site, alongside indicators of relative efficiency (for example, the amount of energy required to produce a megalitre of water). This capability is being developed to take advantage of AI and machine-learning to analyse the vast amount of data we have on energy consumption and plant performance. This will help us improve the efficiency of our sites even further.

Finally, the Energy System Operation team makes sure that we make use of the flexibility we now have within our operations. While we need electricity to power our operations we do have some choices about when we operate certain plant and whether or not we can ramp up or ramp down both power consumption from our operational assets and generation from our back-up generators and CHP engines.

Understanding this flexibility and having the tools to control these assets allows us to optimise the lowest cost supply of power and also earn revenues from a variety of demand side response markets. This is a really exciting area for us and we have been developing our approach over the last five years. It's a win-win – we help the grid balance the electricity network by helping with security of supply and removing the need for investment. Plus, we get paid for providing the services, which offsets the cost of the electricity we consume.

Neil Gillespie

Renewables push

Focusing on energy and innovation has also driven us to increase the amount of renewable power we use, minimising our carbon footprint and helping to tackle future challenges around climate change.

Over the past four years, our renewable energy business has had tremendous success, building more than 50 separate solar PV installations (including a 3MW floating solar array at Godley, near Manchester, pictured), four wind turbines and a hydro scheme across some of our largest facilities in the North West.

Our estate now has the capacity to deliver 40GWh of renewable power to our sites every year. This complements the 140GWh of renewable energy we already produce through CHP, hydro and the injection of biomethane gas into the gas grid.

In total, we are now generating about a quarter of our energy needs ourselves.

Benefits and challenges

We believe our model can deliver real benefits for our business. A reliable and resilient supply of electricity coupled with lower energy consumption and ensuring energy supplied at the lowest overall possible cost helps us to deliver our services at the lowest sustainable cost too. It is great news for customer bills and is entirely consistent with our aims as a responsible business.

But many challenges remain. Market access is still the most fundamental concern for us and other flexibility providers. Notwithstanding welcome changes promised to National Grid's procurement of ancillary services (SNAPs) and widening access to the Balancing Mechanism, ensuring that large energy consumers are a part of and engage with a future energy system is of paramount importance if decarbonisation is going to occur at the lowest possible cost to end consumers. te

Businesses facing 'a perfect storm'

Energy price rises will bite this winter, warns Npower.

Businesses will start to feel the full effect of energy price rises this winter, Npower has warned.

"Today we are seeing winter baseload power prices above £72/MWh and peak prices around £80/MWh. Whereas we have customers that locked in last winter at £35/MWh," said Ben Spry, head of risk management services – Energy HQ at Npower Business Solutions.

"Depending on their hedging strategies, they are now exposed to stuff at £70-plus. That shows how quickly the market can move."

Spry said the effect of rising non commodity costs – such as government policies to support low carbon power generation, or security of supply over winter – have been "masked" to date by benign wholesale prices. But that has changed.

Ben Spry

"We are now seeing bullish commodity as well as a step up in non-commodity," said Spry.

He points to a "huge bullishness" in most fuels, "but especially coal and carbon," with the latter hitting 10-year highs in recent weeks on the back of reforms to the EU ETS.

"On top of that, there are a lot of gas outages," said Spry. "That's routine for this time of year but low storage levels compound [the risk premium]."

Then there is ongoing concern around ageing nuclear fleets. "France always comes into focus around this time of year," with Brexit uncertainty now also coming to the fore, said Spry.

Currency weakness plus a high oil price is compounded by early weather forecasts that currently predict a cold November. "It's almost a perfect storm," Spry suggested.

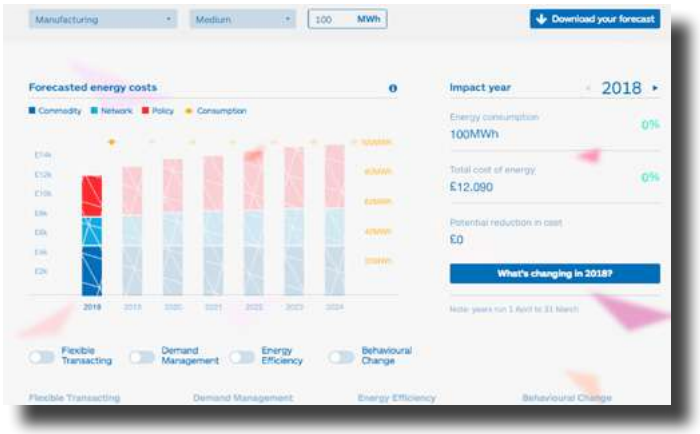
While volatility creates opportunity for those on flexible contracts and with the ability to shift load, for many businesses "there has never been a more pressing time to start reviewing how you buy, use and manage energy", said Spry.

The firm has launched a cost predictor that enables businesses to predict energy price rises based on their profile and usage. It forecasts business bills out to 2024, breaks down commodity and non-commodity elements, explains what is driving rises and highlights savings that could be made through specific actions, such as energy efficiency, demand-side response and behaviour change. In some cases, it shows bill savings of more than 50%.

Spry said the calculator gives energy managers a useful tool to show finance departments what is driving cost and how increases might be mitigated.

He hopes it will also work as a marketing tool to bring businesses to Npower, which, like all suppliers is pushing harder into broader energy services over commodity sales.

"Will we be at the table if we are focused on supply? Absolutely not," said Spry.



Npower's cost predictor shows what is driving costs and how increases might be mitigated

"The industry is changing, it is becoming more decentralised. All sectors are going to be affected one way or another, but there is opportunity in terms of flexibility and cost avoidance.

"Different businesses have different appetite [for risk]," said Spry.

"Flexibility solutions might not be suitable for everyone, but using the cost calculator they can see what's coming. Then hopefully we can talk about the interventions we might make." te

Protecting your assets: the importance of battery testing

Megger's Antony Wills discusses the need for battery testing to ensure the resilience of mission critical facilities as sites cannot afford to become complacent

Standby batteries sit unused for 99% of the time and, as the UK has quite a reliable power supply, it is easy to become complacent. Yet battery failure is a leading cause of load loss. There are some myths and misconceptions in the market that need to be dispelled and the quality of testing still varies widely throughout the UK.

There is a tendency to fit and forget batteries but it is critical that your assets work when called upon, so testing is essential to prevent any costly downtime. Some people believe that batteries, that are advertised as being 'maintenance-free', do not need to be tested, but this simply means that you cannot perform maintenance on the battery – it can still fail before the end of its designed life. Battery capacity can drop significantly long before its calculated life expectancy is reached, and the battery can have weak cells that can cause costly service interruptions.

Capacity testing

A reliable way of measuring battery capacity is to conduct a discharge test, which can be done with a series of test instruments that enable sites to perform discharge tests at constant current, constant power or constant resistance, like our Torkel range does; users can even test the batteries on-line and get extra load units if they need a higher load current.

Our BVM, a battery voltage measurement device that is used for individual cell voltage measurement of large battery banks, can also be used in conjunction with the Torkel to perform a completely automated battery bank capacity test.

Impedance testing

To complement this, impedance testers are also available. The battery impedance test helps to identify weak cells before they cause problems. However, taking the battery off-line for testing is time-consuming and risky – but you don't need to do this if using the online testing capabilities of Megger's battery test equipment.

For example, the BITE line of battery testers will perform online testing that will determine the health of lead-acid batteries up to 7000 Ah. The BITE range of battery testers measures cell impedance, cell float voltage and inter-cell connection resistance, as well as ripple and float current.

Key testing considerations

End users need to consider the practicalities of the test. If they are going to use a discharge tester and remove most of the energy from the battery system, they must ensure the operation is not left vulnerable in the event that the battery is called upon towards the end of the discharge. Impedance tests are very quick and give you a good level of confidence that the battery is going to be ok, but it is good to correlate this with discharge tests – at intervals – so that you can decide when to swap out the entire battery.

Some sites may have their own built-in diagnostics and reporting systems. However, in general, it is recommended that batteries are tested at: delivery, to get a baseline value; when they have reached a quarter of their life; half way through; and then at 75% of their life. After this, you will need to conduct more regular testing to verify that the battery will be in good condition towards the end of its life. Even a single cell failure may mean that the battery cannot deliver its power anymore, so it is important to identify if any of the cells are going to fail towards the end of the battery's life.

Ultimately, regular capacity and impedance testing is essential for predictive maintenance and protection of assets, and it must not be time-consuming or expensive. Megger supplies a range of easy to use testers designed to provide either a full test or just a quick check of the battery's condition.

For more information, visit **uk.megger.com** or email **uksales@megger.com**

Megger

Call for data centres to improve thermal strategies

Thermal issues are top of the list of problems found in data centres, warns Vertiv's Simon Brady. He tells Louise Frampton that data centre operators need to get to grips with the basics

Seconds matter when critical systems go down, with the recovery potentially taking hours or even days to restore the entire infrastructure, damaging reputation and the ability to trade. Yet many data centres are failing to get to grips with thermal issues, putting their facilities at risk, warns Vertiv's head of data centre optimisation, EMEA, Simon Brady.

"When carrying out surveys, in 2017, I found thermal issues in virtually every case – in fact, it was the number one issue," comments Brady. "It is rare for me to find a temperature underneath a raised floor anywhere near where it should be."

"With 29% of outages due to thermal issues, data centres need to improve their thermal strategy," comments Brady.

"If equipment gets too hot, it can lead to thermal overload. It is not an equipment failure, per se, or a software issue, it is simply that part of the room is too warm. This is 100% preventable."

It is not just overheating that is posing a problem; many data centres are also over cooling, leading to wasted energy and higher costs.

Brady advises that effective control and monitoring systems can help optimise the temperature and avoid knee-jerk reactions. A lack of data can lead to either over cooling, or undercooling, if operators haven't fully understood the issues in their data centre.

One strategy is to use the services of a third party to provide remote diagnostics and preventive monitoring for thermal management equipment, with the aim of delivering increased uptime and operational efficiency. Data can be transferred from equipment, to allow experts to gain a real-time insight and quickly identify, diagnose, and resolve any irregularities that may arise in operation.

Brady points out that over 35% of data centre energy use is attributed to cooling: "After the IT load, cooling is the number one consumer of energy. Data centres need to understand what the best practices are. There are a number of standards that are out there to help.

"The EU Code of Conduct for Data Centres offers lots of hints and tips, for example, and it is free to download. As I walk around data centres, I see problems all the time... sometimes I think there is a bit of apathy: 'It's not broke – I don't have to fix it.'

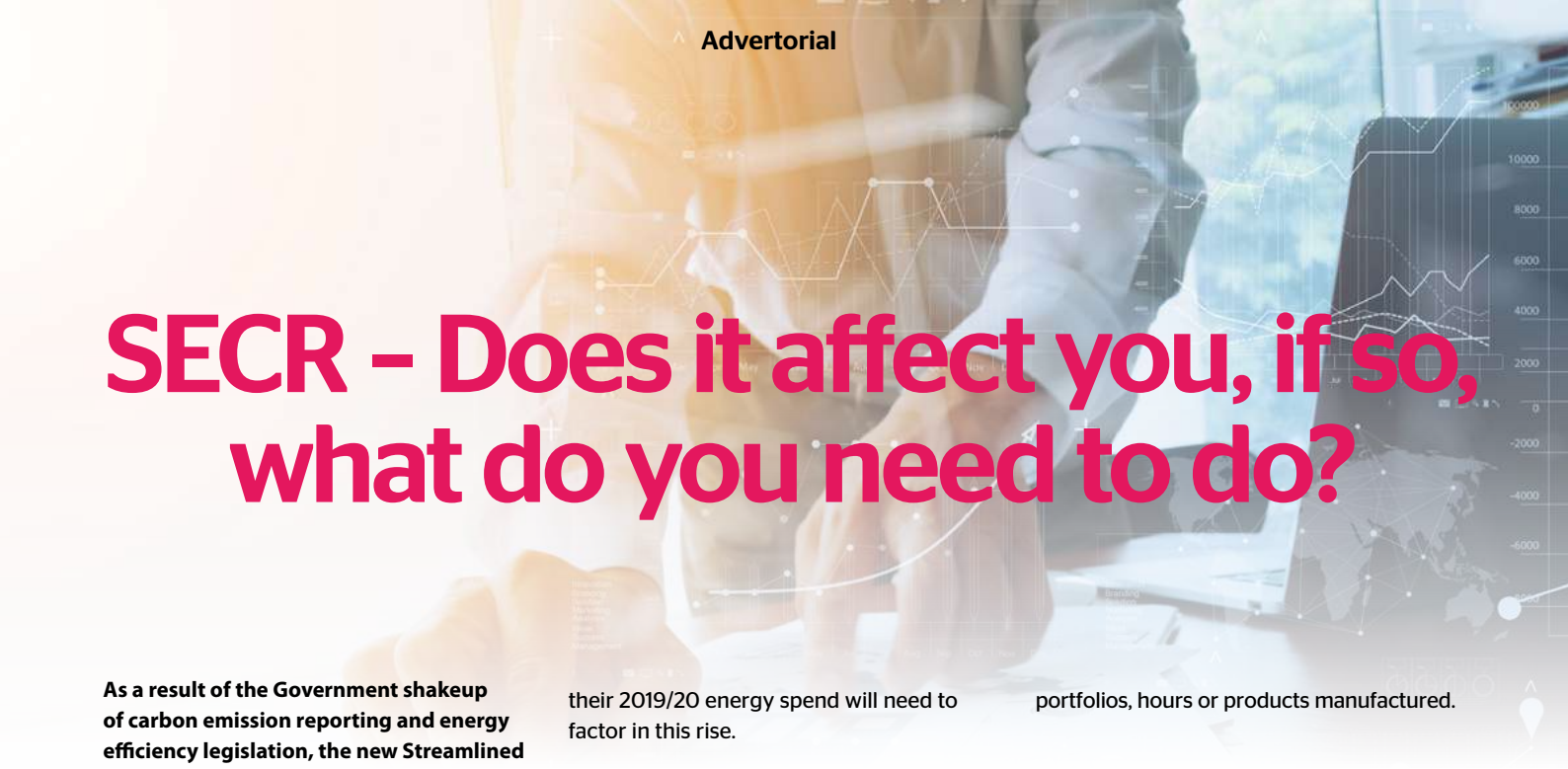
"Data centres need to make a plan and tackle the small things such as blanking off; if you tackle the small things, it will enable you to deal with the bigger issues; to increase your temperatures, overall, in your cold aisle; raise chilled water temperatures on your chiller and implement free cooling. You cannot do these things until you have tackled the basics."

> *It is rare for me to find a temperature underneath a raised floor anywhere near where it should be*

Brady also highlights some interesting developments in terms of technology. "Adiabatic, evaporative and free cooling are the way to go. The cost of R401 gas has gone from £5/kg to £50/kg in the space of six months due to EU import restrictions. The cost is going up for every air-conditioning manufacturer.

"Soon, it could cost more for the gas for an air-conditioning unit than the actual air-conditioning system itself. Having a system that doesn't rely on mechanical cooling compressors, is going to be critical moving forward, if this situation isn't resolved."

The return on investment, when replacing a traditional chiller with an adiabatic free cooling system is typically about three years, according to Brady. However, it can be as little as one year. te



SECR – Does it affect you, if so, what do you need to do?

As a result of the Government shakeup of carbon emission reporting and energy efficiency legislation, the new Streamlined Energy and Carbon Reporting (SECR) framework, which is coming into force from April 2019, will affect an estimated 11,900 organisations in the UK that will now need to comply. Unlike ESOS, it will be an annual submission included within the director's report and will be required to cover all consumption and resulting emissions, including those associated with transport.

SECR is set to replace the CRC Energy Efficiency Scheme that is coming to an end after the 2018/19 compliance year. It will act as the new instrument for businesses to collect, measure and report on carbon emissions and performance. However, approximately 4000 companies (and 1,200 other public and private sector organisations) were required to report on their carbon emissions under the CRC. Moving forward, organisations that qualified for CRC may not qualify for SECR as the qualification criteria is changing from energy consumption to size indicators – the official definition of 'large' organisations.

It is important to note that the criteria change will result in over 7,900 additional companies being required to report on their carbon emissions for the first time. Emma Hird, client optimisation manager at Inspired Energy, who is responsible for ensuring clients are compliant with energy and carbon legislation comments that it is more in line with the ESOS qualification criteria. "If you qualify for ESOS then it's almost certain that you will be required to comply with SECR."

It is important to note that with the revenue generated from the sale of allowances in the CRC scheme disappearing, Government is set to recoup this via increased Climate Change Levy (CCL) charges. Organisations budgeting for their 2019/20 energy spend will need to factor in this rise.

Dates and data

Hird notes that, "while it is essential to be aware of the changes and whether you are within or near the scope of the qualifying criteria, nothing is set in stone just yet." The best thing at present is to keep up-to-date with the latest SECR developments from BEIS so you can put procedures in place once reporting guidelines are published. "You can register for updates by emailing our team via **secr@inspiredenergy.co.uk**. I would also recommend ensuring that you have good visibility on all of your energy consumption data and if you are already doing GHG (Greenhouse Gas) reporting, then keep it up," suggests Hird.

Although there are some consultants currently offering solutions, Hird stresses that none of the processes are in place for sure as yet. The finalised guidance for reporting is anticipated to be published in January 2019, and will reflect requirements from April 2019. For a company with a financial year beginning 1st April 2019, compliant documents for SECR are required to be included in the first set of accounts published following 31st March 2020. For companies with a financial year beginning 1st January 2019, SECR compliant documents will be required to be included in the first set of accounts published following the 31st December 2021.

The reporting structure is expected to be more like CRC than ESOS, with it expected to have to include carbon emissions, total underlying energy use and energy efficiency action undertaken. An energy intensity metric is anticipated to also be required, which is good for firms that are using more energy than in previous years through expansion, such as increased property portfolios, hours or products manufactured.

Getting the right help or go it alone?

Hird explains that of course it is possible to do it all yourself but it is rare to find large energy teams within organisations that would be able to keep on top of it. "We have developed functions within our proprietary software that collects and gives visibility of all the information required for SECR based on the present guidance from BEIS. Directors and managers are able to log-on and see their entire portfolio and how it is performing. If there are changes to the SECR regulations either in January or in the future, then our software will change to reflect this. A reduction in an energy professional burden that ensures compliance is achieved without unnecessary inconvenience."

SECR qualifying criteria

- All quoted companies.
- All large UK incorporated unquoted companies and LLPs fulfilling at least two of the following conditions in the financial year:
- at least 250 employees
- an annual turnover of £36m+
- an annual balance sheet of £18m+
- Qualifying UK registered subsidiaries of parent companies not registered in the UK.
- Public bodies which include limited company or LLP elements.

Excluded Companies:

- UK subsidiaries that qualify for SECR will not be required to report if they are covered by a UK parent's group report.
- Qualifying large companies that are not registered in the UK.
- Organisations not registered as companies, for example some public sector/private/charity organisations.
- Qualifying large companies using less than 40,000kWh of energy in the reporting year.

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Ecolighting's Sapphire LED linear and Altos emergency LED lighting were fitted throughout the warehouse

Debenhams sees the light

Ecolighting UK has recently been specified for the new LED lighting at the Debenhams warehouse in Peterborough

Department store Debenhams has replaced the fluorescent lighting at its Peterborough warehouse with new LED lighting.

The retailer reworked floors one, two and three of the warehouse and chose Ecolighting's Sapphire LED linear and Altos emergency LED lighting to be fitted throughout following the success of a previous project through leading supplier of storage equipment Link 51.

Paul Street, engineering manager at Debenhams, comments: "We needed lighting that was specific to the project; the mezzanine floor is fitted with shelves and has narrow aisles so we required a system that matched the arrangement of the warehouse.

"Ecolighting offers a specialist LED system that is energy saving and works well with the control system we currently have in place. The lights time out when an area is not in use and with the five-year guarantee, 12-month installation warranty and the fittings being maintenance-free, we're very happy with the results."

Total costs considered

When assessing the installation, Ecolighting considered the running and maintenance costs for the site as well as the energy efficiency, maximising the reduction in CO_2 and fitting the design criteria. With no natural daylight available on floors one and two, Ecolighting removed the current fluorescent lighting and replaced it with a more effective and energy saving LED system.

To cope with existing demand, even after converting floor one from an open automated area to a fully racked picking area, significant energy savings were achieved because of the LED and sensor technology.

> *We needed lighting that was specific to the project... we required a system that matched the arrangement of the warehouse*

By installing the Sapphire LED linear, Debenhams has the benefit of a sensor which is activated by occupancy. Its wide range of sensitivity means it performs equally well at height. The sensitivity is user adjustable, which is useful in an environment where fast moving mechanical handling equipment is being used.

The same sensor incorporates light level monitoring through DALI dimming. By constantly reading the light levels in its range, the sensor detects when it needs to deliver light and how much to deliver in order to maintain the required light levels. This function allows management to determine and deliver the precise light levels required, fulfilling health and safety needs while also cutting the cost of providing unnecessary extra light.

The same function also enables the luminaire to steadily increase output, compensating for the gradual deterioration that affects all lamps over time and extending the maintained light levels for longer and reducing costly maintenance intervals.

Each DALI fitting is capable of a pre-determined set-back level. Levels range from 100% to 1% and can be set to hold a lower light level for a pre-determined time to offer a background illumination level (at times of zero occupancy) or off completely. Once triggered by occupancy the fitting brightens to the higher output level and holds that level until no occupancy is sensed

LED lighting technology has been significantly developed in the past 12 months. Efficiency of products now exceeds 140Im/W for linear fittings and 160lm/W for high bay fittings and with the use of prismatic diffusers and lenses, luminaires can now manipulate light delivery from what is essentially an omni-directional light source to provide a more usable, even spread of light from each luminaire. te

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If Carlsberg did lighting upgrades...

Brewer replaces outdated sytem with one that's 'fit for purpose'

Ledvance has helped Carlsberg's logistics centre reduce its lighting energy consumption by 50% – resulting in savings of 650,000kWh and 400 tonnes of CO_2 emissions per year.

Prior to the lighting upgrade at the logistic centre in the town of Høje-Tåstrup in Denmark, Carlsberg was conscious of the outdated and inadequate lighting system that was serving the five large warehouses and the outside area.

The conventional low light in some parts of the warehouse interior as well as exterior sometimes made it hard to navigate and work efficiently.

The ramifications on safety, productivity and overall employee stimulus – especially for night shifts – were too significant to ignore, not to mention the problem of fluorescent tubes and metal halide lamps burning out during operational hours and not being replaced due to the disruptive downtime a replacement would entail.

A step towards a better working environment

In Carlsberg's efforts to improve productivity, an improvement of the lighting was the next natural step.

"Not only would a switch from conventional lighting to LED lighting provide us with a 50% saving on electricity costs and a large saving of CO_2 emissions, but we also needed energy-efficient, flexible lighting solutions that were a better fit for our purpose," says Jesper Larsen, head of distribution at Carlsberg.

A proposal for a lighting upgrade, prepared by electrical contractor Michael Hansson from Kvalitek, outlined a plan that would improve the lighting quality significantly.

New LED luminaires

In the five large warehouses, the conventional luminaires, each fitted with three 58W T8 fluorescent tubes (4000K), were replaced with damp-proof 55W/4000K LED luminaires from Ledvance.

Besides their efficiency of 115lm/W, the luminaires were selected for their luminous flux of 6400 lumen and their neutral white colour temperature of 4000K. With a lifetime of 50,000h (L70/B50) the LED luminaires last about 2.5 times longer than the conventional types.

The conventional lighting burned out frequently in the outdoor and loading ramp areas. This is where powerful metal halide spotlights had to light the driving paths for the trucks when loading and unloading.

The new 200W LED floodlights have a lifetime that is about five times longer and employees benefit from the homogenous and bright light of the new floodlights with a luminous flux of 20,000 lumen.

The floodlights are also used to illuminate the facades of the buildings.

All the way through the project, Kvalitek has worked on improving the light system for increased energy savings, a higher quality of illumination and sustainability. te

Carlsberg has upgraded to Ledvance luminaires at its logistics centre, reducing energy consumption and emissions while improving the working environment

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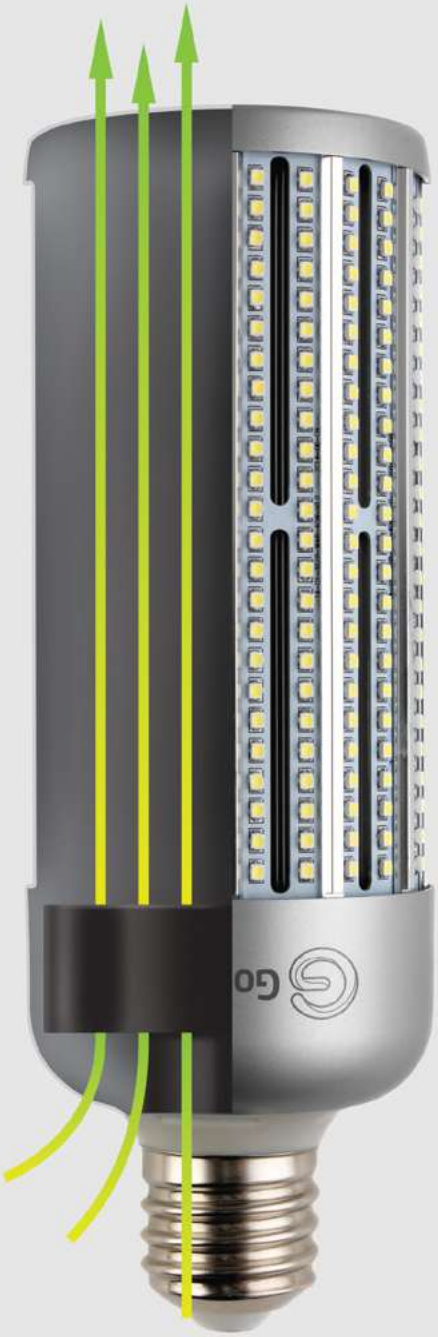

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The kids are all bright

A new London free school saving on energy costs with the aid of lighting presence and slimline motion sensors

B.E.G. has been selected to supply presence and motion sensors for a new free school in London.

John Keats Primary Free School opened in September and occupies the first two floors of a new residential development in South Bermondsey.

The lighting had to be designed and controlled in a way that would maximise the pupils' comfort, concentration and alertness. It also needed to be automated and adjustable, with different areas requiring different lighting levels and timings, and the additional need that areas were only lit when occupied, to save energy and reduce costs.

Presence detection

To meet these requirements, B.E.G. supplied two different types of presence and motion sensors from its range of KNX products – the PD11-KNX FLAT FC and the PD4 KNX C FC.

The products offer the dual benefits of lighting flexibility to ensure the building is fully energy efficient, while helping to create the right learning environment.

The PD11 sensor was selected for the classrooms and offices as it is less than 1mm thick.

The classrooms have been set up to operate in semi-automatic mode (sometimes referred to as absence detection). This means the lights and the detector must be turned on with a wall switch. The lights then set their brightness levels automatically and will continue to operate until there is enough natural day light or no one is present in the room. Reading the level of daylight in the room, the PD11 automatically adjusts the luminaires to the required level to make sure the lighting level is always enough and make maximum use of natural light.

The PD11 automatically adjusts the luminaires to the required level to make maximum use of natural light

Potential reduction in energy costs using automated controlled systems

For the corridor areas of the school, which run nearly the entire length of the two floors, the PD4 C was selected. The product is designed to cover long corridors and so fewer devices were required to get full coverage, resulting in a reduction in time and further cost savings for the school.

The building controls, cabling and trunking was designed and installed by Neo System Automation. The company used the B.E.G. lighting sensors as part of an all-encompassing modular I/O WAGO 750 Series building control system, along with other KNX devices, to control not only lighting but heating, ventilation and air conditioning (HVAC) also.

Proven results

The KNX system monitors conditions to provide optimum lighting, temperature, humidity and CO_2 levels in the school, all of which have been shown to improve alertness and concentration.

Importantly, with use of the B.E.G. sensors, school staff can manually override the controls and dim the lights down or off for presentations or showing films, while reducing lighting levels in areas when there is no occupancy at all. Automated controlled systems can reduce energy costs by up to 30% compared with manual control.

Carlton Reed from Neo System Automation says: "The primary reason for using B.E.G. is because of the choice and quality of its sensors. Being totally flat, the PD11 not only does the job it needs to do, but they also blend into the ceiling and are so discreet, making for a more seamless look.

"The PD4 corridor version, with its great extended coverage, meant we saved time and the school installation costs as fewer detectors were needed on the ceilings." te

Some light reading

Paddington Library now benefits from intelligent and efficient system

Sylvania has specified SylSmart, a smart lighting solution, for Paddington Library in central London.

SylSmart is able to detect human presence and natural light, adjusting the light levels to only emit what is needed. This ability is a benefit to a space with fluctuating footfall levels.

In order to gain funding for the Westminster Council project, a demonstrable payback period of less than five years including maintenance, or eight years on energy alone, was vital.

Jonathan Willis, service delivery manager at Paddington Library, comments: "With the library open seven days a week, any downtime for maintenance is very disruptive to users, so we had to keep that to a minimum. The installation was very straightforward as the lights programme themselves and learn where the nearby fixtures are.

"The lighting system provides uniform light at reading level that promotes comfort and helps library users maintain focus without feeling disorientated or tired. There are carefully positioned spotlights in darker areas, helping library users to locate books or other materials."

Adjusting to human presence detection and natural daylight, the SylSmart Connected Buildings decentralised lighting solution enables possible energy savings of up to 87%.

Sylvania Rana LED suspended luminaires provide the lighting throughout the library, with direct light distribution down to desk and shelf level and neutral white 4000K colour temperature.

The SylSmart Wall Switch and remote PIR sensor provide further control for the system.

Downstairs in the library, the Sylvania SylFlat dimmable recessed downlights provide pockets of light above book shelves and magazine racks.

The Sylvania Giotto LED surface luminaire completes the uniform 4000K colour temperature throughout the library,

Future layout changes inside the library will require no re-programming of the lights. te

Strong LEDs for tough environments

Fitzgerald Lighting has launched an industrial luminaire for subways and walkways as well as prisons, police cells and stations.

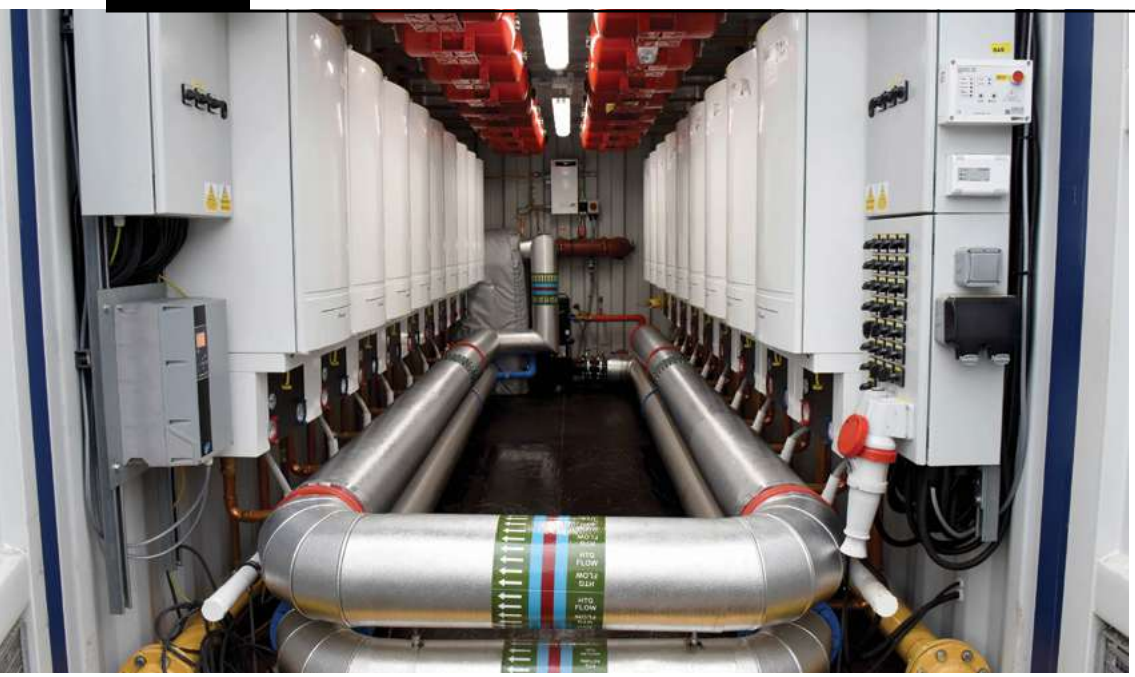
The LED Stronghold luminaire is designed to attain anti-ligature status and is tested to the requirement of the National Offender Management Service.

Two versions are available: a surface-mounted fitting and a corner-mounted design, both available in 10 wattages and lengths from 11W and 720mm long to 66W and 1910mm long. Made to IP65 rating, all LED Stronghold luminaires are suitable for internal or external applications and comes with a a five-year warranty.

As an example of efficiency, the 66W Stronghold luminaire saves some 53% energy against a comparable twin 58W T8 fitting. Also, the LEDs in the Stronghold luminaire have a 50,000 hour life with no lamp maintenance.

The Stronghold luminaire can incorporate Fitz-i, giving a wireless connection for recording and monitoring remotely and also saving site emergency lighting testing requirements. The standard luminaire comes with a constant output driver and there are 1-10V and DALI addressable dimming options and a three-hour maintained emergency option available too.

LED lamp colour temperature is 850 as standard or available as colour 840 as an option. Occupancy and daylight sensor options are also available. te



A flexible solution for social housing

Cost-effective and efficient modular condensing unit housed in a shipping container chosen for Bromley housing development

When the 30-year-old boilers in the plant room at Burnt Ash Heights, a housing development in Bromley, Kent, were judged to be beyond economical repair by social housing provider The Riverside Group, Robert Heath Heating was asked to propose an alternative. Its solution came in the form of the what is claimed to be the world's largest modular condensing unit, housed in a shipping container.

Burnt Ash Heights iscomprised of about 450 dwellings. The building's heating and hot water provision is supplied via a heat network with a central plant room.

The cost of replacing the 30-year-old cast iron boilers in the underground plant room was estimated at roughly £350,000.

The project needed to be completed within a tight timeframe given that the problem arose during the winter months.

A modulating solution

Robert Heath Heating decided to contact Bosch Commercial and Industrial, having worked closely with it on other projects. To begin with, Robert Heath Heating was asked to risk manage the existing plant room in order to keep it running while the modular condensing unit project commenced at Robert Heath's head office in Surrey.

Space-saving efficiency

Bosch supplied 18 100kW GB162 high efficiency condensing boilers for the unit, which were installed as a multi-boiler in-line cascade system (pictured).

With the ability to automatically modulate down to as little as 20% of their total output in order to meet heating and hot water demand as accurately as possible, the condensing boilers also offer up to 110% net efficiency and are expected to significantly reduce fuel consumption. What's more, they can be sequenced to come into and out of operation when required to ensure even load matching, reducing the general wear and tear of each unit.

The shipping container needed to be positioned on site next to the property due to restricted space and maintenance access, making the compact dimensions of the GB162 condensing boilers suitable for the project.

Building blocks to success

In just four weeks, the container was transformed into a fully functioning temporary plant room, with the ability to modulate between 20kW and 1800kW of power. The container was then transported from Surrey to the site in Bromley and within six hours had replaced the existing plant room, following a successful decommissioning.

Chris Vincent, head of commercial gas at Robert Heath Heating, commented: "In terms of the future of the project, the Riverside Group has an asset which is set to function for around 15 years. The nature of the solution makes it extremely flexible, so that in future it can be fully transported to another development or alternatively, dismantled with each of the 18 condensing boilers distributed to other sites."

With minimal disruption to residents and no faults reported since the installation of the temporary unit, the project has been deemed a resounding success. Moreover, due to the energy efficient heating technology chosen, the annual energy bill for the housing development is expected to drop by nearly 40%. te

Expected reduction in annual energy bill

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Let's stop binning heat

Stokvis Energy Systems' Paul Sands asks why are we so bad at recycling heat? He outlines the potential for making more use of waste heat and touts heat interface units as a solution

A quick glance along almost any residential street in the UK when the rubbish collection is due reveals the extent to which recycling has become a part of our lives; with the once ubiquitous metal bins replaced by a varied set of brightly coloured containers to take plastics, paper, glass and other recoverable materials.

Yet reducing energy usage, and thereby carbon emissions, is arguably an even more important goal. Which raises the question: why are we so bad at recycling heat?

There have been some significant steps forward in recent years with high-efficiency or condensing boilers, which feature larger heat exchangers recovering more energy from the flue gases, now dominant. But technologies such as mechanical ventilation with heat recovery (MVHR) are rarely seen in domestic situations as, although recognised within SAP calculations, they are only mandatory for dwellings built to PassivHaus, or the Canadian Super-E specifications.

The latter two standards have been responsible for shaping some of the UK's best performing properties but our own aspirations for having all new dwellings designed to the Code for Sustainable Homes Level 6 were shelved. Cost has also constrained the targets for improving the millions of existing properties which often score a 'D', or lower under an EPC.

Looking across infrastructure, manufacturing and even power generation, it is all too easy to see where heat energy is going to waste. It is not just huge cooling towers spewing out steam, but our supposedly low carbon nuclear power plants sucking in millions of gallons of seawater to cool the reactors, or factories 'dumping' process heat in rivers.

The idea of capturing waste heat and using it to warm other premises is not new, but compared with many of our European neighbours, the UK's uptake of district heating schemes or heat networks has been negligible.

One of the key aims of the government's Round 6 HNDU funding is to move consumers away from employing individual boilers, and onto communal schemes including centralised plant, CHP and solar. More adventurously, however, district heating schemes being fed by incinerators are growing in number while, in the capital, plans are in place to draw excess heat from the London Underground network.

All these initiatives offer huge energy saving potential, but one of the reasons district heating has failed to gain the traction it deserves has been the collective memory of early failures involving problems from leaking distribution mains to armies of pharaoh ants marching around the ductwork of social housing schemes.

> *Compared with many of our European neighbours, the UK's uptake of district heating schemes or heat networks has been negligible*

Improved jointing and integral insulation have addressed these issues but poor controllability and an inability to charge customers for what energy they actually use continued to stifle the successful of otherwise high quality installations. Which is why the modern heat interface unit (HIU) has the potential to finally deliver scale to district heating.

For anyone not familiar with HIUs, they create the interface between the primary circuit and the consumer, using high efficiency plate heat exchangers (PHEs) to extract heat for the dwelling's own requirements. They can incorporate a heat meter to provide accurate billing information and supply both domestic hot water and space heating, depending on their design. Importantly, though, they should be specified to match each system's characteristics, including temperature, flow and demand load. They can also be customised to suit special needs such as space limitations in retrofit situations.

The short to medium-term viability of UK energy policy remains dependant on making best use of existing, mainly fossil fuel-based generation. Modern heat networks using HIUs to meet consumers' precise needs offer a ready solution. te

New cooling system cuts consumption by 12%

Honeywell and Engie Axima's new cooling system for Eurocontrol will help achieve annual energy savings of up to 1,500MWh and will reduce total annual consumption by more than 12% – the equivalent of as much as €150,000 per year in energy costs.

Eurocontrol is an intergovernmental organisation that provides air traffic management for as many as 36,000 commercial flights per day within the European airspace.

The cooling system is designed to prevent overheating at Eurocontrol's headquarters and flight management and data centre facilities in Brussels.

Honeywell supplied the refrigerant and Engie Axima provided the equipment and servicing comprised of two Quantum chillers with remote condensers and two water-cooled Quantum chillers, achieving a total refrigeration capacity of 5MW. The dual chiller configuration allows for redundancy, with both chillers operating on 50% of their full load capacity.

The chillers use Honeywell's Solstice ze (R-1234ze) refrigerant, which replaces an older R-22 refrigerant.

Solstice ze has a global warming potential (GWP) of less than 1, which is 99.9% lower than R-22.

Solstice ze is designed for medium pressure chillers to cool large buildings, infrastructure projects and process chillers.

Modular chiller has flexibility

Aermec has launched the NRV range of modular air/water chillers with the aim of combining the benefits of a single large chiller with the advantages of multiple small chillers.

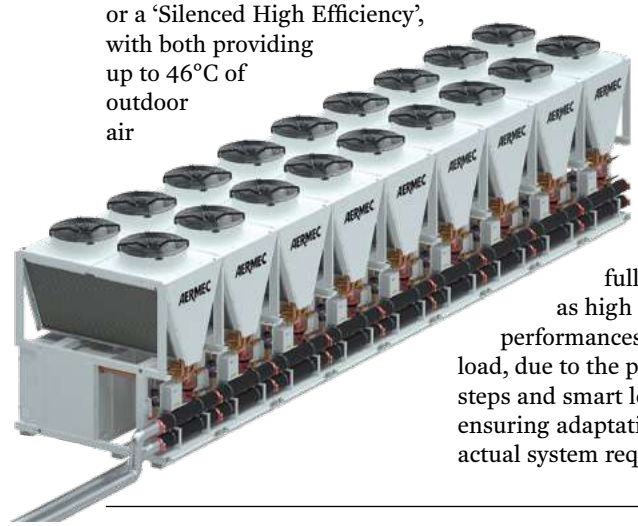
Comprised of independent 108kW modules, the NRV enables up to nine modules to be connected to each other, producing a total of 970kW. This has the advantages of delivering more capacity but keeps the overall dimensions and footprint to a minimum.

Two models are available in the NRV range, offering either a 'Standard High Efficiency' or a 'Silenced High Efficiency', with both providing up to 46°C of outdoor air temperature at full load. A free cooling version is also available for those applications where the requirement for chilled water is significant even during the winter months.

The greater the difference between the outside air and the requested water temperature, the greater the benefits of using free cooling.

Units specified with a desuperheater offer the possibility of providing hot water for free, depending on the application.

The option of connecting additional modules and managing them as if they are a single unit allows for maximum return at full load, as well as high efficiency performances at partial load, due to the partialisation steps and smart logic, ensuring adaptation to the actual system requirements.



Heat network Esco service

Switch2 Energy has partnered with sister company Ylem EPC, an energy contractor, to launch a full-service heat network Esco.

Switch2 EPC Esco Services will provide a complete end-to-end service for the life of the district heating scheme. This includes feasibility, design and construction, commissioning, financing, long-term operation and maintenance, together with billing and customer services.

Switch2 already operates community heating Escos for many public and private sector housing providers but its partnership with Ylem EPC means it can now offer the full package in-house.

The new Esco business combines Ylem EPC's experience in designing, building, financing and operating distributed energy centres, with Switch2's in supplying an end-to-end service to the community and district heating sector. This ranges from equipment supply, metering, billing and pay-as-you-go, through to scheme optimisation and maintenance, energy centre management and customer services.

Switch2 director Kirsty Lambert commented: "Our new Esco service removes the two biggest barriers to heat network development, which are project complexity and investment."

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The next frontier for energy efficiency?

Metered energy efficiency could unlock the holy grail of a market-based approach to cutting carbon while pulling in finance, reducing the need for network investment and unlocking new business models. Brendan Coyne reports

A UK-US partnership is attempting to embed a standardised, automated approach to real-time energy efficiency measurement into the GB energy system.

The firms involved believe it will enable an energy efficiency (EE) market that can help decarbonise the economy, reduce network investment and enable new business models based on actual data rather than calculations carried out to varying standards. They also think it could bring energy efficiency into grid balancing.

EnergyPro is currently in talks with the UK government about using an open-source software platform to help deliver the next phase of the Energy Company Obligation (Eco). Developed by Open Energy Efficiency (OpenEE) in the US, the software and the models it enables are starting to bear fruit in California, where it is being used to enable pay-for-performance energy efficiency projects and defer grid infrastructure investment.

According to EnergyPro's Alex Rathmell: "Metered energy efficiency is a standardised and automated way of 'measuring' energy savings in real time so they can be valued alongside other time and location-specific resources, such as demand-side response."

While energy efficiency can't actually be measured, Rathmell says energy use via real-time (or at least frequent) meter readings as enabled by smart meters can be metered. That means energy savings can be calculated against a counterfactual baseline.

Traditional measurement and verification (M&V) has long used that approach, usually for large building projects. Engineers use global standards to make a calculation – but how the calculation is carried out can lead to inaccuracies around the true savings.

OpenEE and EnergyPro believe a software-driven approach using smart meter data will deliver a more accurate picture – particularly for calculating the impact of aggregated domestic and small business energy efficiency measures.

Rathmell explains in a recent white paper: "The software takes meter readings, other inputs such as the local temperature conditions and uses a fixed, transparent, open source methodology to calculate savings, or avoided energy use (sometimes known as 'negawatts' or more correctly 'negawatt-hours'.)

If the meter readings provided are live, such as half-hourly smart meter readings, the savings calculations are live too," he states.

"When this approach is taken across a portfolio of home retrofit projects, it gives a highly accurate evaluation of the true, weather-normalised savings achieved by an energy efficiency programme. In any portfolio, some projects will exceed expected performance while others will under-perform, but in a properly targeted programme these effects balance out.

"This means savings can be measured for a tiny fraction of the marginal cost of using a consulting engineer to carry out the same analysis, making the approach viable for smaller sites such as individual homes."

OpenEE is using that approach in the US, particularly California, to enable new ways of structuring incentives and markets – and in some cases, leading utilities to defer investment in infrastructure (see box).

The companies believe a standardised approach based on metered data also derisks energy efficiency for consumers, investors and governments implementing energy efficiency programmes.

The software

The software underpinning the approach is called Caltrack (see caltrack.org).

"It's an open source methodology for taking simple inputs from a building - energy use from the meter, temperature data and information about an energy efficiency intervention carried out in that building - and turning that into an energy saving," Rathmell explains. "You are calculating the value of that intervention for that building based on metered data rather than, say, an SAP model, thereby moving into proper measured data."

The approach would not be suitable for large, complex Esco projects, "but at a household level, it is proven," says Rathmell. "Aggregated across a portfolio of households you get a really accurate picture of the savings that have been achieved – and that is a powerful concept."

Flexibility from EE

With accurate data and real-time locational measurement, energy efficiency "moves from static to dynamic", Rathmell suggests.

"It puts energy efficiency at the table with demand-side response, storage and all the other flexible technologies being talked about. It gives EE a seat at that table by enabling a time and location-specific resource rather than something that is modeled a year later that doesn't really reflect actual performance."

However, Caltrack was developed for the Californian market. The task facing

Alex Rathmell, EnergyPro

Rathmell and EnergyPro's is to find a suitable UK entry point. Their initial thinking is that distribution network operators (DNOs) might provide that opening – or potentially, energy suppliers.

"The software is open source. You can download the source code and statement of methodology from the OpenEE website – so we are not trying to create a cottage industry around its deployment as a product," says Rathmell.

"Our revenue model is likely to be enterprise integration into DNO systems, but that's in the future." For now, he says, it is all about getting concept out there. "The best way to do that is to deploy it in real projects – albeit those that don't yet use price signals and pay for performance models we will ultimately be using."

Which is where suppliers come in.

Eco push

Under the Energy Company Obligation (Eco), suppliers are mandated to deploy energy efficiency measures to help less well off customers. The next phase of Eco (Eco 3) is under development and Rathmell thinks it could prove a fertile test ground for metered energy efficiency while providing benefits for suppliers - and ultimately billpayers that pick up the tab.

"There will be a mechanism in Eco 3 to use in situ measurement - and if you can demonstrate your measures outperform the need, you qualify for extra credit to meet your obligations," Rathmell explains. "That is quite attractive to suppliers."

To prepare the groundwork, EnergyPro has conducted a "tentative" pilot with Beis using data from the National Energy Efficiency Database, creating a virtual dashboard to illustrate how a live iteration would function.

"You can see how contractors are preforming, how measures are performing against predicted savings and against other interventions; a whole suite of tools versus manual spreadsheets," says Rathmell. "But the real opportunity comes when Eco 3 goes live and, hopefully, we can deploy it."

Network innovation collaborators?

Network Innovation Competitions (NIC) – where energy networks are awarded funds by Ofgem to develop smarter ways of running their networks – are also on EnergyPro's radar. The company hopes to become part of a consortium bidding for NIC funds, says Rathmell, and recently pitched its ideas at the Energy Networks Association's NIC conference.

"Putting programmes like Eco and NIC projects onto the same measurement platform would be very powerful, because it allows the energy system to properly value energy efficiency interventions and account for them in terms of management and delivery," he says.

With support from the Energy Systems Catapult, the company hopes to find "innovative business model providers to see if we can collaborate on technologies that might be useful for DNOs," says Rathmell.

"If we can provide the evaluation tool, we can be part of those projects. So we are very keen to hear from people in that area with a view to collaborating on one or more innovation projects." te

Making energy efficiency a tradeable resource

OpenEE chief executive, Matt Golden, is one of the driving forces behind metered energy efficiency. He thinks it will provide the building blocks to commodification.

"You can't trade kilowatt hours without a standard understanding of what that is," he tells *The Energyst*.

"A market requires weights and measures, an agreement about what you are trading. That is what we do: a standard, open source platform that uses data from smart meters to measure how energy events impact demand at the meter on a time and locational basis," he says. "And that has not existed before."

The code "has been tested on 50 million meters and anyone can use it without restrictions", says Golden. "They can see every line of the code, there are no secrets. That is key."

Pay for performance

If everybody uses the same metrics for calculating savings, and the 'market' is updated in real time (via smart meters), new business models will follow.

"Efficiency is really weird, it's one of the only things where we pay people in advance based on an engineering estimate," he suggests. That legacy approach leads to perverse outcomes.

"If I am a contractor and you pay in advance, I have no incentive to do high-quality work. But pay for performance aligns those incentives." Moreover, pay for performance "shifts the risk from the rate- or bill payer and onto the private sector", says Golden.

"All of a sudden, companies are taking the risk, so regulators don't have to micromanage every step. You enable innovation and competition," he says. "You only pay for outcomes, and let the best solutions win."

EE versus infrastructure

Reliable data and standard methods for calculating the impact make energy efficiency bankable, says Golden. Tie in time and locational impact "and you can quantify the savings by hour and the impact on load shape".

He thinks that is a game changer.

"If you know when and where efficiency is happening, you can put EE into the same procurement bucket as other distributed energy resources. You can trade in the same way and treat it as a resource to support the onboarding of renewables or use it as a replacement for aging infrastructure," Golden suggests.

"Instead of paying for estimates in advance we are now competing with the marginal cost of the alternatives such as batteries," he says. "And [on that basis] we are finding that EE is plentiful and a good deal."

Californian utility PG&E has taken note. The firm has launched a rebate scheme that will pay aggregators of energy efficiency up to $20m based on actual metered results. The utility will calculate efficiency using the open-source Caltrack methods.

Heat as a service

Rendesco funds and installs heat pumps into retirement homes, providing lower carbon, lower cost heat for residents – and making a guaranteed 20-year return from renewable heat subsidies. Brendan Coyne reports

Rendesco designs, installs and maintains the ground source heat pump system for 20 years, free of charge to the property owner. The client receives renewable heat from the system, which can be used for central heating, hot water and underfloor heating.

The firm retains ownership of the system and leases the client's plant room. Index-linked Renewable Heat Incentive (RHI) payments provide its return on investment over a 20-year period.

As of September, it had 65 sites in development, of which 37 were up and running, according to MD Julian Sowerbutts. It plans to deploy 100 by next year. The company anticipates that will deliver a £44m income stream over the life of the RHI payments.

Innovation and finance

Sowerbutts, from a domestic solar background, had tried to make heat pumps work in the domestic sector, but said domestic RHI tariffs were insufficient. So he launched Rendesco to try and crack the commercial sector - and had to start from scratch.

First, the company had to "develop a legal document that allowed us to retain ownership of the plant room over the 20-year RHI period," he says. Then it had to convince clients to trial a site and then find financial backers.

"The process is quite lengthy, 12-18 months for each site," he says. "Once sites are switched on, the costs are minimal [and returns start to come in]. But they are very cash hungry early on."

Sowerbutts said Triodos Bank understood the model and was "fantastic" in backing early projects, enabling Rendesco to commence its pipeline. Earlier this year, the company also launched a £5.5m seven-year bond to fulfill its ambitions, attracting investment from investors such as Thrive, a Triodos spin-out (see box below).

Subsidy, Brexit, opportunity

Sowerbutts says the company has factored some digression of RHI tariffs into its plans, though thinks heat pumps will likely be at the back of the queue for support cuts given low deployment rates.

While the future of the RHI post-2021 is uncertain, Sowerbutts is more concerned about Brexit; the company "is not looking beyond 2019 at present" due to the uncertainty affecting the sector.

"If the RHI is maintained, we will branch out – as long as housebuilding continues," he says. "But there is a lot of uncertainty; we are entering unchartered territory."

However, Sowerbutts thinks taking up renewable heat is financially prudent for housebuilders concerned about economic uncertainty. "There is a great opportunity to take on more district heating systems if commercial developers are open to it – because they are getting a free heating system that allows them to allocate those funds to building another house or apartment while earning green credentials," says Sowerbutts.

Julian Sowerbutts

He says the challenge is finding consultants and installers that can understand non-traditional systems and, crucially, design and install heat pump-based systems correctly.

"There is an element of fear of the unknown. But this is not new technology," says Sowerbutts. "More people should be taking of advantage [of incentivised renewable heat], but persuading them to switch is always difficult."

In the meantime, Rendesco is doubling down on its 2019 target for 100 projects. The company hopes to have started work on its 80th site by the year-end, with "hopefully another 10 by spring," says Sowerbutts, "so we will be close." te

How does it work?

Rendesco is working primarily with retirement housebuilders Churchill and McCarthy & Stone, fitting heating systems to new developments. New builds tend to be in urban sites where space is restricted, so Rendesco is first on site to drill the borehole, then the developer constructs the building and Rendesco installs the plant.

Though it would require "more consideration", Sowerbutts says the model could also work for retrofits.

For new builds, he claims residents' heating bills can be as much as 30% cheaper versus heat powered by fossil fuelled systems. Meanwhile, retirement home developers have a unique selling point: cheaper, more environmentally friendly heating that enables them to demonstrate good management credentials to prospective clients.

The investor's perspective

Renewables fund Thrive invested £350k into Rendesco's bond offer. MD Matthew Clayton says the fund is "impressed" by what Rendesco has managed to achieve. "It is a simple business model, but very effective."

He says Thrive is keen to invest further into "proven" renewable heat technologies and is actively seeking opportunities. "Positive environmental performance is critical and we also look for positive social impact," he adds.

The company is not keen on energy crops. It might invest in projects using biomass from waste wood, though "not something that in five years' time starts importing wood from Brasil", says Clayton. He says genuine waste fuel stocks are "quite interesting" to the fund.

Compressing energy spend: the other side of the story

Compressed air, while utilising a 'free' working fluid, is one of the highest energy consuming utilities found in today's industrial premises. Tony Baldwin provides an overview of significant technology advances in compressed air systems that are now reducing costs attributable to this utility

Having spent 30 years in the energy field reviewing many industrial applications, I have to admit the actual generation and distribution of compressed air has commonly been one of the first and prominent elements of focus for reviewing energy efficiency opportunities. Significant recent developments in compressed air systems and components are now making it possible to bring energy costs of this potentially high energy consuming process right down.

Vacuum ejectors

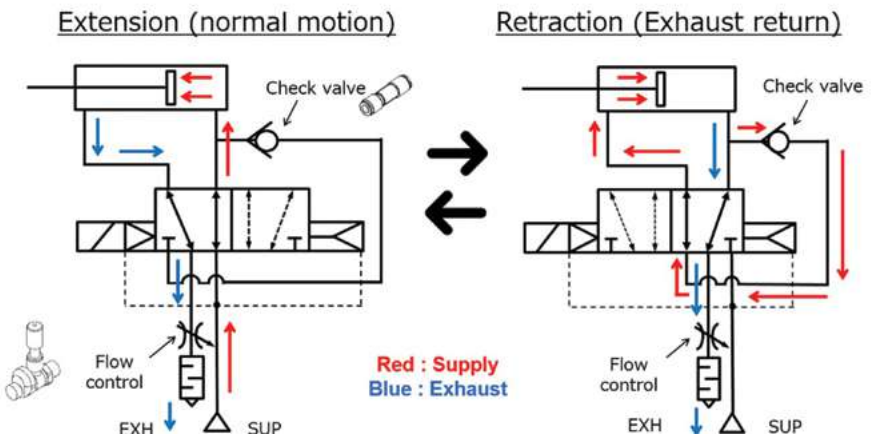
Vacuum ejectors are prevalent in many factories for movement applications such as in picking and placing of products in palletizers, jigs and component placement processes. The typical vacuum ejector uses compressed air through a venturi orifice to create the vacuum force. When the vacuum has been established the compressed air continues to pass the venturi in order to maintain the vacuum force.

Modern vacuum ejectors now employ a sensing vacuum switch that isolates the compressed air line at the same time as a valve closes the vacuum line to the cup. This thereby stops compressed air usage when the correct vacuum level is sensed. Should the vacuum pressure deteriorate (through porous material or worn or damaged vacuum cups), the solenoid switches the compressed air line back on to create further vacuum and then switch back off when vacuum pressure is re-established.

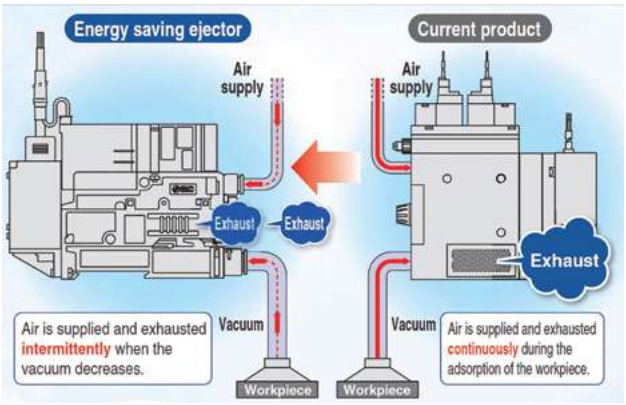
Switching vacuum ejectors to the modern alternative can reduce compressed air usage by up to 90% over their predecessors.

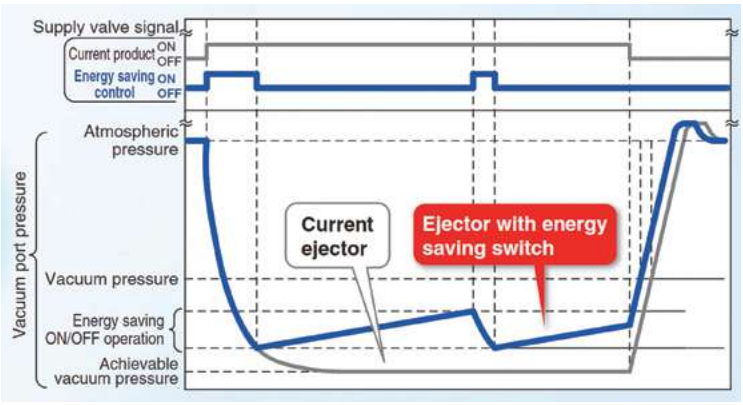
Energy-saving cylinders

Many pneumatic cylinders are provided with line pressure for both the power stroke and return stroke even though the return stroke may not be carrying a load



Specific energy recovery cylinders that have the necessary integral porting can use the air from the power stroke to offset air usage in the return stroke of a cylinder. By doing so, a reduction in compressed air of up to 45% is possible compared with a standard cylinder





Switching vacuum ejectors to the modern alternative can reduce compressed air usage by up to 90%

or require the necessary force to return. Therefore the pressures for each stroke can be adjusted to provide compressed air savings that can be significant for large bore, large volume displacements or high frequency operations.

For example, 5 bar may be required on the outward (power) stroke and a reduced 2 bar pressure for the return stroke may be acceptable.

When the volume of the cylinder is of significant size, the volume saved in compressed air or the number of strokes per hour reduced through these adjustments can be considerable, leading to a 20-30% reduction in air consumption.

Further to this, specific energy recovery cylinders that have the necessary integral porting can utilise the air from the power stroke to offset air usage in the return stroke of a cylinder.

By doing so up to a 45% reduction in compressed air is possible compared with a standard cylinder.

Blow guns

The ubiquitous blow gun can be found in the majority of factory compressed air systems. Used for the clearing of swarf, debris and partials from working surfaces through to cleaning and blow out of cleaning fluids and oils and a multitude of other tasks, the air consumption of blow guns can become a significant element of the overall factory energy consumption.

Modern blow guns are specifically designed to minimise the use of air during their operation. The use of high efficiency nozzles that entrain air through the use of the Bernoulli effect can reduce air consumption by 30% over the conventional gun while having the same effective output. Combination with the use of correct fittings, connectors, and selection of a coiled tube can all have a significant effect on reducing air usage.

Air guns can easily be operated at or near factory line pressure with little regard for energy consumption. A simple on/off type of blowgun should always be used with a tamper-proof pre-set regulator, set at 2 bar. This is a value, which has been long recommended by the American OSHA body but does not negate the possibility of compressed air being injected through the skin.

Energy saving blow guns

Energy-saving blow guns are now being developed to prevent the continuous blowing of air. They use an integral reservoir of compressed air to permit the rapid fire impulse method to displace fragments and flakes of material. Therefore the use of 3 to 4 sub-second repeated air blasts can clear the equivalent material at minimal consumption compared with a constant stream of compressed air.

While we have just looked at three simple areas of air usage reduction, development in a number of areas is ongoing: from low wattage solenoids on air manifolds through to pressure boosters for high-pressure applications allowing lower factory line pressures to be set.

Development of energy-efficient pneumatic components such as those discussed here are helping end users to dramatically lower their use of air usage and therefore energy consumption. There will always be the necessity to evaluate the generation and distribution of compressed air to ensure correct delivery of air is optimum and not wasted, but we must not forget the components that affect the direct use that have their role to play too. te

Tony Baldwin is a committee member at the UK Association of Energy Engineers (UKAEE) and works as an energy and resource specialist at SMC Pneumatics UK. UKAEE covers a range of expertise in the energy management and energy efficiency sectors. It delivers a range of technical-focused seminars and offers excellent networking opportunities for energy and sustainability professionals. It offers Continued Professional Development opportunities for AEE certifications such as Certified Energy Manager, Certified Measurement and Verification Professional and Certified Energy Auditor.

Membership to the UKAEE is currently free. For more information on UKAEE or how to join, please visit ukaee.org.uk

Gas on demand rather than storing it? Grain LNG terminal in Kent

Should we underwrite new gas storage?

Gas storage has reared its head again as a subject for government debate. Janet Wood questions whether we should underwrite the infrastructure

Once again gas suppliers are arguing that consumers should underwrite more gas storage for Great Britain. The argument is that GB 'nearly' ran out of gas during the 'Beast from the East', and the Beis Select Committee has duly announced an inquiry.

Gas storage – Is it worth it?

Sometimes it is worth consumers underwriting infrastructure. But let's look at a few points to consider before agreeing to take on that cost for gas storage.

It is always worth remembering that 'nearly' is 'didn't' – ie, we did not run out of gas during the 'Beast from the East'. This is despite the fact that Centrica's Rough store is now largely out of operation and, as National Grid says in its *Winter Outlook* consultation, "very low temperatures contributed to the formation of ice on many offshore platforms. This led to issues with asset operation and resulted in onshore supply losses. As a result, forecast supply for 1 March was much lower than expected, particularly in the first part of the day." But when prices rose (that's the market working), "gas flowed into GB through the interconnectors. As assets were brought back on line, more gas was able to flow into the NTS from the UK Continental Shelf and Norway."

Gas use is falling – and will continue to do so. It could fall faster: in its *Future Energy Scenarios*, National Grid notes that, "Improving the thermal efficiency of most homes by one EPC rating gives the potential for a 14% reduction in residential gas demand in 2030, a 17% reduction in 2040, and a 23% reduction in 2050. In 2050 this equates to 18TWh."

Supplies are diverse. During the Beast from the East, LNG supplies arrived at GB terminals – but they were mostly not called on.

We do have access to storage. European gas storage is extensive, and available to GB customers (Brexit notwithstanding) through the interconnector. And IUK is large – it can import 20 billion cubic metres of natural gas a year, almost a third of our annual demand.

The problem is often not having gas supplies, but having them in the right place.

National Grid's system was designed to transport gas from north to south, but now the pattern of use is very different, causing growing problems with maintaining pressure in specific areas. Some gas shippers exacerbate this problem: they are supposed to inject gas consistently through the day, but they wait until late and 'catch up' at the end of the day.

Increasingly, gas is about local issues and operability. Building storage in the wrong location may simply worsen that problem.

In contrast, injecting gas (from anaerobic digestion) at beneficial points in the system, or inviting companies to flex their use is a more 'smart, flexible' (and greener) solution.

Careful

What's the upshot of this? It may be worth investing in more gas storage, but first, we must:

- Invest in energy efficiency. That will reduce gas and power needs for ever. Once we understand how much investment storage proponents require, a cost benefit comparison against energy efficiency should be run before any decision is made.
- Consider location and operability. We need to operate the system as efficiently as possible. Check that shippers are acting to maintain network pressures and operability. Make sure that potential storage sites are beneficially located for current and future supply scenarios. Look at 'green' gas storage and AD as an alternative.
- Look at 'smart, flexible' solutions and – as with 'Power Responsive' – widen the market for demand response.

I don't always argue that shortages are a good thing, but a too-comfortable power margin is also not much help in developing the 'smart, flexible' energy system supposed by Beis and Ofgem. te

Janet Wood is editor of *New Power* magazine

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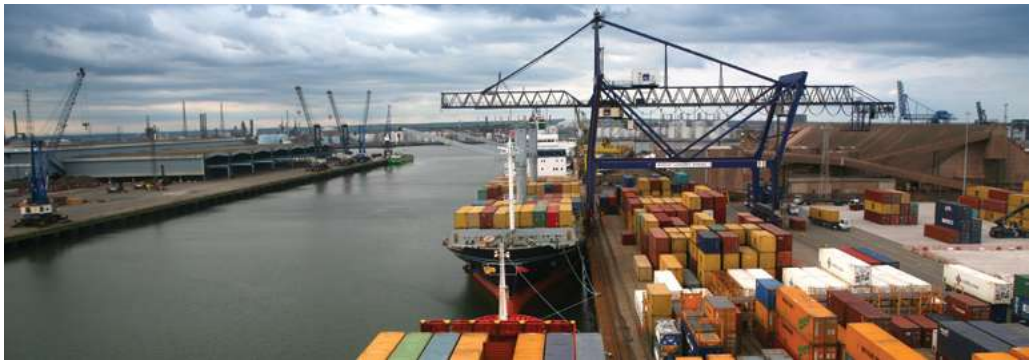

AMR boosts sustainability and yields cost savings

PD Ports in Middlesbrough employed IMServ to provide automatic measuring and monitoring of energy data from 15 electricity substations and switch rooms at its 315ha Teesport estate.

IMServ installed 19 MID-approved (Measuring Instrument Directive) sub-meters and provided online access to the half-hourly data from these meters through the cloud-based software analytics platform Resource Advisor.

The project delivered immediate results, including the removal of the labour and transport costs of collecting the meter reads.

A major benefit was the identification of the ship-to-shore cranes generating electricity which was being consumed elsewhere onsite.

Justin Vroone, commercial director at IMServ, explains: "The identification of this electricity generation was a welcome result for PD Ports; the metering data showed this generation was 11% of the energy consumed. To quantify this, in a sample week the three cranes consumed 22,600kWh with 2,520kWh being generated. When fully harnessed it could provide a net benefit for Teesport for the full year via a reduction in grid supply of around 131,000kWh, of circa £19,000 and 52tCO_2."

Bespoke VSD solution cuts cost

Aggregate Industries' Torr Works site in Somerset is benefiting from cost savings and improved system reliability following the installation of four new conveyors with bespoke variable speed drive (VSD) bypass technology, a concept requested by the customer and developed by Siemens.

The site's four new conveyors, which process up to 2,500 tonnes of quarried product per hour, required a solution that was not only able to deliver a high torque start for the conveyors but also able to reduce air conditioning requirements associated with electrical equipment in quarry environments.

The solution developed by Siemens is not only expected to deliver annual energy savings of up to £10,000 per conveyor but also reduce initial capex expenditure over the conventional approach.

In addition, the new VSD bypass system also eliminates the requirements for harmonic correction, which cancels the entire spectrum of harmonic currents at the point of connection, while improving system reliability by ensuring that equipment operates with lower losses and heat generation.

Getting the NAC of it

Schneider Electric's Network Automation Controller (NAC) for its C-Bus system provides users with the means to control their building from a single, secure system. The controller integrates and communicates with the central building management system, becoming a gateway for managers to monitor and control all of the building's crucial systems, including power consumption, circuit breaker status, lighting, heating, security and cameras

All building functions are controlled and displayed through its web server application on both local and mobile devices. The interface allows managers to stay on top of operations whether they are in the office or working remotely.

The NAC helps managers play a proactive role in the energy efficiency of their building. It collects data from across the building's functions, giving managers easy access to all maintenance, management and energy usage information. It displays gas, water and electricity measurements, and monitors consumption on a daily, monthly, or yearly basis.

The device then stores and analyses this data before identifying potential energy savings. Energy billing is possible at a glance and provides managers with enhanced scope to identify efficiencies and cut waste.

Asad Zaidi, category marketing manager for smart space at Schneider Electric, says: "The C-Bus NAC gives building and facility managers the ease and degree of control they need to ensure peak operational and energy efficiency."

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Blessed are the cheesemakers

Dairy Partners, a cheese manufacturer, is set to cut its energy costs by 29% a year by switching from light fuel oil to liquefied natural gas (LNG) to power its operations, and investing in new boiler equipment. It is also set to cut its CO_2 output by 30%.

Calor supplied and installed a single, horizontal 60m³ above ground LNG storage tank on the site, which is vacuum-insulated and features a twin ambient vaporiser system.

The tank is also fitted with automatic top-up technology, so that an LNG delivery is automatically scheduled by Calor once it begins to run low on fuel, providing peace of mind to the business.

The investment in LNG at Dairy Partners' manufacturing facility in Newcastle Emlyn is part of a wider programme of energy reduction measures for the business. This includes a refrigeration project that has reduced Dairy Partners' electrical consumption by 20% for cooling processes.

Discussing the move to LNG, Robert Peel, director of Dairy Partners, said: "Steam is used in dairy production for process heating, which is very energy-intensive.

"LNG gives us the ability to cut our CO_2 emissions by 30%, while reducing our costs at the same time too."

Dairy Partners' switch to LNG will have a payback period of two years, according to Calor.

Air compressor, energy impressor

Atlas Copco has introduced a new version of its ZT 90-160 air-cooled oil-free screw air compressor, including re-designed compressor elements that have been adapted to increase energy efficiency.

Available with fixed or variable speed drive and with or without an integrated dryer, the ZT 90-160 also features an advanced touchscreen monitoring system that enables end users to evaluate, adjust and optimise the pressure and performance of the compressor in real-time, says the firm.

The ZT 90-160 compressor contains an integrated Neos drive that communicates directly with the new touchscreen Elektronikon Mk5 Touch Controller. The Mk5 Touch displays warning indications, maintenance scheduling and provides online visualisation of the machine's condition. The data monitoring program Smartlink is integrated as standard. Atlas says this remote monitoring system optimises the compressed air system and reduces energy and cost.

Grid balancing with second-life battery technology

Engie has deployed a 150kW/90 kWh E-Stor system, developed by British energy storage technology developer, Connected Energy, at a site in Rotterdam, Holland.

Connected Energy's storage system - which is powered entirely by second-life batteries from Renault electric vehicles - has been installed on a section of the TenneT distribution network.

The Rotterdam project is the first part of a three-stage project by Engie and Connected Energy. This first step is a seen as 'proof of concept'; designed to demonstrate the technical and economic viability of using E-Stor second-life battery systems for frequency response services.

The results are positive: E-Stor has been proven to integrate seamlessly into Engie's flexibility pool of industrial assets – and has already generated its grid balancing revenues.

In a wider context, the project is part of the 're-use, re-power' initiative at Engie. Phase 2 and phase 3 will see Engie and Connected Energy deploy much larger E-Stor systems at other sites in Northern Europe for grid balancing services.

The Rotterdam installation uses a new system architecture which enables second-life EV batteries to be operated in series – increasing power and capacity while also reducing cost.

Arie Kleijn Hesselink, project manager of the Rotterdam project said, "Using second life car batteries is known to have technology challenges due to the different ageing history of the batteries. As this Rotterdam unit has been approved by the Dutch TSO to provide frequency reserve, Connected Energy has proven to manage these complexities."

Matt Goddard

Open Energy Market's head of acquisition on how stairs and new shoes don't mix, crooning in Las Vegas and what the Romans did for us

Who would you least like to share a lift with? The antagonist from Final Destination. My doppelgänger wouldn't be much fun either.

You're God for the day. What's the first thing you do? Reset the world's resources and atmosphere to pre-industrial levels with her permission, adding a new string of islands to the Atlantic, visible from space, that spell out 'Second chance'.

If you could travel back in time to a period in history, what would it be and why? The cusp of Roman Republic and Empire, in a kevlar toga. Mainly to realise that while politics hasn't changed much in 2000 years, a great deal has.

Who or what are you enjoying listening to? When I haven't got Bowie on loop, the agony at realising Wolf Alice, Chic and Adam Ant are all playing London on the same day this December should give you an idea. Supplemented with R4's *In Our Time*, so I can perfect my Melvyn Bragg impersonation.

What unsolved mystery would you like the answers to? Where pens, single gloves and earphone buds go... And what's being planned for them?

What would you take to a desert island and why? A pen, sketchbook and an eye to capture some endless natural beauty.

What's your favourite film (or book) and why? It's always been Jaws - the best mix of horror and progressive, bravura filmmaking. It created the Hollywood blockbuster single-finned, for which it has a few things to answer for, but remains the original and best.

If you could perpetuate a myth about yourself, what would it be? That my crooner days were the talk of Vegas, but I did it my way and all good things have to end.

What would your super power be and why? Jumping back 30 seconds to nail that one-line retort.

What would you do with a million pounds? One impulse purchase, no doubt with an engine – the rest shared, saved and donated.

What's your greatest extravagance? A vinyl collection that never ends. They're like giant, 33 ⅓ rpm Pringles once you start, but a lot prettier.

> ***Where do pens, single gloves and earphone buds go... And what's being planned for them?***

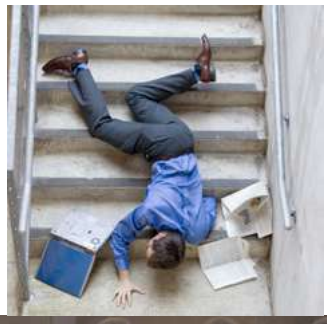
If you were blessed with any talent, what would your dream job be? A steady career in top-flight football, with one England call-up where I score that crucial, qualifying goal (make it left-footed).

What is the best piece of advice you've ever been given? Never run down stairs in new shoes. A great truth and metaphor.

What irritates you the most in life? A lack of curiosity and general apathy in the face of necessary change. It's everywhere and inexcusable.

What should energy users be doing to help themselves? Asking for more insight to be delivered in a simpler way. If energy users continually test the industry for greater innovation and technology that allows them a better understanding of their portfolio, everything else will follow. Especially as a route to reducing energy consumption in a meaningful and long-lasting way.

What's the best thing – work wise – that you did recently? We've just rounded out how we can open up a host of complementary energy services to users of our procurement marketplace that really reinforces our mission of offering insight and integrity at every stage. It's important to keep options open for buyers and make sure that services tailored to them reach the table at the optimum time. Getting that balance right, and keeping users and suppliers on a level playing field while responding to constant changes is a real challenge and we can't wait to share the results. te



Nothing much changes in politics...except perhaps less physical back-stabbings

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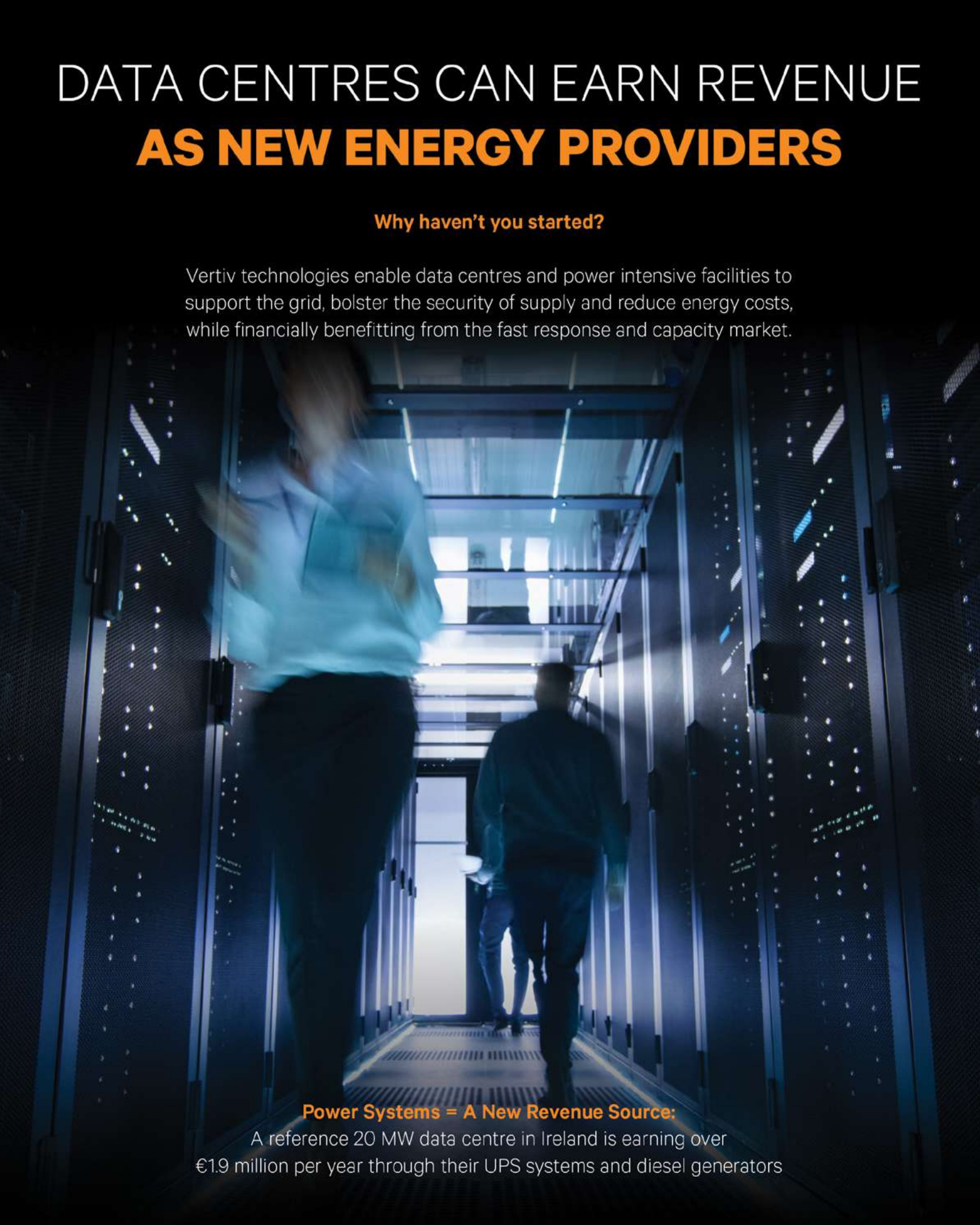

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