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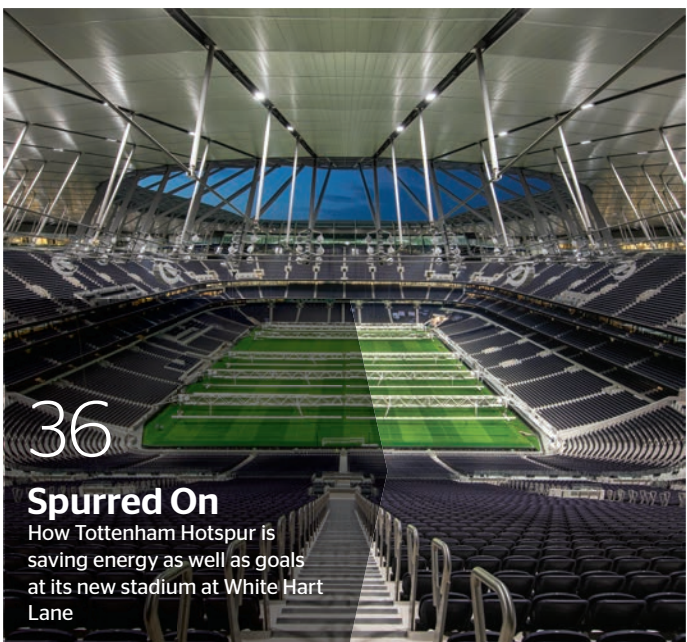
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Blackouts: how much is too much?

The blackout on 9 August raises questions about the resilience of both the UK's electricity supply and consumer's back-up power systems. National Grid ESO's (NGESO) interim report says that a lightning strike north of London led to RWE's Little Barford gas plant and Ørsted's Hornsea wind farm to shutdown almost simultaneously. Furthermore, various embedded generators failed from a loss of mains protection. This, cumulatively, was 1,878MW of lost generation to the grid causing the frequency of the system to fall below acceptable operating levels. The system operator succeeded in preventing a complete collapse of the system at the expense of disconnecting 5% of consumers. Should there have been a need to save the network? More than the 1,000MW was in reserve, a level compliant with the Security and Quality of Supply Standard to cover the loss of the single biggest power generator to the grid. But is this enough?

“ If power cuts can happen when just two power generators drop off, then something fundamental has gone wrong ”

I was asked to comment on the blackouts by BBC News and made the point that 'only' two power stations that represented about 5% of demand went offline. NGESO said that the event was exceptional. A single lightning strike, the loss only 5% power stations and some embedded generation, in line with NGESO expectations for such an event, does not seem exceptional enough for intentional blackouts to be necessary for grid protection.

Professor Dieter Helm, a government adviser on energy policy, commented: "The very idea that the electricity system could be brought to its knees just because a couple

of power stations dropped off at short notice should send alarm bells ringing in Beis and the Treasury... If power cuts can happen when just two power generators drop off, then something fundamental has gone wrong."

Resilience versus cost

It must be said that much of the fuss in news coverage was actually caused by consumers' back-up systems or procedures, not the system operator, generators or DNOs. You have to question why passengers were stuck on a train from Edinburgh to London for over 12 hours? NGESO said the grid was back to normal with all DNOs completing demand restoration 45 minutes after the initial outage.

Intermittent renewable generation and its lack of system inertia power makes grid security more challenging. The legal requirement for the UK to achieve net zero carbon emissions, will mean more renewable power supplying the grid. Additionally, electricity demand will need to increase to accommodate more EVs, heat pumps and internet enabled devices.

The reliability of the UK network, on the whole, is very good. The question is how much more are consumers prepared to pay for an increase in reliability? The cost has to be considered alongside decarbonising and the electricity grid's role that is central to the economy and society in general.

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the energyst

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A better use of energy

Make firms show they have acted on Esos, say MPs

MPs have urged government to make energy efficiency a national infrastructure priority to stand a chance of hitting net zero targets.

The Beis Select Committee delivered a withering assessment of energy efficiency policy across the domestic and commercial sectors.

“We are concerned that the government has set targets for energy efficiency without having a clear grasp of how much public investment is required to meet them,” states the parliamentary report.

The Select Committee recommends a raft of policies to improve performance in buildings, with tougher, mandatory stepped targets out to 2050 and urges government to act immediately to raise awareness across sectors that energy efficiency is fundamental in decarbonising the economy.

“The government has failed to raise the salience of energy efficiency within business,” states the report, with “most businesses unaware” of targets



Call to action: government could do worse than follow Australia's lead and adopt the NABERS blueprint, states the Select Committee

and “progress slower than in the residential sector”.

“The government should act swiftly to agree a trajectory for the ratcheting up of the Minimum Energy Efficiency Standards (MEES) for commercial buildings. We recommend that the government assesses the viability in raising MEES for rented commercial properties to EPC Band B by 2035, with milestones of D and C in the lead up time,” suggests the report.

But MEES only focuses on building design – not its actual performance. In

Australia, the NABERS (National Australian Built Environment Rating System) scheme, which implemented mandatory operational ratings, has delivered significant energy productivity gains – and commercial premises with poor NABERS ratings command lower rents, incentivising property owners to take action. The Committee suggested government could do worse than adopt the NABERS blueprint:

“There is strong evidence that mandatory operational ratings can successfully reduce energy use. We recommend

that the government moves to the public disclosure of operational energy data for the commercial sector, and the use of rating tools that focus on performance outcomes, from 2020.”

Give Esos some bite

Evidence to the Committee suggested just 5% of organisations, obligated to undertake Esos audits, are acting fully on the recommendations.

Government should spur action by giving the regulations some teeth, said the Committee:

“We recommend that the government requires Esos audits to be publicly available and to mandate that businesses in scope of Esos demonstrate that they have acted on the energy saving opportunities identified.”

The report also urges changes to building regulations to include tighter standards to ensure new commercial buildings do not require energy efficiency retrofits from 2025.

Beis seeks views on energy efficiency markets

The government is consulting on how to better incentivise energy efficiency and is seeking input to inform market-based approaches. It wants views on how current markets can be leveraged and how new markets might be created.

The consultation highlights key challenges around rewarding energy efficiency via current market approaches. The Capacity Market, for example, pays for generation or load reduction over winter

to be ready to respond to a system stress event. It is not designed to reward permanent demand reduction.

National Grid's ancillary services also tend to require specific short-term actions to help balance the system.

Similarly, distribution network operators are starting to procure alternatives to network reinforcement, but they are largely paying for services that can help manage constraints at specific locations



The government is asking how flexibility-based markets might be used to facilitate energy efficiency

at certain times of day. The government is asking how flexibility-based markets might be used to facilitate energy efficiency, but is also seeking views on new market models, and on potential benefits of combining energy efficiency with flexibility.

The consultation requests evidence on whether behaviour change should be rewarded in the same way as measures that require installation of equipment/investment.

Study outlines smart energy plans to cut Ellesmere Port emissions

A new study by the Energy Innovation District (EID) has revealed how a local, smart energy system could reduce greenhouse gas emissions in Ellesmere Port by 34%.

The £200k project – part funded by the government’s Prospering from the energy revolution programme – also demonstrates potential energy cost savings of up to 25%.

The study sets out a design and 10-year investment plan for the industrial heartland around Ellesmere Port, where 5% of the UK’s energy is currently consumed. The feasibility study shows how locally generated energy could be traded between local consumers and generators.

Ged Barlow, chair of EID, said: “We face a huge challenge in the UK to decarbonise and safeguard the industries that make our nation prosper... With companies like Vauxhall threatening job losses in the region, it brings into sharp focus the need to reduce energy costs and offer a viable solution to decarbonisation. This study demonstrates how the North West is leading the charge, setting out a nationally replicable model for smart energy systems.”

Jonathan Chapman, Burns



Ellesmere Port's Stanlow Industrial area

& McDonnell’s UK managing director and principal author of the report, said: “Investment and regulatory change will be required for E-Port Energy to fulfil the huge positive impact it has the potential for, and the same goes for the UK as a whole. Our current inability to create supply security that can deal with demand spikes while also finding solutions to meet carbon emission reduction targets reflects some failings in mapping out a clear future.

“However, a whole system approach – a fully integrated proposal for master-planning and delivering energy services at a district level, encompassing the supply and demand of all interconnected energy vectors – will optimise the UK’s sustainability,

reliability and affordability performance in the future.”

Other findings outlined in the E-Port Smart Energy Master Plan include:

- A whole system approach combining electricity and hydrogen is key to a lower carbon future – by enabling flexibility between different vectors, the concept unlocks capacity on the energy networks
- The introduction of a higher carbon tax would enable the competitiveness of investment in low-carbon projects and reduce the cost of energy for consumers

To download an executive summary of the Smart Energy Master Plan, visit: <https://tinyurl.com/y67nqv6m>

Smart Buildings Show 2019

Smart Buildings Show 2019 is now open for registration. The free-to-attend conference and exhibition, which takes place at the Olympia London on 9 and 10 October 2019, features its biggest line-up of exhibitors and keynote and CPD-accredited training sessions from some of the biggest names in the smart buildings industry.

John Hatcher, conference director, said: “We will have a great line-up of speakers who will be able to inform delegates of the state of the market, while delivering real life examples of how smart buildings can save money and improve the user experience. We also have a training theatre, which will provide CPD accredited courses.”

Smart Buildings Show 2019 will cover all key aspects of creating and managing a smart building, including: building automation systems and design, energy management and energy efficiency, HVAC, lighting and controls, networks and wireless, regulations and consultancy, security, smart cities, smart meters and monitoring, and much more.

This year’s sponsors include platinum sponsors Bluetooth SIG and Schneider Electric; gold sponsors Engie and the Wireless Infrastructure Group; and silver sponsor Condeco. In addition, a number of professional organisations are supporting the show including BSRIA, KNX UK, IWFM and the BCIA.

To register, visit smartbuildingsshow.com

Npower posts deeper operating loss

Npower posted an €81m (£75m) operating loss for the first half of 2019. The retailer shed 238,000 customers versus the first half of 2018.

Parent company Innogy said competitive pressure and that the domestic price cap were the main factors in the negative result, with the UK market environment “persistently difficult”.

Earlier this year Innogy

announced plans to cut 900 jobs within its UK retail division. Though some redundancies have been made, headcount remains broadly stable at around 6,000.

Innogy finance chief Bernhard Günther said in March that the company was still trying to sell Npower, but that all options for the company remain open, including winding it down.

Günther declined to quantify the number of roles that would be required at a combined Eon-Npower retail entity, should that eventuate.

However, Npower’s first-half result appears better than Innogy feared: Günther had stated that the company expected a negative Ebit contribution from UK retail of about €250m for the full year.

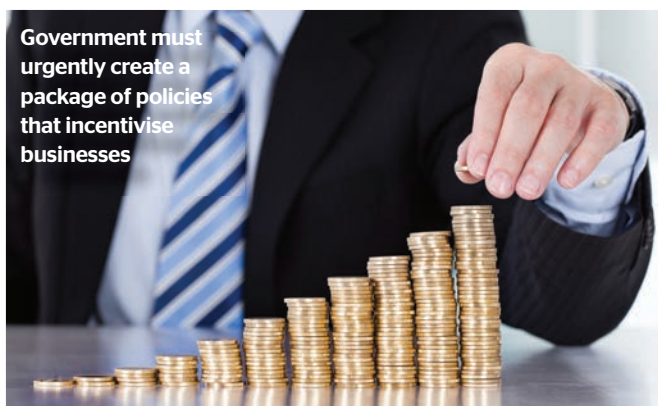
Net zero: design incentives for business decarbonisation

The Committee on Climate Change (CCC) has told government to urgently create a package of policies that incentivise businesses to invest in decarbonisation.

Business and industry, said the committee, will be required to do much of the heavy lifting if the UK's economy is to hit the net zero target now enshrined in law.

The CCC said government must “urgently establish a mechanism to incentivise widespread uptake of near-zero emissions technologies in industry, including the use of hydrogen, electrification, carbon capture and storage and bio-energy carbon capture and storage, as well as support for energy and resource efficiency.

“The design of this mechanism must ensure it does not drive industry overseas, which would not help to reduce global emissions, and be damaging



Government must urgently create a package of policies that incentivise businesses

to the UK economy”.

The report also said electricity distribution network operators should effectively be allowed to lay much fatter cables and invest in bigger transformers, substations and other network infrastructure that can accommodate much higher levels of electrification.

The CCC pointed to analysis it commissioned from Vivid Economics that suggests the cost of adding more capacity than currently required is

not much higher if the works are being done anyway.

“Future-proofing networks, as and when they are upgraded, can enable greater electrification at lowest cost,” sates the report. “It is essential, therefore, that when network capacity is increased, this is to a sufficient level to avoid having to upgrade the capacity again prior to 2050.”

Its recommendations may require a redesign of the current regulatory framework

for networks to enable them to invest with an eye on 2050 rather than over a short-term price control.

The CCC says improvements in system flexibility will also be essential.

The report outlines a wide range of urgently required policy interventions across:

- heat – develop a “fully fledged” decarbonisation strategy by 2020
- transport – make the ban on new petrol and diesel engines 2030 if possible
- energy – provide routes to market for onshore wind and solar, get cracking on CCS and hydrogen, create a workable nuclear strategy.

The CCC said decisions and policy cannot be left to individual departments such as Beis, the Environment Agency and Treasury, but must be taken across government, which must take the lead across its own estates.

Decarbonise or risk divestment, investors warn

Investors representing \$2tn in assets have called on cement makers to commit to net zero by 2050 – or risk funds divesting and access to capital drying up.

In a letter to cement makers CRH, Lafarge and Heidelberg Cement, and construction materials maker Saint-Gobain, members of the Institutional Investors Group on Climate Change (IIGCC) and participants in Climate Action 100+ urged immediate action and increased R&D spending to enable decarbonisation of the industry.

“The cement sector needs to dramatically reduce the contribution it makes to climate change. Delaying or avoiding this challenge is not an option. This is ultimately a business-critical issue

for the sector,” said Stephanie Pfeifer, CEO of the Institutional Investors Group on Climate Change and a member of the Climate Action 100+ global steering committee.

“Major economies such as the UK and France are increasingly adopting economy-wide net zero emission targets. The cement sector needs to get ahead of the profound transformation their sector faces by addressing barriers to decarbonisation in the short- to medium-term if companies are to secure their future,” she added.

The group said cement makers account for 7% of man-made CO₂ emissions. It noted Heidelberg Cement has set a decarbonisation target, and advised others to follow suit.

“Construction materials companies

may ultimately risk divestment and lack of access to capital as an increasing number of investors seek to exclude highly carbon-intensive sectors from their portfolios to meet their own decarbonisation plans,” said Ethos Foundation CEO Vincent Kaufmann.

“Investors expect construction materials companies to substantially increase the R&D budgets available for research into decarbonising cement production.”

The letter was signed by RPMI Railpen, Hermes EOS3, BNP Paribas Asset Management, Aberdeen Standard Investments, the Local Authority Pension Fund Forum, Ethos Foundation, Trustream Finance, Sarasin & Partners, Degroof Petercam Asset Management and Nykredit Asset Management.

Centrica to exit oil and gas production

Centrica has confirmed it will exit oil and gas exploration and production and that CEO Ian Conn will step down next year.

The group posted a statutory operating loss of £446m in H1 2019 compared with a statutory profit of £704m in H1 2018. Adjusted operating profit collapsed by 49% to £399m.

The consumer division took a £300m hit from the domestic price cap, with adjusted operating profit down 44% to £240m.

Centrica Business operating

profit plummeted 89% to £11m. The company said it would focus on cutting costs to become the “lowest cost provider in all our markets” in a bid to remain competitive.

Conn acknowledged that Centrica had “faced an exceptionally challenging environment in the first half of 2019”, but said the outlook was “more positive for the second half of the year”.

He predicted that this momentum would “continue into 2020”, adding that cashflow and net targets for 2019 would be met.

Wind powers Ørsted profit: plans for EVs

Ørsted posted higher first-half profit as wind generation continues to deliver significant return on investment.

Operating profit increased 2% to DKK 8.8bn (£1.1bn); return on capital deployed increased six percentage points to 29% for the period.

The company said it is on track to reach 15GW of offshore wind capacity by 2025, which CEO and

president Henrik Poulsen said would “meet our target of a 98% reduction of the carbon emission intensity from our energy generation by 2025, making it essentially carbon free”.

Ørsted also revealed its next targets are to reduce supply chain emissions by 50% by 2032, and to switch its entire fleet to electric vehicles by 2025.



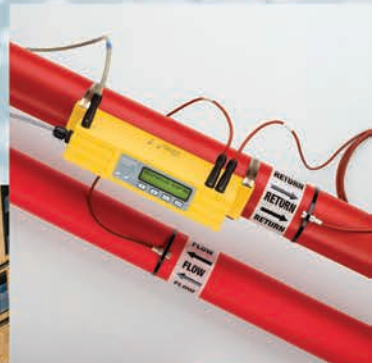
Ørsted is on track to reach 15GW of offshore wind capacity by 2025

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Flexibility to dominate next decade, but power-to-gas to rise

The next decade is all about flexibility, according to power systems firm Wärtsilä. After that, from about 2030 onwards, power-to-gas technologies will rise to the fore, predicts Melle Kruisdijk, vice-president, Europe, Wärtsilä Energy Business.

Cracking power-to-gas could then enable the power system to decarbonise the gas system.

Kruisdijk believes it is possible to deliver a 100% renewables-powered economy by 2050, but he says natural gas and flexible peaking plant (peakers) are increasingly required in the medium term to balance a power system that will become dominated by intermittent sources.

“Then, once you hit the point where you have excess electricity [from renewables], you can utilise it in power-to-gas technologies, because it will be low cost and green,” he told *The Energyst*.

“But that will only take off when you hit that point [of excess] – and then you can have the final push to a 100% renewables system.”



Wärtsilä has delivered two 50MW power plants to Centrica to balance the stability of the grid. They are the biggest medium-speed engine-based gas power plants in the UK, offering electricity for about 100,000 households in less than two minutes after they have been switched on

When might that tipping point arrive?

“Our view is that it can go pretty fast, depending on the uptake of renewables. I guess the next 10 years is about flexibility – getting it into the system to enable [more] renewables – and the next 10 years after that is about power-to-gas.”

Wärtsilä is working with a start-up in Germany to understand the potential

for cost reductions in power-to-gas technologies. Kruisdijk thinks the green gas transition will be “stepped”, initially blending hydrogen and natural gas, as well as synthetic methane (SNG).

He suggests SNG is a better bet, as it can be used without changes to existing infrastructure. Moreover, as synthetic methane uses CO₂ in the production process when produced

via renewable electricity, there are some interesting potential implications for carbon capture and storage.

“Maybe carbon capture will need to be bigger but I don’t think storage will happen, because you want to utilise carbon [to produce] synthetic methane,” said Kruisdijk.

Batteries and gas engines

For the decade ahead, Kruisdijk believes batteries and gas peakers will underpin system flexibility, with batteries potentially delivering the lion’s share.

Wärtsilä is “seeing huge interest from the market for storage”. While UK market hype has cooled, “we don’t see reduced appetite for storage in the UK”, said Kruisdijk, with buyers specifying ever larger systems.

“The trend is bigger.

First were 5-10MW systems, now it is moving to 50MW or even larger.”

He added that, while Wärtsilä is mainly selling to utilities, it is also seeing new companies entering this field, attracted by the opportunities.

Inspired Energy acquires 40% of Ignite Energy

Inspired Energy has paid £5m for a 40% stake in Ignite Energy and has a two-year option to acquire the remainder of the company.

The deal sees Inspired bring clients including Halford’s, SSP, Network Rail and WH Smith into its portfolio. The third party intermediary said Ignite’s specialism in energy efficiency projects and optimisation services would also benefit existing clients. The

optimisation market is relatively immature, noted Inspired.

The price could rise to £8m subject to performance clauses. Should Inspired decide to acquire the rest of Ignite, it will pay 6.0 x Ebitda, subject to a maximum Ebitda of £7m.

Inspired’s CEO Mark Dickinson said Ignite is “highly complementary to Inspired’s core Corporate Division” and the deal “significantly broadens and accelerates our

optimisation service offering”.

“Ignite has proven itself, over many years, to be capable of achieving material improvements to the energy efficiency of its clients. Inspired currently has over 500 clients within the estate and energy intensive segments who meet the Ignite customer profile, and could benefit from the services that Ignite provides.”

Ignite director David Higgins said the companies’

combined capabilities would enable “significant new opportunities both in terms of winning new clients but also in bringing benefits and savings to our existing portfolios.”

Ignite employs about 50 people across three locations. It provides large-scale energy demand reduction projects, ranging from building management system installation, local space control systems, plant efficiency measures and lighting upgrades.

Microgrid build for London City Airport

UK Power Networks' services arm is to build a microgrid at London City Airport that combines solar PV, CHP, new substations and automation, doubling the airport's electricity capacity and boosting resilience. UKPN Services said the funded package will also reduce the airport's carbon footprint and improve air quality. The firm will also help enable electric vehicle infrastructure.

London City Airport said it has reduced carbon emissions per passenger by 28% since 2013 and aims to become 'carbon neutral' by 2020.

Peter Adams, chief development officer of London City Airport, said the partnership

"will ensure we are best placed to maximise our commitment to sustainability and the environment".

Ian Smyth, director of UK Power Networks Services, said the firm is "designing, building, operating, maintaining and financing" the project, which will unlock "triple bottom line benefits for the airport – lower cost, greater resilience and help towards the UK's decarbonisation agenda".

He suggested microgrids "are the holy grail of new sustainable renewable energy networks. Finding ways to make microgrids economically viable and self-funding has challenged global energy markets for decades."

Tony Blackwell (left), UK Power Networks, and John Higgins, London City Airport



RWE to shut 1.6GW Aberthaw B coal station

RWE will close the 1,560MW Aberthaw B coal-fired power station on 31 March, 2020. The utility said it will transfer Capacity Market agreements to third parties and a small portion to other units in its fleet.

Carbon prices have surged to an 11-year high adding pressure to economics, which have been "challenging" for some time, according to the company. Consultation has begun with 170 staff affected by the decision.

Chief commercial officer Tom Glover said the station had played "an invaluable role" for nearly 50 years and said RWE will "remain an important player in the UK energy market" via gas and biomass assets.

Heating Tower Bridge



Two Hoval SR-plus 225kW boilers were installed

The success of a boiler upgrade project at Tower Bridge relied heavily on close collaboration within the project team and Hoval's end-to-end service delivery.

As one of London's most familiar historic landmarks, Tower Bridge is a popular venue for corporate and other events, with a number of unique spaces for hire. The ageing boilers, however, were struggling to meet space heating and domestic hot water requirements, so a decision was taken to upgrade them. The work coincided with the conversion of a 9m high exhibition space, with the addition of a mezzanine to create two new spaces.

The design was carried out by Brinson Staniland Partnership (BSP) and the new boilers, along with associated upgrade works, were installed by contractors T Brown Group. Hoval engineers worked closely with both parties in meeting a number of key challenges, ranging from providing design support to constructing the boilers in-situ because of access issues.

One of the early challenges faced by the design team was that, while regulations require condensing boilers for such an upgrade, the Grade I listing of the structure meant that Tower Bridge did not want plumes issuing from the flues on the side of the bridge base columns, 10m above the water level. Following discussions with the City of London authorities, special dispensation was given to

use a bespoke, non-condensing boiler installation.

As a result, Hoval SR-plus 225 high efficiency, low NOx boilers were specified for the project. However, because of regulations such as the ErP Directive, the fully modulating Riello burners selected for the project had to be supplied separately from the boilers. Two Hoval SR-plus 225kW boilers were installed in each of the two boiler houses, which again presented challenges.

"Not least of these challenges was access to the boiler houses through narrow walkways and corridors, steep stairwells, ship's ladders and tight turnings," recalled John Pearson of T Brown. "To overcome this, Hoval supplied the boilers in complete 'knock-down' (CKD) form, which were then assembled on site, fully welded, hydraulically tested by Hoval's engineers, and then casings, burners and controls were fitted."

It was also important to avoid disruption to the venue, as well as to traffic in the area, with most deliveries being made during the night. Managing this situation required interaction with the Tower of London project team, the City of London, the Port of London Authority, Transport for London and two local authorities.

"Despite all the challenges, the project went very smoothly and the clients are delighted with the end result," Pearson concluded.

hoval.co.uk

Hoval

Two generators tripping caused the biggest frequency drop for years on the 9 August, leading to widespread power outages, as National Grid's systems disconnected demand in order to limit the impact.

According to REMIT notices, it initially appeared that RWE's Little Barford gas-powered power station tripped first, followed by Ørsted's Hornsea Offshore wind farm. But National Grid's interim report suggests Hornsea actually came offline first, followed almost instantaneously by Little Barford.

Following the incident, Ørsted, RWE and all of the distribution network operators are to be investigated by Ofgem, alongside National Grid Transmission and Electricity System Operator (ESO).

What happened?

The ESO's report cites a lightning strike as triggering the chain of events that led to widespread disconnection. However, the ESO has acknowledged that lightning strikes happen all the time.

It also lays out a timeline. While REMIT data shows Little Barford reporting offline first followed by Hornsea, National

Blackout: Still some grey areas

An investigation into the recent power outages intends to shed light on some conflicting information



Grid's timeline suggests Hornsea started deloading a fraction of a second earlier, though the report suggests they were parts of the same incident.

Although Hornsea's initial reaction was "as expected", the reaction to voltage fluctuation expanded through the plant, activating protective safety systems, according to the report.

"Following an initial review, adjustments to the wind farm configuration, and fine tuning its controls for responding to abnormal events, the wind farm is now operating

robustly to such millisecond events," the report states.

That statement raises doubts as to whether it was correctly configured.

Either way, Hornsea deloaded from 799MW to 62MW. Milliseconds later, Little Barford's steam turbine tripped, taking 244MW off the system. As frequency response kicked in to manage the initial drop, about 500MW of embedded generation came offline as their loss of mains protection systems activated.

Little Barford's protection

systems then automatically tripped another of its turbines, which caused frequency to breach 48.8Hz – the Low Frequency Demand Disconnection threshold.

At that point the ESO's systems instructed DNOs to shed 931MW of demand. Little Barford staff then manually shut down another turbine 30 seconds later in response to high steam pressure – but National Grid said the disconnected demand and the additional power it had instructed to come on stream

Reaction: more frequency response required?

The blackout prompted a flurry of calls for the system operator to rethink its approach to frequency response procurement, particularly from providers of frequency response

According to consultancy Aurora, the blackout could lead to a rethink on how much reserve National Grid ESO procures through ancillary services such as frequency response. Per a briefing note:

"This event highlights the need to place sufficient value on being able to manage frequency through ancillary services such as frequency response. Being prepared for every possible eventuality may be expensive, but we have seen that even short outages cause high levels

of disruption and associated cost if key infrastructure such as airports, hospitals and railways are taken out.

Currently about £170m per year is spent on frequency response – doubling this would add £2 to an average annual household bill. As renewable penetration increases and the expected opening of Hinkley Point C later in the 2020s adds to the largest infeed loss,

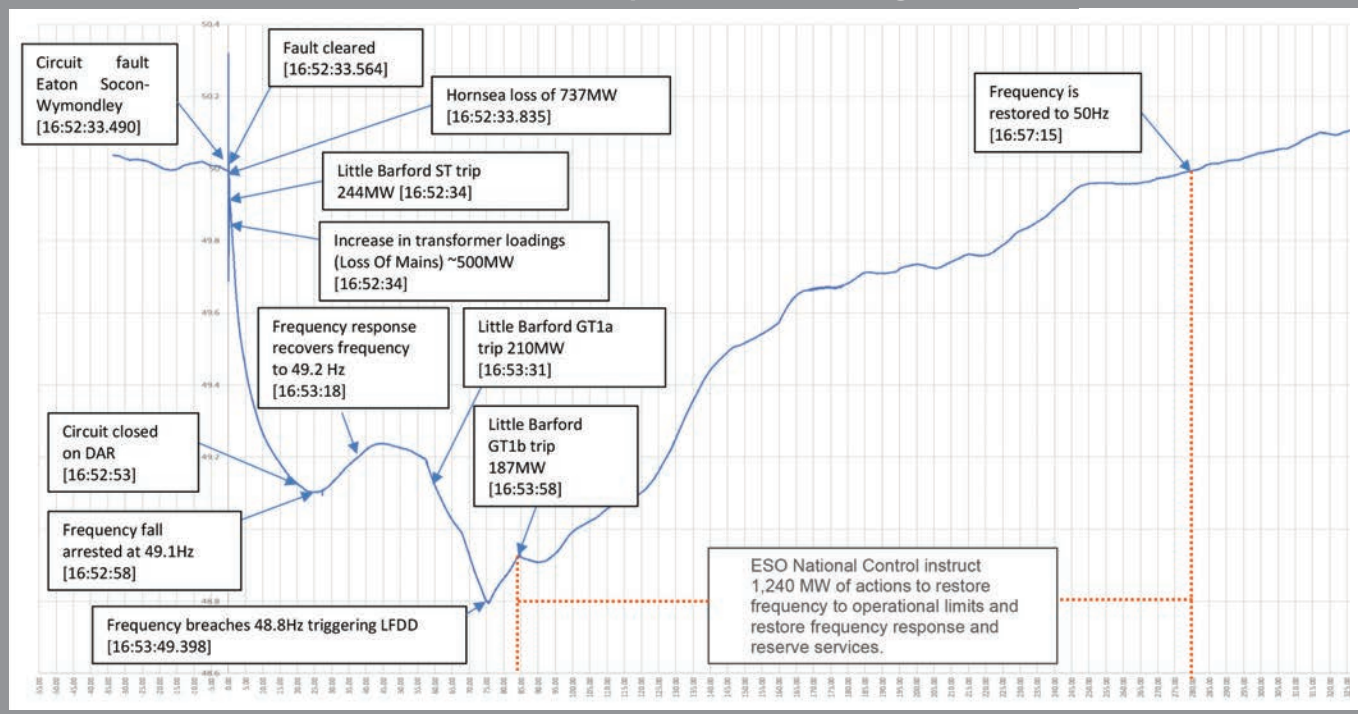
requirements are set to grow significantly. National Grid must address this if it is to meet its stated aim of operating a zero-carbon grid by 2025."

David Middleton, head of commercial delivery at Origami Energy, took a similar view. "We need to replace the inertia on the grid that is being lost through the closure or mothballing of large generating units. While some new power stations



David Middleton:
'We need to replace the inertia on the grid'

National Grid ESO's timeline of events as they unfolded on 9 August...



“The investigation will focus on whether any party involved breached license conditions or other obligations. Ofgem has the power to impose fines

accommodated that loss. Frequency was back to 50Hz within five minutes – and DNOs instructed to commence demand restoration in under 15 minutes – of the initial failure. Ofgem’s investigation will focus on whether any party

involved breached license conditions or other obligations. If they have, the regulator has the power to impose fines. It will look at whether National Grid ESO held sufficient inertia and frequency response and

whether the generators should have been more robust in reacting to the initial fault. On demand disconnection, it will look at whether the DNOs made the right decisions in terms of who was prioritised – and who was not.

In the interim report, National Grid ESO said it was holding enough reserve in line with security of supply standards – to cope with a single event. The ESO also said it is working on a project to determine “how new sources of inertia and other stabilising capabilities can be provided to the system”, as well as new frequency response services. **te**

are being constructed, progress is slow. In the meantime, National Grid Electricity System Operator (ESO) should consider purchasing more frequency response,” he said. “Increasing frequency response capacity can be achieved quickly. “We also need more energy assets that can provide fast response from storage and quickly turning demand on or off to balance frequency supported by real-time visibility and control.”



Steve Shine: ‘Greater volume of faster response services needed’

Steve Shine, executive chairman at Anesco, a battery storage developer and operator, also urged the ESO to buy more of the services his company provides. “It would be easy for National Grid to write this incident off as a fluke event, but they have actually been aware of this potential issue for many years. Indeed, it can be seen in their System Operability Framework publications and was referenced in their System Needs and Product Strategy document,” said Shine.

“What is needed is a greater volume of faster response services. This would have prevented the need to turn the power off.” As did Moixa CEO Simon Daniel, warning that the challenges are only set to grow: “It is critical that the National Grid and DNOs stay ahead of the curve by procuring and trialling flexibility solutions now, so that the appropriate framework is in place for future changes to grid demands, such as the increase

in electric vehicle adoption.” Others suggested that the frequency protection thresholds of distributed generation should be revisited, to prevent hundreds of megawatts regularly coming off stream, something Ofgem is currently looking into. There were also calls for National Grid ESO, distribution networks and Ofgem to re-examine who gets disconnected, and for critical infrastructure providers to reassess their strategies and back-up systems. **te**



Simon Daniel: ‘Critical National Grid and DNOs stay ahead of the curve’

Battery storage: Balancing risk and reward



Andy Lowe, Head of Business Development at Flexitricity, discusses the emerging battery storage opportunity as the UK transitions towards a low-carbon economy. As the development and investor sector is challenged with transitioning the previously heavily subsidised industry into one that is subsidy-free, the demand response expert believes there is potential in the fast-growing market space and early movers might have an edge over their competitors

Renewables' march to victory can't happen without increased flexibility in our energy system, which means that battery storage alongside demand response will play a pivotal role in our transition to a low-carbon economy. National Grid predicts that as much as 30GW of installed battery capacity could be required by 2050. The future looks very bright indeed for battery developers and investors, but the road to there is not free of twists and turns.

I started working in the low carbon energy sector 12 years ago, cutting my teeth on large-scale wind energy. Within a couple of years, I was turning my attention toward smaller-scale renewable projects, as both an advisor and a developer. I worked on projects around GB which were to be incentivised by a new government scheme: the Feed-in Tariff (FiT). For anyone who was at the FiT theme park during the nine years that the scheme was open, it is fair to say that FiTs

were a bit of a rollercoaster. But boy did FiTs hit the objective of stimulating investment. They provided index-linked payments for 20 to 25 years based on what became pretty accurate yield forecasting, all at a time when equipment suppliers were competing on price. Investor confidence was high and finance for the right projects was readily available.

Now in 2019, the development and investment sector is challenged with the task of transitioning this previously



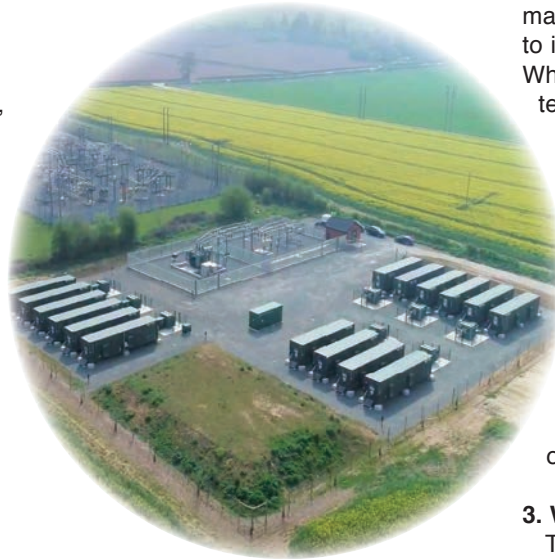
heavily subsidised industry into one that can stand on its own two feet, subsidy-free. When I first entered the world of battery storage as a developer, it became apparent that it was going to be a complex business case. At the time, de-rating factors for storage in the Capacity Market (CM) had been reduced, triad export benefits were for the chop and frequency service prices were starting to drift downwards. Each business case lasted a few months before needing a tweak. And the term “merchant” operation was being floated more frequently into such discussions.

While I understood the basics of this, I knew there was more to learn. I approached Flexitricity for help and within months I was working for them. I now understand the business case and sit on the other side of the desk, spending most of my time assisting developers and investors in getting to grips with these realities. And, make no mistake, it is a hard business case to get your head around.

Broadly speaking, front of the meter batteries can participate in the CM, Firm Frequency Response (FFR), Fast Reserve and DSO services, and can be traded in the power markets. Added to this, these energy storage assets can be traded directly with National Grid in the Balancing Mechanism. The same asset can contract for all of these services, although apart from the CM the services can't be delivered simultaneously. Added to this there may be embedded benefits driving particular strategies for assets, and a dollop of triad management in the mix in some geographical areas. Of course, that's just until the services change. Behind-the-meter and co-located batteries have slightly differing revenue stacks but similar strategies, market forces and operational governance apply.

While some investors have jumped in, some have dipped their toe and some are waiting to see if those who have jumped come up for air, questions from the investor community are broadly similar:

1. What is the best service delivery/ operational stack?



***“Battery storage is complex...
The key to making it happen
is to build a realistic business
case and pick the right market
access partner”***

An asset owner needs to be able to access all potential revenue streams with the same asset. Remaining solely in ancillary services or solely in the Balancing Mechanism is not optimising the potential of battery storage. In current markets, for a site without any significant geographical benefits, I think the best stack is part FFR (while the price holds), taking what is available from the day ahead market but not selling yourself short, refining your position intraday and being available to National Grid in the Balancing Mechanism for the remainder of the time. Embedded benefits will drive pricing strategies and will impact the volumes secured in different markets; investor risk appetite does the same thing. The trick to successful optimisation is to be dynamic and have the right humans and algorithms that enable you to be agile and follow the money.

2. How secure is the revenue?

Decent floor price structures might emerge, but until they do no-one should ever say that revenue is secure. Everything you do will be either tendered competitively in the

market or traded regularly, right down to individual settlement periods.

While some ancillary services can be tendered month ahead, and you can still lock in some term for certain EFA blocks at certain times of the year, values here are likely to be a low percentage of your total stack. This is merchant operation in the energy markets and the risk is yours. The Capacity Market will bring a level of revenue security if/when it is reinstated but as we've seen often in the past, requirements and opportunities can quickly change.

3. Who can do all of this for me?

That one's easy... Flexitricity offers full access to all revenue streams coupled with market-leading expertise.

The reality is that battery storage is complex for developers and investors previously accustomed to a subsidised environment. It is not simple to understand, and given the appetite for risk and

the corresponding hurdle rates that these drive, it is fair to say that there is a reasonable amount stacked against the rapid growth that most want to see in this space. However, if the parties can get their heads around this, and are confident about the current and future need for energy storage, then with the right diligence on capex and opex, it is a commercial proposal that can be made to work. The key to making it happen is to build a realistic business case and pick the right market access partner.

The final question then remains – should you invest?

We believe that the merchant model will be proven soon and we are hard at work – literally 24/7 – to make it happen. Positive regulatory changes are afoot via Ofgem and other bodies, and the demand for flexibility is predicted to grow exponentially. So, for those who can stomach a level of uncertainty, getting an energy storage project off the ground now might indeed be a smart move, landing you in pole position as the market continues to grow.

BEIS considers multi-year contracts for DSR

The government expects the Capacity Market to be reinstated later this year and is reviewing potential issues, including delivery assurance and contract lengths

The Department of Business, Energy & Industrial Strategy (Beis) is mulling a number of Capacity Market changes as part of its five-year review, many relating to demand-side response (DSR).

The Capacity Market (CM) is currently suspended pending the outcome of an investigation by the European Commission. It was halted after the European Court of Justice (ECJ) ruled that the Commission had failed to effectively scrutinise the CM's compatibility with state aid rules.

The ruling came about after Tempus Energy launched legal action in 2015. CEO



Beis said it remains open to considering multi-year agreements for DSR if evidence supports that view

Sara Bell claimed the market was anti-competitive because DSR could only bid for one-year CM agreements whereas new build generation could bid for 15-year agreements.

Bell argued that the Commission did not conduct a proper investigation into state aid compatibility – which the ECJ upheld, ruling in Tempus' favour.

The government believes the CM will be reinstated without requiring major changes later this year, but said it intends to review potential issues related to DSR.

These include contract lengths, de-rating factors, delivery assurance and the 2MW

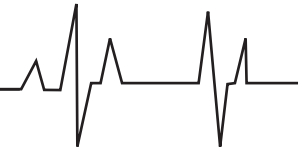
minimum threshold, which may be brought down to 1MW.

Multi-year contracts?

“Our preference is to maintain one year agreement lengths wherever possible, unless there is strong evidence to deviate away from this,” states the document.

“Regarding DSR, no quantitative evidence, or any other sufficiently strong evidence [has come forward] that could be used to inform a policy decision on whether multi-year agreements for DSR are necessary.”

However, Beis said it “remains open” to considering multi-year agreements for DSR if evidence supports that



components are registered over time, with an increase in cover required just ahead of T-1 for any remaining unfilled capacity at this time”. It thinks stiffer penalties will also boost secondary trading.

Transparency and derating

Beis said there is a need for transparency of DSR components to ensure de-rating factors are fair and accurate. For example, generation or storage behind the meter acting as DSR would currently receive an 86% de-rating factor, whereas a half hour battery registered as a battery capacity market unit is de-rated as low as 10%.

The department said it would work with the Delivery Body on de-ratings for DSR – including the need for a duration component. Based on the results of T-4 auctions to date, Beis believes that up to 70% of DSR may currently be behind the meter generation.

Emissions limits

DSR made up of generation assets will also have to consider new EU emissions limits designed to stop dirtier assets receiving capacity payments.

Since July 2019, any new plant that emits more than 550g/CO₂ of fossil fuel origin per kWh and more than 350 kg CO₂ of fossil fuel origin on average per year per installed kW_e, cannot receive capacity payments.

By 2025, those limits apply to any existing plant. The emissions limits “will affect coal, diesel and possibly some old inefficient gas generation, including any such fossil-fuelled components included as part of DSR capacity market units”, states Beis.

Therefore, the department is consulting on Capacity Market rule changes to accommodate the legislation, such as contract lengths for refurbished plant likely to exceed the emissions limits, and how to police and penalise false or inaccurate fossil fuel emissions declarations. **te**

view. It committed to research DSR contract lengths and engage with industry and the EMR Delivery Body as part of evidence gathering.

The department pointed out that 15-year agreements represent 2% of the total capacity secured to date through the CM and three-year agreements represent less than 1% – though it expects a greater number of multi-year contracts in future.

Penalties and credit cover

Beis intends to impose stiffer penalties for non-delivery during stress events. It is also considering suggestions from industry to “progressively release credit cover as DSR

Reactive Technologies in National Grid ESO deal to measure UK power system inertia

System operator in commercial agreement to gain a clearer picture of real-time grid stability

Reactive Technologies has signed a commercial deal with National Grid ESO to measure inertia on the UK power system, providing a clearer picture of real-time grid stability.

The six-year agreement will see Reactive initially build out hardware and software, then provide commercial inertia measurement services for five years.

The company said hardware includes one of the world’s largest ultracapacitors, used to ‘inject power’ into the grid, while proprietary measurement units directly measure the response.

Reactive said by measuring – rather than estimating – inertia, National Grid ESO can better transition to a system that can, at times, run on zero carbon power, by enabling a greater penetration of renewables on the grid.

What is inertia?

Inertia is valuable to the power system because it helps keep frequency stable: if frequency deviates much from 50Hz, there is a risk of the lights going out.

Large power stations, with big spinning turbines, are traditional sources of inertia. While wind turbines also provide inertia, that is dependent on weather and wind speed.

As centralised power systems come off the system,

or operate less, National Grid has less inertia in its toolbox to manage frequency – and has to take more actions to balance the system, such as calling on demand-side response providers via services such as frequency response.

Reactive has been working with National Grid for some time, two years ago announcing that it had

50Hz

The frequency at which the UK power system operates. Deviating much from this risks power failures

measured inertia across the UK system, believed to be a world first.

“Our previous collaboration with National Grid ESO successfully demonstrated the technological advantage of our GridMetrix platform and we are now excited to deliver it as a full commercial service,” said CEO Marc Borrett.

“This agreement will lead to the commercial deployment of an accurate inertia measurement on a nationwide scale, supporting National Grid ESO’s and the UK’s overall decarbonisation ambitions.” **te**

Energy as a service – shifting mindsets towards flexibility

By Vincent de Rul, Director of Energy Solutions at EDF Energy

Energy services are a way of facilitating the paradigm shift from traditional, centrally-generated dispatchable energy, through to a decentralised, electric future.

Energy as a service is not only about reducing energy spend, but about managing power supply and demand during the shift to an electrified, low carbon energy system. The principle is that businesses and consumers sign up to an energy supply deal in which they pay a fixed amount for energy use.

The future electrified energy system will need to be supported by reliable baseload generation alongside a full set of energy solutions: flexibility, energy efficiency and storage. These energy solutions can be included in an end-to-end energy management deal. Ultimately, this helps both businesses and the wider country to transition to low carbon alternatives.

For example, electric vehicles will increasingly place new demand on the grid. Energy services such as vehicle to grid (V2G) technology, which enable power to be drawn from car batteries and fed back into the grid when not in use, will be important to support the balancing of electricity demand.

If we focus only on the cost saving potential of energy as a service, we fail to recognise that there

is something far more fundamental behind the shift towards energy being sold and managed in this way.

Energy as a service represents the point at which the decentralised, decarbonised and digitalised energy future that is envisioned from the big podiums at events like Davos and COP24 becomes something both

practical (delivering real benefits to companies) and practicable (that is, actually implementable).

This approach is growing because companies are recognising that thinking more strategically about energy management, rather than just shopping around for the best prices, opens up a range of opportunities and benefits. As they make

this shift, they are able not only to save energy, but to create extra revenue, decrease their company's carbon footprint and improve their company's resilience.

Energy companies that are primed for change will help consumers and businesses to understand how they are using energy and support them to build operational resilience and achieve their sustainability targets. This is the true potential of energy as a service.

If you are interested in working out what change is right for your business right now, get in touch at: energysolutionssales@edfenergy.com or find out more about the power of flexibility at: edfenergy.com/positivedisruption



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National Grid models big DSR and storage increases

System operator says in report that DSR has 'important role to play'

National Grid's latest energy scenario modelling suggests a potential major increase in demand-side response (DSR) provided by UK businesses. The electricity system operator has also increased its projections of storage capacity, though revised down long-term solar growth across scenarios that could play out, depending on the policy decisions and market developments in the medium to long-term.

DSR could quickly double

Two of its 2019 future energy scenarios outline a doubling of 'load' DSR (turning on or off, up or down) to 2GW by 2025. Those models are based on a higher penetration of renewables and the UK taking more urgent steps to mitigate climate change.

Under the 'community renewables' scenario, load DSR triples from 1GW today to 3GW by 2027, hitting that level by 2029 in the 'two degrees' scenario. Load DSR also increases in the other two models – 'steady progression' and 'consumer revolution' – but at a slower rate.

National Grid ESO said DSR "has an important role to play as one of the tools that support flexibility in a future energy system" and that the "notable upturn by 2025" in its models comes about "as the market framework and products become more streamlined".

However, the report illustrates how load DSR has flatlined for the past four years.

Batteries charge

National Grid said 500MW of storage has come online

Figure 1: Annual electricity demand from the commercial sector

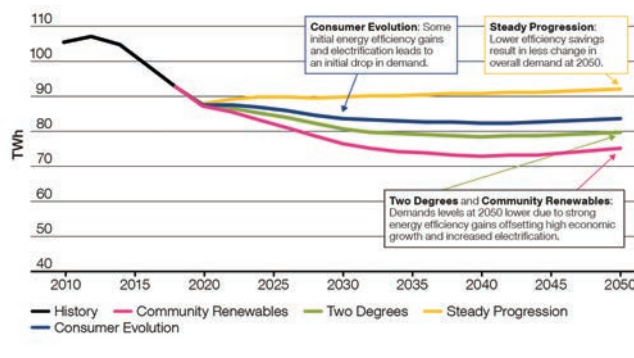


Figure 2: Installed electricity storage capacity

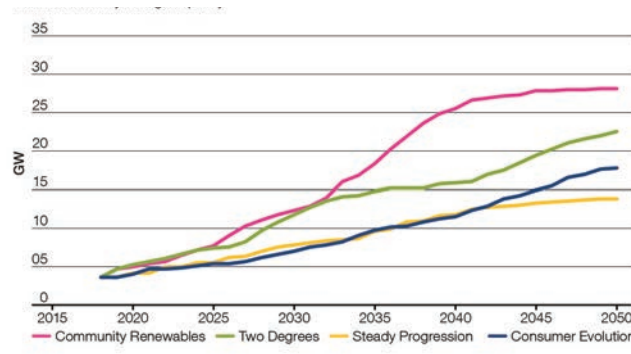
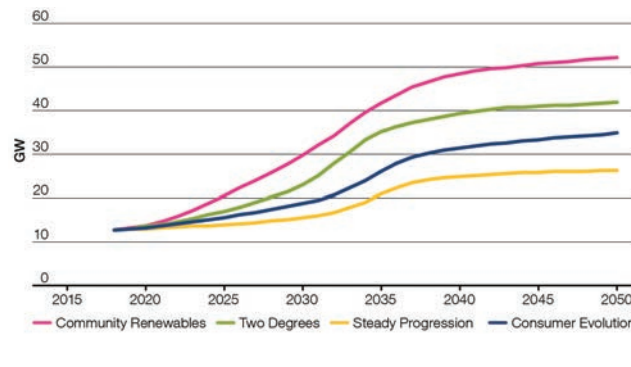


Figure 3: Solar capacity by scenario



in the past year, mostly short duration batteries, though including some novel forms, such as Highview Power's 5MW/15MWh liquid air energy

storage facility at Bury. "This rapid development of projects in the past 12 months has led us to increase our projections of storage growth

in the 2020s in most scenarios, as we see the development of a robust project pipeline," states the document.

Under 'community renewables' and 'two degrees' scenarios, UK storage capacity reaches around 7.5GW by 2025, an increase of roughly 50%, and increases to around 13GW by 2030 as increased penetration of intermittent renewables creates greater system flexibility requirements.

Electric vehicles for grid services

The models for battery storage do not include those within electric vehicles. But National Grid said these could also be a significant source of flexibility. In line with FES 2018, National Grid's scenarios maintain that only 2% of electric vehicles will be used to provide grid services (V2G) by 2030. However, between 10 and 14% could do so by 2050, equating to gigawatts of flexibility and offsetting 85% of EV demand at peak.

Solar dip

National Grid said it has revised down maximum penetration of solar PV across its scenarios following stakeholder feedback. However, even its most pessimistic scenario models a doubling of capacity to about 25GW by the mid 2030s.

For the next few years, growth in solar PV remains depressed under National Grid's models, picking up again from the early 2020s as cheaper batteries improve co-location economics. FES 2019 contains a broad number of models and scenarios across multiple industries and energy sectors. **te**



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Testing opens for Balancing Mechanism and Terre

Companies that want to trade power in the GB Balancing Mechanism – and the European reserve exchange – can now test their systems

Elexon is leading on work to change settlement systems so that aggregators can trade flexibility within the Balancing Mechanism (BM), the main tool used by National Grid to balance supply and demand close to real time.

As contracted revenue streams for flexibility come under pressure, the BM is seen as an increasingly important market for flexibility providers.

To date, only licensed suppliers have been able to trade in the BM – which led some aggregators, such as Limejump and more recently Flexitricity, to acquire supply licences.

However, National Grid

and Elexon aim to enable parties without supply licences to participate, with the arrangements also enabling participation in the new European reserve exchange, Terre, involving nine European transmission system operators (TSOs).

That will enable companies selling flexibility to access deeper pools of value – with the BM accounting for almost half of GB balancing costs – around £530m per annum net or £1.1bn gross.

By way of comparison, non-BM ancillary services stood at about £480m in 2018/19 – but that includes Black Start, a grid reboot service that is currently the preserve



“
Elexon said it still intends to make wider BM access available this year, regardless of whether GB participation in Terre is deferred

of large power stations.

Terre will likely be a smaller opportunity for flexibility providers, though could theoretically be worth nine figures – if the five of the eight TSOs physically connected to the GB system have similar requirements to the UK’s estimated 1.1TWh per annum.

Terre was due to go live at the end of 2019, but has now been pushed back because the French TSO, RTE, is not ready to go live.

Because the GB route into the market is via France, National Grid has also requested a derogation

Severn Trent eyes more flex technologies

Water company seeks feedback to unlock flexibility, reduce its energy bills and cut its carbon footprint

Severn Trent Water is asking for feedback on its procurement strategy and for new ideas on how it could better harness flexible technologies.

After the feedback exercise, Severn Trent will go to market for specific solutions that cut its energy bill and carbon footprint and unlock flexibility,

Severn Trent uses 900GWh of power per year, equivalent to £100m, though it generates approximately 40% of its own consumption. It wants to use flexibility to drive down cost further and seeks ideas in the following areas:

- Opportunities to use hydrogen and biomethane,

including vehicles and power generation

- Alternatives to traditional diesel standby power resilience
- Energy flexibility and control solutions
- Innovative use of waste heat
- Low-head in-pipe hydro generation
- Solutions for storage and



National Grid and Elexon aim to enable parties without supply licences to participate in the Balancing Mechanism

and all the other TSOs, bar Czech Republic, are now holding fire, potentially until December 2020.

Elexon said it still intends to make wider BM access available this year, regardless of whether GB participation in Terre is deferred.

Alongside making changes to industry codes to enable aggregators to play in the BM and Terre, Elexon is developing a software platform that they can use to access the markets as 'virtual lead parties', or VLPs.

The firm is inviting aggregators and others to

test the platform to ensure their systems are compatible and later this month will start publishing bids and offers for replacement reserve as well as publishing additional information in its settlement reports to reflect replacement reserve trading and VLP participation.

The tests, which will run through September and October, are open to existing balancing and settlement code parties, prospective VLPs, half-hourly electricity data aggregators and third parties that provide software involved in settlement. **te**

Anesco and Western Power Distribution strike flex capacity deal

Flexible capacity agreement is claimed to be the first of its kind and falls under a different charging methodology

Anesco and Western Power Distribution have struck a flexible capacity agreement that they claim is the first of its kind. Anesco said the arrangement, which will see it relinquish some import capacity on its 19.5MW connection at peak times, will cut its grid charges by about 25%.

"This agreement is different to existing flexible agreements including WPD's Flexible Power arrangements," said a WPD spokesperson.

"It falls under a different charging methodology which has been available but not used previously by any customers. This is the first time WPD has signed such an agreement with a customer."

While distribution network operators are ramping up procurement of flexibility to manage network constraints, some industry participants believe there is greater value to be had from flexible connections, given the multibillion-pound



Flexible capacity deal will cut Anesco's grid charges

reinforcement programme that DNOs must undertake if the UK is to meet net zero ambitions.

Incremental revenue from providing distribution grid services gives investors short-term price signals and optionality. But opening up flexible connections and access across the UK market that reflects the value of avoided cost could provide the long-term price signals investors require to start putting serious money into flexible assets, such as batteries, or unlocking flexible load.

Network access arrangements are a large part of Ofgem's significant code review. **te**

balancing of surplus onsite generation

Once the company has assessed commercially available flexible energy solutions, it intends to go to market via a tender.

But it also wants to understand how its procurement and contracting strategy might better enable smaller companies to provide services.

Robert Wild says Seven Trent Water is looking for feedback on its contracting framework



"We are a fairly big utility company and [our contracting framework] may be quite difficult to navigate for small firms with good ideas, so we are looking for some feedback on that," Severn Trent

Water demand-side response manager Robert Wild told *The Energyst*. He said the exercise will

also outline "some indicative solutions that we are likely to go to market for in the near future – such as batteries, storage and aggregation services – so we are looking for feedback there as well". **te**

Robert Wild will be among the speakers at *The Energyst's* DSR Event in London on 11 September. To register, visit: **dsrevent.uk**



Don't miss the DSR Event...

This year's event unpacks the changing flexibility landscape – and what that means for businesses that can harness flexible demand or behind-the-meter generation assets

Taking place on 11 September at One Moorgate Place, London, the DSR Event is free for end user organisations that can harness onsite generation or load to help provide flexibility to National Grid ESO, distribution network operators, or to help suppliers balance their contracted positions.

What you will learn

National Grid ESO will outline the direction of travel as it works through service revisions in a bid to create a more dynamic and diverse flexibility landscape.

Consultants Baringa Partners and LCP, alongside sponsors

EDF and Enel-X will discuss where value is headed for flexibility providers and how the fluid market environment impacts strategies.

The Environment Agency will outline how the Medium Combustion Plant Directive (MCPD) and Specified Generator legislation impacts DSR provision from onsite generation – and where emissions control may be headed.

The Department for Business, Energy & Industrial Strategy will provide an update on the Capacity Mechanism – and the aspects DSR providers should bear in mind in the short to medium term.

Cornwall Insight will provide a topline view on incoming charging regime change and its potential implications for DSR.

UK Power Networks will lead on a session around local flexibility and the opportunities this presents to those with flexible assets and demand to add another revenue stream by helping to manage network constraints and other services, as DNOs transition to DSOs.

Elexon will outline the opportunity presented by European reserve exchange programme, Terre, while end-user demand-side response providers Aggregate Industries, Severn Trent Water

and Simec will share their experiences of DSR provision – highlighting challenges and opportunities that other providers should bear in mind.

Free DSR report

The event will also mark the launch of *The Energyst's* 2019 DSR report. It includes a reader survey containing data and qualitative interviews from both DSR providers and those that could, but do not yet provide DSR, plus views from aggregators, suppliers, DNOs and consultants. te

If you would like to attend, register at dsrevent.uk

Speakers at the event



Steve Edwards
Head of flexible energy,
Liberty House
Network



John Henderson
Senior Advisor Fuel &
Power,
Environment Agency



Richard Eaton
Energy manager,
Aggregate Industries



Kyle Martin
Head of Market Insight,
LCP



Caroline Bragg
Senior Policy Manager,
ADE



Charles Phillips
Head of Capacity Market,
Bels



Matthew Roper
Market Architect,
Elexon



Molly Webb
Founder & CEO,
Energy Unlocked



Sotiris Georgiopoulos
Head of smart grid,
UK Power Networks



Tom Palmer
Principal Consultant,
Cornwall Insight



Brendan Coyne
Contributing editor,
The Energyst



Robert Wild
Demand side response
manager,
Severn Trent Water



Vincent de Rui
Director of Energy
Solutions,
EDF Energy



Colm Murphy
Acting head of business
development,
National Grid



Tom Harper
Senior manager,
Baringa Partners



Graham Oakes
Independent
consultant



Janet Wood
Editor,
New Power



John Gallagher
Head of Sales & Business
Development UK (B2B),
Enel X



Is battery technology on the verge of a blue period?

A new battery technology – derived from a widely available pigment that inspired Picasso’s ‘Blue Period’ – claims to provide a safer and more efficient alternative for DSR and bridging applications

Prussian blue, a dark blue pigment derived from ferrous cyanide (a material that has been safely used for more than 250 years in paint, leading to Picasso’s famous ‘Blue Period’), has now found its way into a new application – battery technology.

Natron Energy has developed a patented cell technology based on Prussian blue electrodes and a sodium-ion electrolyte, producing a battery with extremely low internal resistance and round-trip energy efficiency of 97% in normal operation and over 98% round-trip efficiency on a coulombic level. This makes the technology ideal for stationary energy storage and UPS applications where reliability and high-power are paramount.

range of operating conditions.

“Our extended lifecycle testing at 45°C with high rates of charge and discharge (and no rest or settling time between cycles) have demonstrated the battery tolerates abnormal abuse. Natron has built the first battery in which chemistry does not limit battery lifetime,” Pouchet claims.

“It was our intention to design and build a safer, more efficient, reliable battery using chemistry and material science to eliminate the characteristics and thermal runaway associated with lithium-ion batteries in use today.

“In addition, our sodium chemistry does not use any rare earth elements – like cobalt or tantalum – and, unlike lithium, that uses a large amount of water in the mining and

Key features

The sodium battery technology is designed to:

- Produce high power and fast recharge time
- Deliver a long life with up to 100,000 cycles
- Sustain energy capacity with minimal degradation under float conditions
- Operate safely, even under fault conditions that lead other batteries to combust

“For long-term energy supply such as two-hour grid serving applications, the sodium battery performs with significantly higher cycle frequency, recharge rates and no settling or recovery times between charge/discharge cycles. However, we do require a somewhat larger footprint than lithium-ion for a comparable kWh rating as the sodium energy density in these types of applications is less than lithium,” Pouchet continues.

Traditional telco customers have been attracted to Natron’s 1U product, which features high peak power capacity that enables new architectures for redundancy. A typical 2N battery design that would be required for either a lead or lithium-ion battery deployment is unnecessary with Natron’s

sodium battery. The battery can provide 2X its rated two-minute peak power for 30+ seconds without modifications.

“We see applications for use in any mission critical infrastructure where bridging to genset/fuel cell or other energy source is required. Due to the sodium batteries’ ability to function like a supercapacitor, the battery can be used with prime power fuel cells to provide ride-through for variable ramp-rate loads,” comments Pouchet.

Other ideal applications include mining and industrial applications, where frequent charge/discharge events are considered normal, or in applications where the operating conditions would put tremendous strain on lead or lithium-ion batteries.

For off-grid sites such as mines, the sodium battery can be paired with solar, wind or hydro systems to provide long autonomy periods, greatly reducing the demand for stationary generators, fuel deliveries, and generator service/repair cycles. The high peak-power capacity of the sodium battery also means that operators can use their battery plant for grid services such as frequency regulation, demand-side response, or peak shaving to generate additional revenue streams. ●

“Natron has built the first battery in which chemistry does not limit battery lifetime

Natron Energy’s Jack Pouchet says: “As we move to larger form factor batteries for high-capacity UPS and EV/ Grid applications, we expect to see additional improvements in system-level efficiencies.”

The Prussian Blue cathode and anode atomic cell structure are effectively large cages that allow ions and electrons to flow in either direction with ease compared with other chemistries. As a result, the batteries experience no mechanical stress and generate minimal heat under a wide

refining processes, our core materials are readily available at significantly lower cost.”

Natron claims that its sodium battery offers more power (kW) per unit of energy capacity (kWh) rating than lithium-ion or lead-based batteries.

“The significantly lower internal resistance and high round-trip efficiency enable the sodium battery to excel as a short-term power source, for bridging to a generator in the two to five-minute range, or providing ramp-rate power like a supercapacitor,” says Pouchet.



The Medium Combustion Plant Directive (MCPD) came into force on the 24 January 2018 and affects businesses throughout the UK. The MCPD targets emissions of nitrogen oxide (NO_x), sulphur dioxide (SO₂) and particulate matter and covers any plant with a thermal input between 1MW and 50MW (equivalent to approximately 400kW to 20MW of electrical load) that combusts fuel, including combined heat and power units, boilers and diesel generators.

Only businesses in England and Wales are affected by the Specified Generators Regulation. This regulation is focused on NO_x and requires plant that generates electricity with a thermal input from 0MW to 50MW to comply in a tighter timescale.

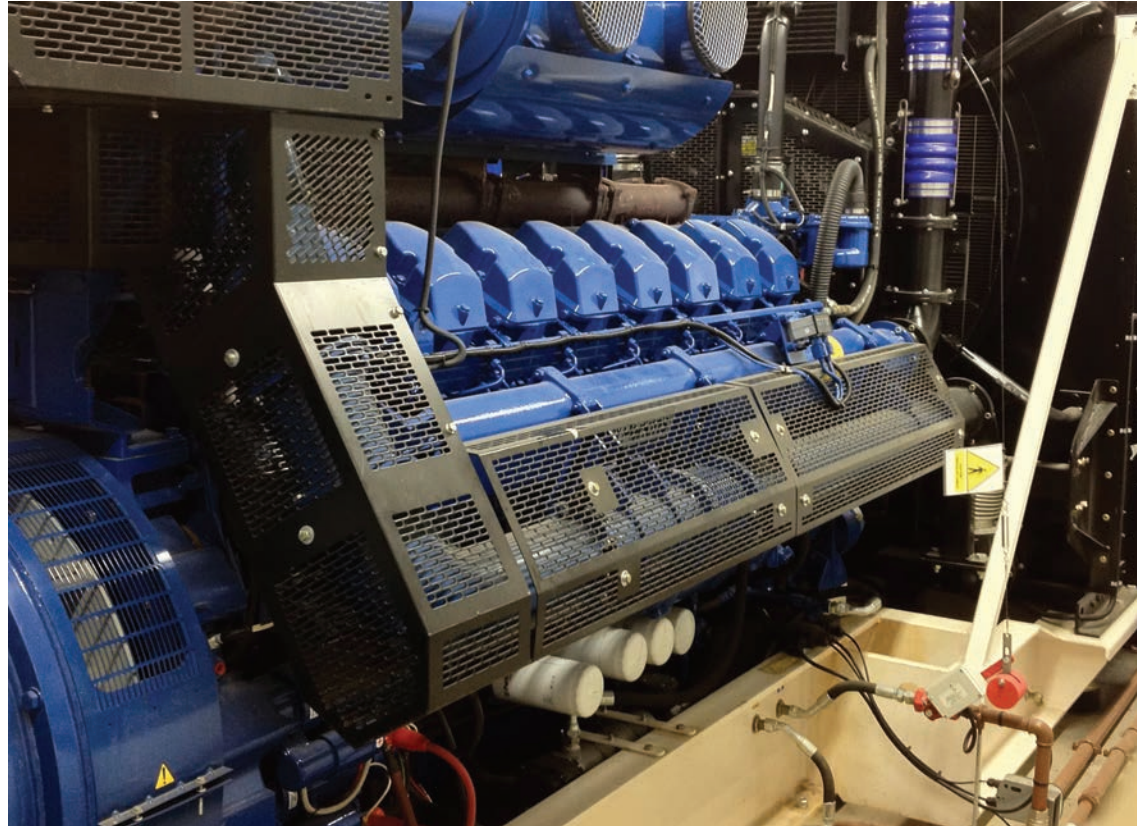
The regulations are complex and evolving, and introduce different compliance timeframes according to the size of plant, fuel type, operating hours, location etc. With penalties for non-compliance, it is important businesses take the time to understand how the legislation affects their sites and plant, the impact on their operation and what they need to do by when.

Steps to compliance

In order to comply with the legislation your business will need to take steps to measure and monitor its emissions and abate plant accordingly. Depending on where your business is based, you will also need to apply for a permit from the Environment Agency, the Scottish Environmental Protection Agency or Natural Resources Wales.

The most effective abatement technology is known as selective catalytic reduction. This is a flexible solution which can reduce NO_x emissions by up to 99%.

The cost of fitting this is site and plant dependent but is usually in the region



Demystifying the Medium Combustion Plant Directive

Tens of thousands of businesses across the UK are affected by new legislation designed to improve air quality and cut pollution, but many remain unsure of what they need to do. Kiwi Power's Jack Christie explains what the Medium Combustion Plant Directive means for businesses

of £60,000 per MW.

Figure 1 summarises the compliance deadlines and related tranches of plant. Transitional arrangements exist for existing plant (Tranche A), while new plant (Tranche B) is expected to comply immediately.

An exemption exists for backup generators operating for onsite resilience only (up to a maximum of 50 hours over a

rolling 12-month period) but a permit may still be required.

Implications for demand-side response

Entering into a demand-side response (DSR) programme (eg STOR or some Capacity Market contracts) will automatically classify your plant as Tranche B, whatever its age. This means that if your business wishes to take part in

STOR or the Capacity Market from October 2019 and has not already secured contracts it needs to comply now.

Triad participation will also be affected and a permit will be required for all Tranche B sites that wish to run for Triads in 2019/20. Tranche A sites over 5MW are able to run for up to 50 hours without a permit until 2025. This means they will have to use their 50 hours wisely and

An exemption exists for backup generators operating for onsite resilience only, but a permit may still be required

track their running hours to ensure they hit the Triads and comply with the legislation.

With careful management and a bespoke Triad strategy this is very achievable. While we have known risk-averse clients run plant for 60-70 hours to be sure of hitting Triads. Last year Kiwi Power hit all three Triads with a runtime of only 19 hours, conserving fuel and leaving clients with valuable hours free for testing and maintenance.

Ultimately, since all businesses will have to comply at some stage, there is a strong business case for acting sooner rather than later – allowing your business to continue to take advantage of valuable DSR revenues and savings.

COMPLIANCE DEADLINE	CATEGORY
1 January 2019	Tranche B: All new generators and generators entering new DSR contracts
1 October 2019	Tranche A: An existing generator, or site with generators, over 5MW thermal input, over 500mg nitrogen dioxide (NOx), operating for more than 50 hours
1 January 2025	Tranche A: An existing generator, or site with generators, over 5MW thermal input, over 500mg NOx or operating 50 hours or fewer
1 January 2030	Tranche A: An existing generator, or site with generators, under 5MW thermal input
NB: For the 2025 and 2030 permitting deadlines emissions reporting will be required for one year in advance of receiving a permit	

Figure 1: Countdown to compliance

“ *Since all businesses will have to comply at some stage, there is a strong business case for acting sooner rather than later* ”

Jack Christie, Kiwi Power



The return on investment is typically between two and three years and this does not include some of the newer revenue streams and market opportunities that are opening up, such as local constraint management participation, balancing mechanism access and wholesale trading.

What next for businesses?

With an estimated 50,000 premature deaths attributed to air pollution each year in the UK, the MCPD is an important piece of legislation that will ensure businesses play their part in improving health and air quality across the UK.

Rightly, the legislation requires businesses to act quickly, so it is important businesses develop strategies to manage power generation assets in order to minimise legislative risk and maximise financial returns. **te**

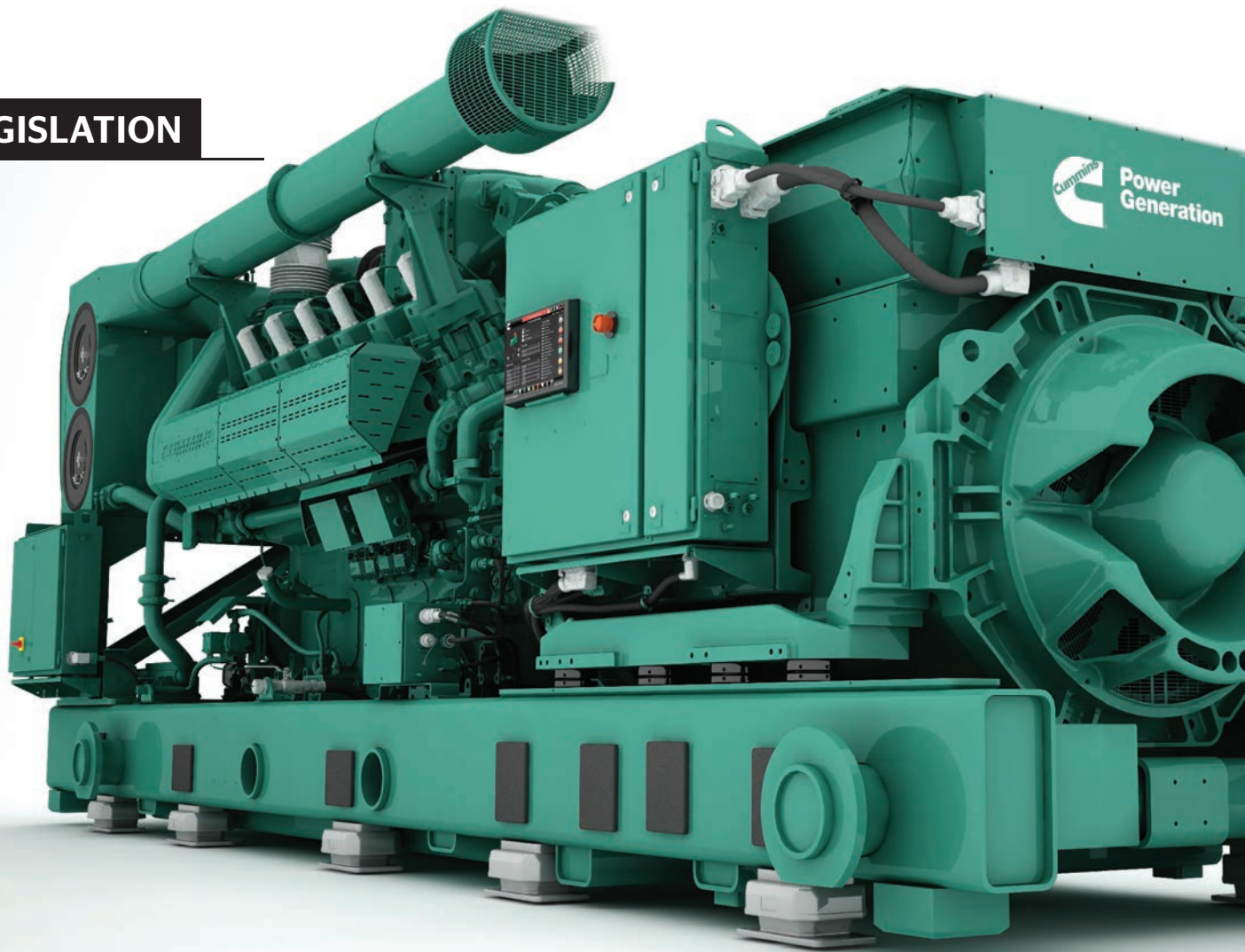


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Natural solution to MCPD?

Against a backdrop of ever stringent emissions legislation, Craig Wilkins, from Cummins, explains how natural gas-powered generators play a vital role in energy efficiency for onsite generation

There is an increasing demand for gas generator sets as a base source of onsite generation, with the grid being used only as a backup. The key drivers leading to this shift are environmental considerations, the need for increased reliability and potential savings in energy costs.

Natural gas power has come of age. An uninterrupted supply of fuel, cleaner technology and a better total cost of ownership, all combine to present a viable option for power generation, especially when compared with diesel.

In the context of progressively stringent global emissions standards, including the Medium Combustion Plant Directive (MCPD) and the

Specified Generator regulations, both of which seek to protect the environment by securing reductions of pollutants, modern gas-powered generators, such as Cummins 'lean-burn' HSK78G, are much cleaner than former diesel generators.

The HSK78G gas-powered generator is a flexible power solution for urban sites right through to heavy industry installations in the worst possible environments.

By using a lean burn generator set, air pollutant

outputs will be lowered, including NOx, hydrocarbons (HC) carbon monoxide (CO) and particulate matter (PM), which will ensure compliance with emission regulations.

Emission levels can be reduced because it uses twice as much air in the fuel/air mix than is required for total burn, which lowers burn temperature and NOx output. The main difference is that the NOx emitted from lean burn engines is far less than that of diesel engines.

Lean burn particulate levels are almost zero, so meeting location-specific emissions regulations can be far easier across a global perspective.

Emissions aside, gas-powered gensets offer users operational advantages. Having access to a continuous, uninterrupted fuel supply via a gas pipeline is an obvious benefit for use for modular power systems, microgrids and standby power. It also negates the need to store large quantities of diesel on site, which require costly

“Lean burn gas is most efficient for applications like hospitals, because they can recover waste heat from the generators to heat buildings and for steam and hot water
Craig Wilkins, Cummins



6:1

The typical fuel cost ratio for diesel and natural gas respectively

efforts to maintain the quality of the fuel. Considering that the typical fuel cost ratio for diesel compared with natural gas is 6:1, operators can also achieve a significant opex saving.

Lean burn generators are also more effective, in part because a resupply of diesel may be compromised in a major disruptive event. Also, if customers have access to a gas pipeline, they do not have to worry about running out of diesel.

Combined heat and power options can also provide benefits to lean burn generators.

A lean burn gas is most efficient for applications like hospitals because they can recover the waste heat from the generators to heat the buildings and to form hot water and steam.

Customers can also offset boilers with heat from the

NOx limits

New engine-driven MCPD NOx limits are 95 mg/Nm³ when fuelled with natural gas and 190 mg/Nm³ when fuelled with gas oil (diesel) or other fuels, both at 15% oxygen in the exhaust. The specified generator limit is 190 mg/Nm³ at 15% oxygen in the exhaust for all fuels. Existing plants with 5-50MWth input must be registered with a Competent Authority (ie the Environment Agency) by 1 January 2024 and the NOx limits applied from 1 January 2025 are 190 mg/Nm³ at 15% oxygen in the exhaust for engine driven plant on all fuels. Existing plants with 1-5 MWth input must be registered by 1 January 2029 and the NOx limits applied from 1 January 2030 are 190 mg/Nm³ January at 15% oxygen in the exhaust for engine-driven plant on all fuels. There are no dust limits for engines running on gaseous fuel or gas oil (diesel).

engines. Because of the ability to produce power and to recover heat to be reused elsewhere, there is an added financial benefit for customers. It is a benefit to the environment as well delivering cogeneration for electricity, heating, hot water and steam.

Natural gas-powered generators offer operators

an efficient, proven and future-proof power solution for onsite generation. From a Cummins perspective this change is exciting. It is driving our investment into new technologies – natural gas, diesel, batteries and fuel cells, to ensure that our customers have the right power for the right application. **te**

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Do the numbers stack up?

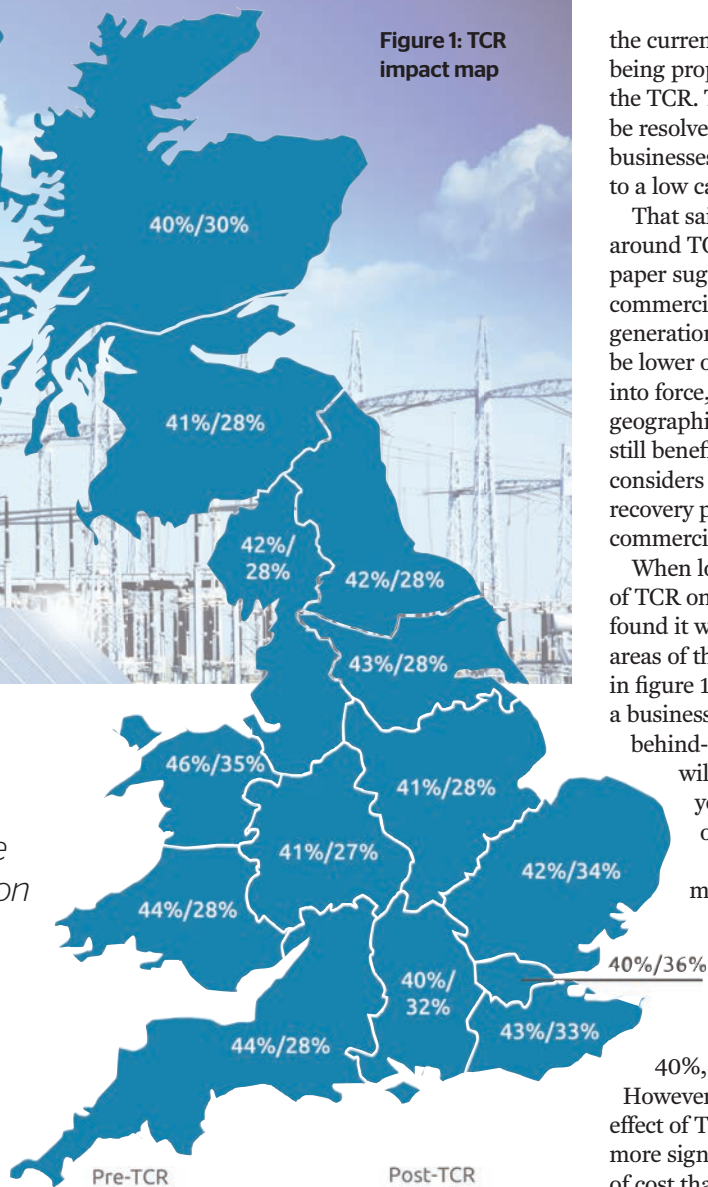
Stuart Reid, managing director (projects) at AMP Clean Energy, considers the impact of Ofgem's Targeted Charging Review on the business case for onsite generation

For many industrial energy users, Ofgem's proposed Targeted Charging Review (TCR) has made them question the benefits and financial case for onsite generation. However, against a backdrop of net zero, large companies will undoubtedly need to be part of the solution to decarbonise energy by 2050.

While the return on energy projects is often measured in direct financial savings, there is an additional commercial benefit in raised CSR credentials – something that is likely to increase as the climate change agenda and policy becomes more defined.

So, what are the onsite heat and power generation 'sweet spots'? Furthermore, what will be the true impact of policies including TCR? Arguably, there is currently a mismatch between the electricity market requiring increased – and more flexible – capacity and

Figure 1: TCR impact map



the current range of policies being proposed, including the TCR. This will need to be resolved to better support businesses through a transition to a low carbon system.

That said, our analysis around TCR in a new white paper suggests that while the commercial benefits of onsite generation might appear to be lower once TCR comes into force, there are certain geographic regions that will still benefit. If a business considers a gas CHP or heat recovery project, then the commercial case still stacks up.

When looking at the impact of TCR on onsite gas, we found it will vary in different areas of the UK, as shown in figure 1. The level of costs a business can offset from a

behind-the-meter project will differ depending on your district network operator (DNO).

For example, as the map shows, in London the impact will be small. Before TCR, the amount of cost which could be offset is 40%, after TCR, it is 36%.

However, in Yorkshire, the effect of TCR will be much more significant – the amount of cost that can be offset reduces from 42% to 28%.

To put it into context, we looked at the impact on a hypothetical 1MW baseload consumer in Yorkshire. Figure 2 looks at a current electrical spend of this consumer – around £1.1m per year. Its costs are made up of wholesale and system use charges, capacity market charges and levy costs. Wholesale energy makes up about half of the bill, so TCR will reduce energy costs for this consumer.

This means a behind-the-meter project will currently help it to avoid grid and levy costs by shifting generation onsite. Post-TCR, while the potential savings of a behind-the-meter project

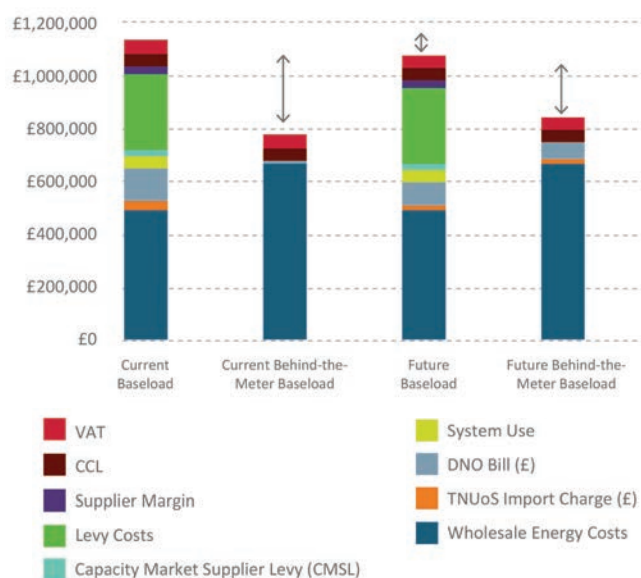


Figure 2: Impact of behind-the-meter savings

may reduce, heat capture will still provide significant value, and onsite generation remains an exciting prospect.

TCR does not mean that onsite CHP is ruled out for organisations. What it has done is make it important to find the right site with

by switching from fossil fuels to low carbon technologies. That said, many businesses are not yet funding onsite generation themselves – there are often competing priorities for capital investment, and it is perhaps unsurprising that those with a shorter payback

time period. However, to build resilience over the longer term, investment in energy is crucial.

For businesses struggling to find capital investment, long-term energy supply agreements, known as ESCOs, can be used to fund, develop, and sometimes operate,

attractive for many businesses.

So, back to our original question – will the numbers for investing in onsite generation stack up in a post-TCR environment? The answer is... it's complicated.

We can't ignore the fact that it may make project choices more complex. Our analysis shows that a case-by-case consideration is vital – there is no one-size-fits-all rule – and for many businesses, onsite generation remains a viable option.

What can't be ignored is the bigger picture. While the path to net zero is not yet clearly defined, the opportunity for large energy users is clear. They can plot their own route to decarbonisation by implementing practical solutions that are cost-effective to their business, right now. They just need to assess which is the best option for their own unique needs. **te**

**“ There is no one-size-fits-all rule - and for many businesses, onsite generation remains a viable option
Stuart Reid, AMP Clean Energy**



the right heat demand for a business' energy project.

With this in mind, against a backdrop of an unpredictable energy market, onsite generation still provides a valuable opportunity for many businesses that are facing increasing energy costs. Intensive energy users stand to make the most significant gains from cost and carbon savings

period will get precedence.

For example, as the return on capital investment for onsite generation projects is usually over five to six years, it may not seem an exciting prospect to some businesses who may be spending the money on equipment to boost production levels or other front-line technology that delivers a return in a shorter

low carbon and renewable installations. They typically operate for a 10 to 20-year period, during which time a business simply pays for the heat or electricity they use through a secure energy supply agreement.

Depending on financial structuring, they can potentially offer an off-balance sheet funding solution, which is

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Unlocking savings: ESCOs, EPCs and EaaS

There are a wide range of energy services on the market, from ESCOs and EPCs, to EaaS. So, how can end users decide the best option for their organisation? Steve Fawkes, founder of EnergyPro, provides an insight

Usually when we talk about energy service companies (ESCOs) we mean companies that deliver energy efficiency upgrades through Energy Performance Contracts (EPCs) that provide a guaranteed level of energy savings over a long-term contract.

One appeal of an EPC is that the capital works can be externally financed by loans and the savings exceed the repayments back to the lender – generating positive cash flow for the client from day one. Because of this financing option EPCs have often been promoted as the answer to improving energy efficiency and as a financing mechanism to increase investment into energy efficiency.

However, EPCs have not grown as much as some proponents envisaged and two realities are often forgotten:

- EPCs are not a financing mechanism themselves, just a particular form of delivery contract
- Despite many attempts around the world to apply the model into the commercial sector the EPC model is largely confined

to the public sector, the Municipal, University, School & Health (MUSH) market in the US, and the NHS and local authorities in the UK

Although excellent in the right applications, EPCs are not the single answer – the ‘silver bullet’ – to address the massive under-investment into energy efficiency that we have.

The past few years have seen innovation in energy service contract forms driven by a number of factors including; realisation that EPCs do not work well outside the public sector, technical innovation, and changing accounting standards regarding balance sheet treatment of assets.

In the US we have seen ESAs (Efficiency Service Agreements), MESAs (Managed Energy Service Agreements) and MEETS (Metered Energy Efficiency Transaction Structure) come to the market. All these have their advantages and can work in different situations but have not yet gained significant markets. The world is changing and it is time to consider how



EFFICIENCY

ESCOs will need to change.

With the rise of ‘as a service’ models throughout the economy, innovators are developing energy as a service (EaaS) models that could take us closer to the ideal of selling not energy (which no one really wants), but the services which consumers

really want such as heat, coolth, comfort and light.

One of the most advanced areas is lighting as a service (LaaS) where companies such as E-Light in the UK and Lighthouse in Europe provide lighting upgrades to LEDs at no capital cost to the customer. The customer pays a flat fee over an extended period that is less than their existing lighting energy cost and covers capital and ongoing maintenance.

The big energy savings that LEDs bring about make LaaS attractive but the next step is to move away from single technologies to EaaS.

EaaS models are being developed by both SMEs and multi-nationals for different markets from residential to large-scale industrial and commercial. Big utilities, hardware companies and technology companies are all



Benefits of EaaS include no capital cost, deeper energy efficiency and operational savings, lower risks, improved resilience and off-balance sheet treatment



working on EaaS models and are converging on the space.

EaaS typically take the form of subscription services, paying a fee for energy services which cover energy supply, capital equipment and ongoing operations and maintenance. Technologies such as combined heat and power, local PV, demand response and micro-grids as well as long-term power purchase agreements from off-site renewable assets can all be combined to produce a more efficient system and controllable cost structure that sits under an EaaS agreement.

The investment into new generation assets and energy efficiency projects, as well as operating costs such as operations and maintenance, are all wrapped up into the service fee.

Clearly issues such as varying demands due to

changes in production or building use or weather conditions, and the vendors need to recover investment, all need to be taken into account in formulating an EaaS agreement.

EaaS models are highly attractive to the technology giants, the so-called FAANGs (Facebook, Apple, Amazon, Netflix, Google) as they could allow them to 'own the customer' in the way that they do with their internet offerings.

The FAANGs can also harness their data analytics skills and harness additional value from the consumption data. Data is an essential component of any EaaS model. The technology companies are well placed to make inroads into the market.

Although the utilities are also developing EaaS models there is no doubt that they

have organisational and cultural issues that impede their diversification into new business models.

EaaS can offer the customer many benefits including; no capital cost, deeper energy efficiency and operational savings, lower risks, improved resilience and off-balance sheet treatment. The latter has long been seen as an advantage but of course it has been largely restricted through changes in the accounting

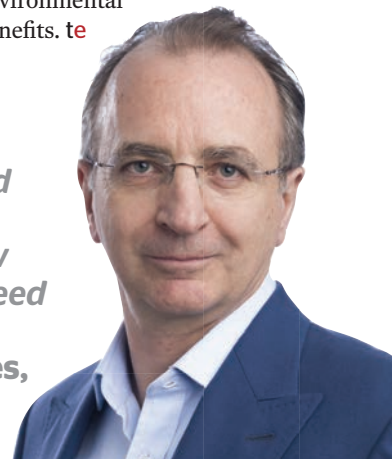
standards. To qualify for off-balance sheet treatment providers will have to accept higher levels of risk transfer than traditional ESCOs have been willing to accept. Energy efficiency improvements used to be regarded as no or low risk but of course they have a number of risks that can impact performance.

In fact the performance gap on energy efficiency projects can be significant. One implication of this is that ESCOs offering EaaS model will need to minimise and mitigate the risks through standardisation approaches such as the Investor Confidence Project's Investor Ready Energy Efficiency certification system, and consider the use of performance insurance where it is available.

Although the potential benefits are clear, we are clearly in the early days of market development for EaaS offerings. Suppliers are developing and refining their offerings.

Clients in the public sector and industrial and commercial markets need to consider them as a new way of addressing cost, environmental and resilience problems and to demand new solutions that go far beyond the norm. The next few years should see an increase in the use of EaaS models that change the way that people and organisations buy energy and help deliver cost savings and environmental benefits. **te**

“ *The world is changing and it is time to consider how ESCOs will need to change* **Steve Fawkes, EnergyPro**



Energy debt: a crisis for SMEs?

Metering and billing issues are having a serious impact on SMEs, says Amjad Khan, MD of TPI Lumens Business Services



Energy debt is a real crisis for the UK's SMEs, predominantly caused by metering and billing issues.

Small businesses account for more than 99% of the private sector in the UK yet there is little published about the amount of financial debt, particularly energy debt, these businesses are facing.

According to a recent research report from the Money Advice Trust looking into supporting SMEs with energy debt, of the 22 SMEs interviewed, 14 of them had energy debt that stemmed from issues with metering and billing. Extrapolating this research statistic, that suggests that more than half of the UK private sector could be struggling with energy debt.

So, what is energy debt and why is there so little discussion on the issue facing SMEs?

Energy debt causes

Energy debt is caused by a business paying less for the energy it is using. Businesses are unknowingly putting their account with a utility supplier into debt with each

passing month; the debt soon mounts up with reports of figures from £1,500-£70,000.

In the most part, energy debt is caused by metering and billing problems.

Billing problems occur when utility suppliers rely on estimated bills that underestimate actual usage. They set the SMEs direct debit too low and by the time a true read is taken or submitted, the SME faces a back bill

24%

of energy meters tested every year, on average, are found to be running either too fast or slow

and in most cases, a demand to pay in one lump sum.

Metering issues are even more worrisome for SMEs. Faulty components mean many of the UK's 53 million gas and electricity meters are inaccurate. Consumer group Which? analysed government figures for disputed gas meters and found an average 24%

tested every year, since 2006, have been running too fast or too slow. As with billing issues, once a meter has been fixed there is a back payment request by the utility supplier.

Strain on cashflow

Metering and billing issues, and the resultant energy debt, is a big issue for many small businesses. It can put a huge strain on cash flow and if not paid, can also result in disconnection, which would render many businesses unable to operate.

Amjad Khan, director of Lumens Business Services, explains how third party intermediaries (TPIs) can help SMEs realise the amount of energy debt they are in and work with the utility suppliers to find an agreeable course of action that is beneficial to the SME – and has minimum impact on their cashflow:

“We have recently been supporting Ninos of Sheffield who, after acquiring new premises, soon realised they had inherited a broken gas meter. With gas being the main utility for the business, they needed to fix the meter

in order to have a true understanding of energy consumption and be able to pay the utility company, as well as ensure that they could budget for future bills. Another cause of concern is the back billing this SME is due to face from the utility supplier once the meter has been fixed and, due to them being out of contract with the supplier, the impact on their cashflow as this back bill will be on the much higher ‘deemed’ rates.

“Our team have been working with the supplier and have now agreed a date to fix the meter and a payment plan for the back bill plus compensation against the deemed rates for this SME.

“TPIs can be the middle ground between the supplier and the SME, helping to not only source suitable tariffs and contracts but remedy the issues that can lead to energy debt. Rectifying meter and billing issues and establishing suitable payment plans, on behalf of the SME, are critical to ensuring that a demand for a lump sum payment does not force the business into liquidation.” **te**



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Spurred on to save energy

Tottenham Hotspur FC is saving energy, as well as goals, at its new state-of-the-art stadium at White Hart Lane, using the latest technology. The use of connected analytics is also preventing the risk of catastrophic outages, which have stopped play at other major sporting venues around the world. Louise Frampton reports

For fans of Tottenham Hotspur, ‘football came home’ to a new £850m stadium at White Hart Lane on 3 April this year. Capable of seating more than 62,000 fans, the state-of-the-art stadium kicked-off a new era with a victory against Crystal Palace.

Capable of hosting both Premier League football and American football matches, this impressive sporting facility boasts some stand-out features – including a glass walkway, where visitors can experience a ‘Sky Walk’ 40ft above the pitch, reach out to touch the cockerel above the stand, and test their nerve by abseiling from the stadium roof.

The stadium also features the world’s first retractable, dividing pitch, rolling out

the natural grass to reveal an artificial surface below; and, for thirsty fans, there is also a queue-busting 65m bar (the longest in Europe) spanning the entire length of the goal line, served by the stadium’s own microbrewery. Every last detail has been designed to enhance the fans’ experience.

High-profile incidents

However, behind the scenes, White Hart Lane is also one of the most technologically advanced stadiums in the world. Any outage during a game would have serious ramifications for safety, as well as impacting the reputation and finances of the club. In the US, a power outage lasting 35 minutes interrupted the 2013 Super Bowl in New Orleans, which was traced back to a “relay’s trip

setting”. At the time, the outage prompted considerable anxiety over whether the incident would impact the city’s ability to attract ‘big-ticket’ games in the future.

To avoid the risk of high-profile incidents such as these, technically advanced electrical infrastructure has been installed at the heart of the new stadium’s design – supported by Tottenham Hotspur’s energy management partner, Schneider Electric. The electrical infrastructure installed at the site has been optimised to deliver the twin goals of resilience and energy efficiency.

Four major substations from Schneider Electric bring power into the stadium and provide a high level of resilience in the event of any problems with the UK power networks. In addition,

the stadium’s power is backed-up by two standby generators, while various uninterruptible power supply (UPS) systems have been installed throughout the stadium.

Schneider has also supplied switchgear and protection for the stadium – including 55 sub-distribution boards and 680 distribution boards.

“The reason for this large volume of panels is not simply for electrical safety, but to break down the measurement and control of the automation of every part of the stadium. This is to help the club optimise energy efficiency,” says David Hall, vice-president, Power Systems, for Schneider Electric UK&I.

The company also provided boiler plant and chiller systems, as well as



“ *All of the assets are connected on to the network, so the estates team at Tottenham can understand exactly where there are inefficiencies, how they can optimise usage, increase productivity and extend the life cycle of their assets* ”

319 lighting control panels. For the pitch, 2,300 lights were provided to enable the grass to grow while it is retracted under the stadium.

All of these systems (along with a wide range of connected equipment from third-party suppliers) are supported by Schneider’s advanced BMS and connected analytics. This includes a range of intelligent EcoStruxure software platforms.

Unrealised potential

According to figures cited by Schneider Electric, 66% of UK energy consumption is attributed to buildings (including stadiums and other commercial premises), compared with 58% for industry, for example. The unrealised potential in terms of energy efficiency is estimated to be around 82%. With the UK government

committing to net zero carbon emissions by 2050, unlocking energy savings for large buildings such as Tottenham Hotspur’s stadium, will have an important part to play.

Visibility is key, according to Marc Garner, vice-president, Secure Power Division, Schneider Electric UK&I. “EcoStruxure provides a converged network that allows you to get control of data and make informed decisions around energy efficient actions,” he explains. “All of the assets are connected on to the network, so the estates team at Tottenham can understand exactly where there are inefficiencies, how they can optimise usage, increase productivity and extend the life cycle of their assets.”

In addition to energy management, EcoStruxure software facilitates a predictive approach to maintenance for electrical

infrastructure and potential problems can be quickly identified and addressed.

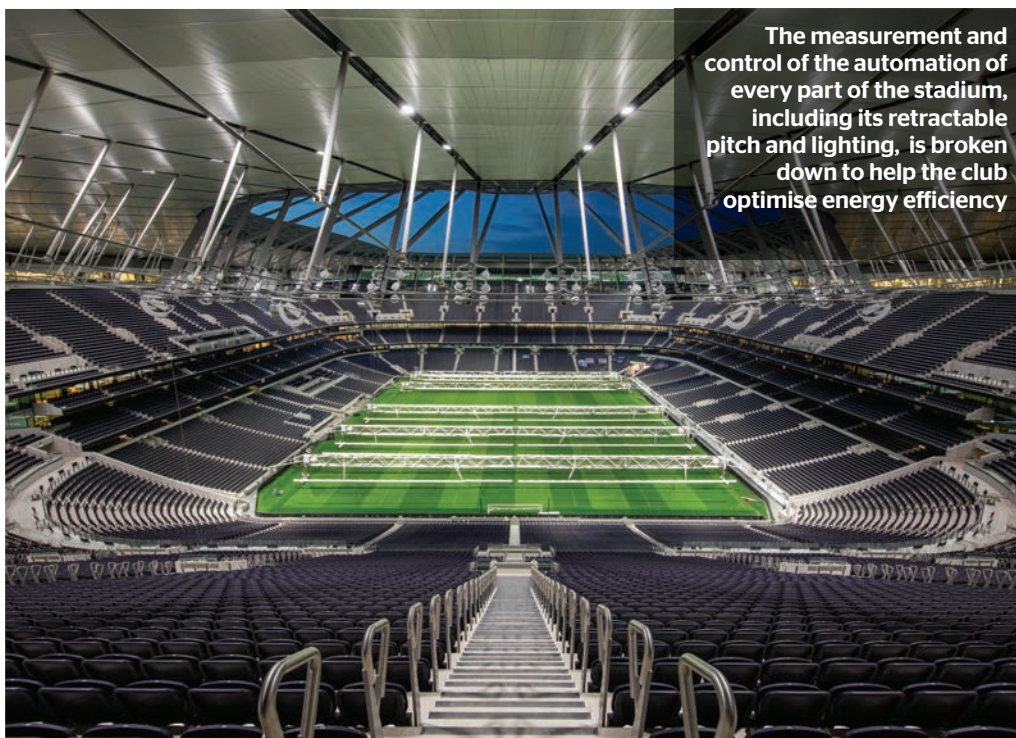
Connectivity via DALI (digital addressable lighting interface) enables the software to locate individual lamp failures to ensure efficient replacement, while the stadium’s lighting can be efficiently controlled according to the outside ambient lighting levels.

Potential threats identified

Ultimately, EcoStruxure allows the evaluation of live data from critical connected assets to identify potential threats. This enables the stadium to anticipate and address any issues before they become critical incidents – mitigating safety risks, avoiding unplanned downtime, avoiding operational losses and eliminating expensive maintenance interventions. In fact, Schneider Electric’s technology facilitates 5,000 data point checks every five minutes at Tottenham Hotspur’s stadium – equating to 60,000 checks per hour.

The infrastructure is constantly monitored from Schneider Electric’s field services bureau, which is operational 24/7 and this is backed up by a product expert on site, who is responsible for personally monitoring the stadium’s power infrastructure. During special events, this is further reinforced with extra personnel from Schneider, to ensure reliable uptime.

With a combination of N+N redundancy, high levels of support and real-time analytics, Tottenham Hotspur fans can now expect uninterrupted enjoyment of the game – unless, of course, Arsenal score. **te**



The measurement and control of the automation of every part of the stadium, including its retractable pitch and lighting, is broken down to help the club optimise energy efficiency

A recent survey of 2,000 UK adults and more than 600 UK businesses revealed that 68% of industry leaders reported their organisations wasted energy, particularly in the form of inefficient building and office space.

Fewer than half (43%) of company chiefs also shared their organisation had not implemented any measures aimed at tackling these inefficiencies in the past year.

Schneider Electric presented the survey findings during a panel debate on “Rethinking Energy”, at Tottenham Hotspur’s new stadium.

During the discussion, Mike Hughes, zone president, Schneider Electric UK & Ireland, commented: “We need to bring energy front of mind. The market needs to take an activist approach to advocate for and instil efficiency and build an investment mindset if we are to achieve the 2050 net zero goal.” He added that “as energy waste becomes more visible, businesses will increasingly be held accountable”.

Hughes highlighted the importance of reducing energy consumption from a business reputation perspective, adding that investment firms have been ‘disengaging’ from enterprises that are unable to show the right sustainability models.

In fact, the difference in energy consumption between the average company and the best in class can be as high as 75%. He asserted that organisations can typically cut energy consumption by about 30%, using relatively easy measures, which converts to around 10% in overall operating costs.

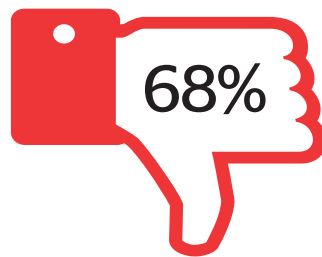
However, to drive transformation, individual consumers will also need to take more responsibility; 73% of energy consumers surveyed said they thought they were “already doing enough” in terms of

‘Activist approach’ required to reach net zero target

A panel of experts from the CBI, Beis and the UK Committee on Climate Change discussed the carbon zero goal in light of a recent survey that revealed an urgent need for a change of culture



Rethinking Energy: (from left to right) panelists David Joffe, UK Committee on Climate Change; Ben Golding, Beis; James Diggle, CBI; and Mike Hughes, Schneider Electric



The percentage of business leaders who reported that their organisation wasted energy

energy efficiency, 16% said they “did not care” and only 10% said they “plan to do more”.

To get to the carbon zero goal by 2050, there will need to be greater engagement, therefore.

To encourage people to change their behaviour, David Joffe, team leader at the UK Committee on Climate Change, highlighted the need to: 1) give people enough information to make decisions; 2) make it a desirable (almost competitive) thing to do; and 3) enable people to take action.

“Much of the problem with energy efficiency is measurement, you need to

know how the measures you have put in place are performing,” he commented.

Despite the survey findings, James Diggle, head of energy and climate change at the Confederation of British Industry, said that there is “a huge appetite for change from businesses, not just driven by reputation, but also by future business stability”.

He pointed out that businesses are becoming aware that consumers are showing increasing activism, and this was apparent across “all generations, not just the younger generation”.

He added that businesses are “setting their own net zero targets”, in many cases earlier than the 2050 goal.

Ben Golding, director, Energy Efficiency and Local, Department for Business, Energy & Industrial Strategy, commented that an investment of £22-23bn in business energy efficiency will be needed by 2030 to help deliver climate change. “If we deliver that, we could wipe £6bn off business energy costs in 2030,” he continued.

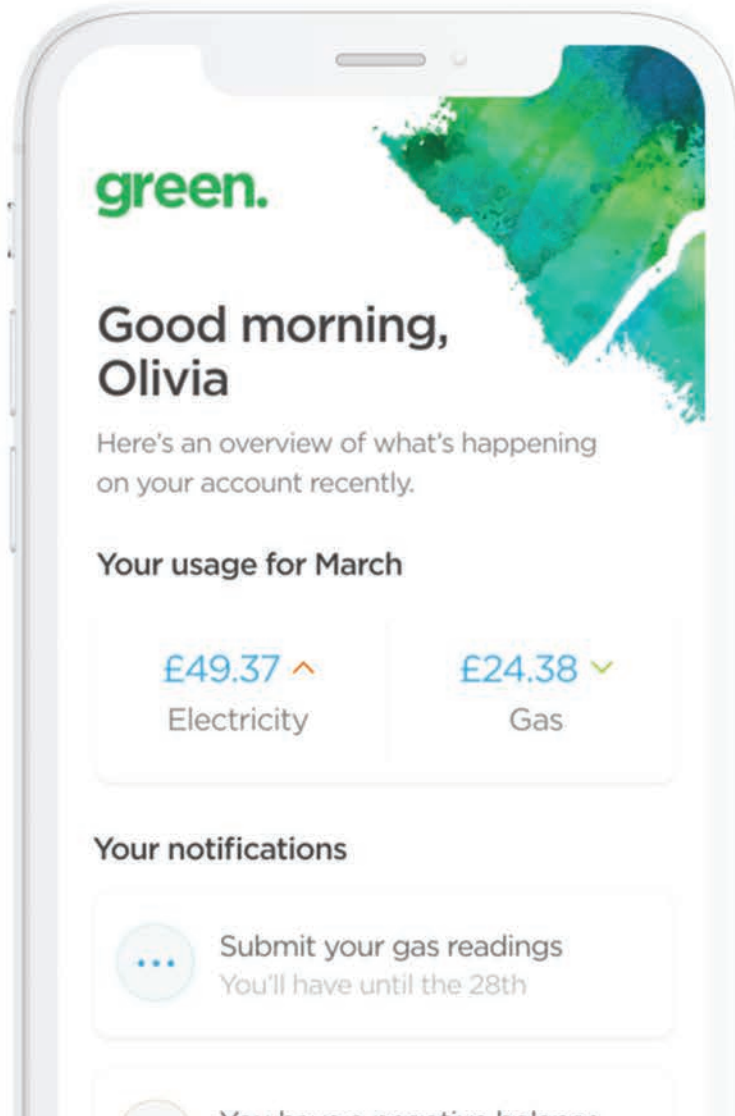
“The government can help to make it easier and simpler for UK businesses to change, building on successes, for example, in making renewables and electric vehicles cheaper.” However, he concluded that it is a question of “when, not if, we will reach net zero.” **te**

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Building a pathway to net zero

James Rushen, group head of environment at Centrica, outlines the important role of decentralised energy as part of the UK's efforts to tackle global warming

In June, Theresa May officially set a 2050 deadline for the UK to end its contribution to global emissions levels as recommended by the Committee on Climate Change's (CCC) *Net Zero* report.

A net zero emissions target will be a challenging target to meet, but it is the right thing for the UK government to consider and we welcome the report and the debate.

We are on the same page for much of the report and it is positive to see how many of the CCC's recommendations align with our own climate change ambitions – Centrica's recently published *Responsible Business Ambitions* recognise the need to achieve net zero by 2050, and we have committed to develop our plans to do just that with our own emissions.

Another key point from the CCC is that it estimates that demand on the UK's electricity network could double by 2050 – partly due to the transition

toward electric vehicles and heating. As such, exploring how other energy sources can alleviate some of this strain – particularly for heavy goods transport and industrial heating needs – will be important.

Distributed energy

However, where the CCC's report focuses on reinforcing the UK's existing centralised energy network, our vision is one where much of the energy the country needs is created onsite by those who use it. This would create a more distributed energy network that is more resilient and more tailored to the individual needs of users.

We are actively exploring how decentralised flexible assets can work together in an efficient local energy system that meets the needs of generators, customers and networks alike – reducing strain on the grid at peak times and maximising the productivity of low carbon generation

assets. We have committed to delivering 7GW of these distributed, flexible and low carbon technologies by 2030.

Projects such as the Cornwall Local Energy Market (LEM) trial offer a glimpse into the future of a truly decentralised energy landscape with thousands, if not millions, of homes and businesses playing their part in localised energy markets.

As well as our work on the LEM, Centrica Business Solutions is helping a large

“

Core sectors such as healthcare, industry and hospitality could make significant reductions

number of organisations, including manufacturers, retailers, hospitals and universities, to install a range of onsite energy efficiency, generation and storage technologies.

We have conducted research that suggests core sectors such as healthcare, industry and hospitality could make significant emissions reductions through the use of these technologies. According to our data, if just 50% of the organisations in these sectors adopted them, they could reduce the UK's emissions by 137 MtCO₂e – more carbon than was produced by the entire transport industry in 2017.

Solutions such as combined heat and power units and battery storage systems that improve efficiency and enable more reliable use of renewables are also helping our customers reduce emissions – while delivering real business benefits. The forward-thinking organisations making use of these technologies are able to create additional revenue by selling surplus energy produced on site back to the National Grid – and can more effectively demonstrate green credentials to increasingly environmentally conscious customers.

UK's flexible energy future

What is needed now is more collaboration and for the government and energy sector to do their part to educate businesses about the efficient, clean technologies available to them.

The CCC is right to propose these targets and we fully support the ambition behind them. The UK has long been a global leader in driving the green agenda and it is vital we continue in that role.

We need to empower businesses to take the future into their own hands and start to invest in the technologies that will allow them to be more efficient, cleaner and more resilient. **te**



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Heat: the self-defeating problem of the energy sector

Decarbonising heat is a challenge – but one that the industry can solve. The best place to start is by doing the basics: measuring, managing and optimising instead of working on assumptions, says Association for Decentralised Energy director Tim Rotheray

My role involves a lot of speaking with people about the future energy system. Increasingly central to that is the discussion of the decarbonisation of heating.

When talking about heat I seem to encounter two views. The first is: “It’s easy, just insulate buildings and then put heat pumps everywhere.”

The other view is: “It’s all too hard, how are we going to get into all those buildings and homes? No one is prepared to pay for the energy efficiency measures.”

It’s easy

The “it’s easy” view is normally made by those in the power sector, experts in electricity who apply the logic, that works well there, to heat. Power is a standardised commodity.

Heat is not. People have personal views about what they like. In homes, some like the direct heat from a radiator in a room, whereas others prefer the gentle pervasive

heat from underfloor heating.

In industry, reliability of heat supply may be valued over almost everything else. Industrial heat users often invest in costly backup plant just to give that security of supply.

I visited an industrial member of ADE that had three boilers each the size of a small house ticking over just in case it lost its main heat source. This site was proud of having steam supply for 13 years with no interruptions.

Each of the users – from industrial and commercial through public sector to domestic – are different.

Another challenge to oversimplifying heat is that it is generally not part of a wider network. Unlike power, excess heat cannot simply be

sold off. This is why domestic solar power is more appealing than solar heating. Once the hot water tank is full there is no grid to sell your excess to.

Our approach to heat cannot be the same as that of power.

It’s too hard

That said, the “it’s all too hard” view is the more dangerous to put forward.

Yes, there are real obstacles. Seeing how changes will be

made in every home, office and industrial complex to improve efficiency and change fossil fuelled plant can seem daunting.

But if we, the industry, keep telling the media, the government and parliamentarians how hard it all is, do we really think it will encourage them to act?

I would suggest a better approach is to admit that there are challenges but also,

“Boilers, pumps, piping are all oversized. You may not think this matters; after all, better to have and not need, than need and not have. But it has profound economic and carbon impacts

as an industry, to declare with confidence that we can do this. We can deliver zero carbon heat to homes, offices and businesses.

Sizing matters

Where do we start? The first port of call is knowing what is going on – and we do not.

Astonishingly, the heating sector does not know very much about heat use. People give figures for the heat demand of a home, office or high street store but it is not based on real data for that home or office. It is based on a myriad of assumptions.

We assume the efficiency of boilers, the heat losses through walls and windows, and the effectiveness of radiators. All these assumptions are based on tests, some are lab conditions, others real world, but not on real live data for that property. For roughly half the energy we use in our economy, we don't really know where it goes.

Compare this with cars – most car owners can tell you how many miles they get from a tank of fuel and how much it costs to fill. Their costs will differ from the manufacturers' test figures due to location (hilly or flat) driving style (gentle or aggressive) and the type of journey (urban or rural). The car driver has accurate real-life data based on their own circumstances. This knowledge can inform their next car choice.

Rather than being focused on cost-effective performance, the industry is most worried about there not being enough heat and they do not have the data.

The absence of data combined with the risk of installing something that may not be enough for the freak cold blast means we routinely oversize. Boilers, pumps, piping are all oversized. You may not think this matters; after all, better to have and not need, than need and not

have. But it has profound economic and carbon impacts.

Because we pay for connections based on assumed use, new hospitals can end up paying too much for their gas contract, reducing money for frontline services.

Heat networks, designed based on assumptions from the traditional heating industry, have been routinely oversized.

This oversizing of heat networks leads to the stories of common areas of apartment buildings overheating because of oversized pipes. In the home with a gas boiler, an oversized condensing boiler means overheated radiators and the central heating water returns to the boiler too hot for them to 'condense'. This condensing action can reduce gas use by up to 10% – but it only works if the system is well sized and managed.

Measure, manage, optimise

Much of the industry keeps telling government that decarbonising heat is very challenging. The truth is that we have oversized assets which are wasting energy and carbon.

The first step is very simple: all that is needed is data monitoring – like in-room thermostats and data on the flow temperature of boilers – to optimise performance.

More importantly, if we started gathering this data, it could be used to ensure that heat pumps, heat networks and efficiency measures could be appropriately sized and installed. Good data is the first step on the route to good heating.

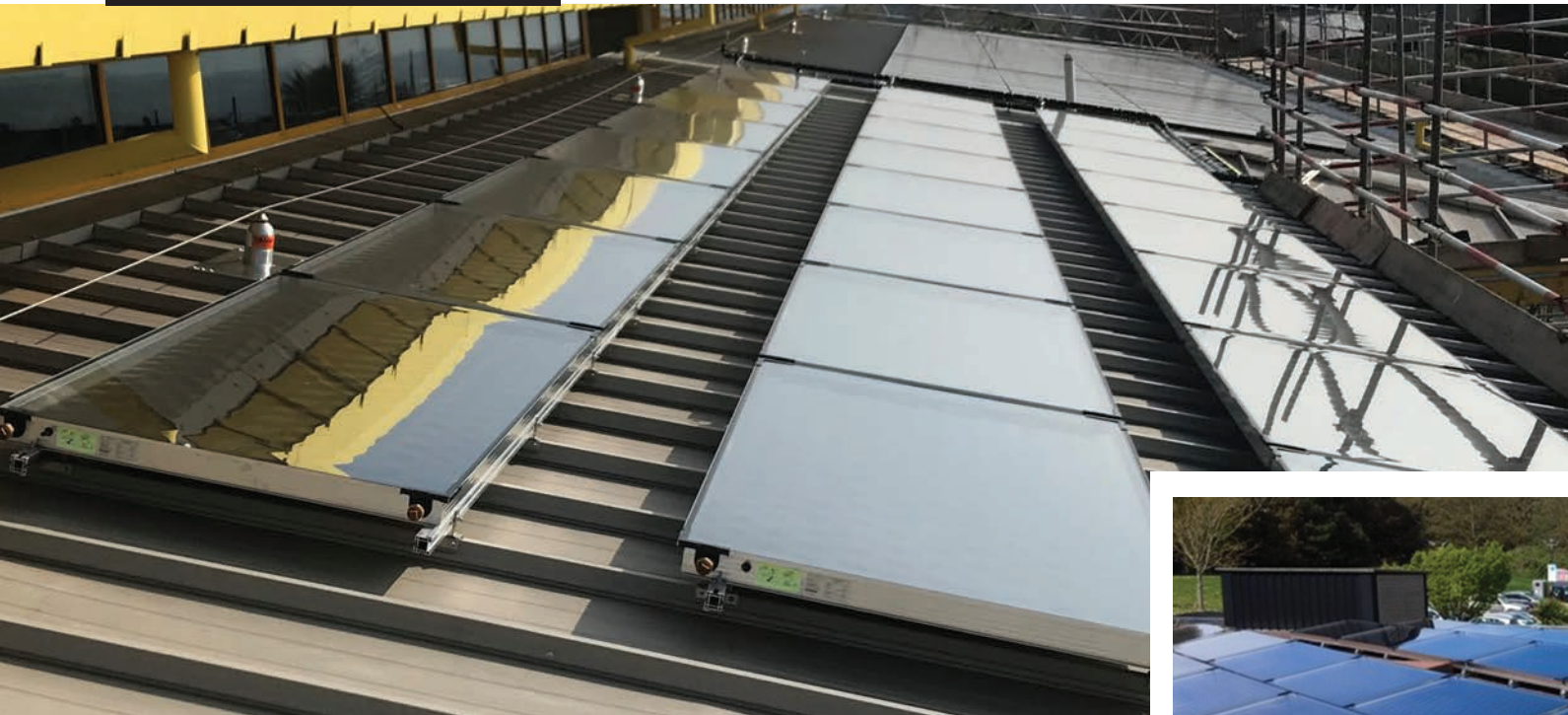
Rather than telling all who will listen how hard it is, why don't we start telling them what we can do – right now, with traditional systems? Because, ultimately, if we do not tell them, how we can do it, eventually someone else will – and they will take your business with it. **te**

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Solar thermal market heating up

Neil Bland, managing director at energy consultancy Leisure Energy, says PV's less popular relation, solar thermal energy, is attracting more attention as costs fall and subsidies under the RHI remain available

As everyone reading this magazine will be aware, the government closed the Feed-in Tariff (Fit) scheme to new entrants on 31 March this year. Barring a few technical exceptions, this meant that the large incentives for new solar PV have finally come to an end.

Arguably the Fit had already served its purpose, which was to drive the market for new entrants and make subsidy-free PV work economically. As more PV has been installed, the price per kW of generation has dropped significantly.

Solar thermal and the Renewable Heat Incentive

With the government's drive to decarbonise heat, the Renewable Heat Incentive

(RHI) is acting in a similar way for heating technologies as the FiT did for PV. Various technologies can benefit from RHI including biomass, ground/air/water source heat pumps, geothermal, biogas

is simpler as the system is classed as microgeneration, usually resulting in no need for planning permission or building control sign off as accreditation is through the Microgeneration Certification

operators. Sites have seen savings by introducing variable speed drives, condensing boilers, CHP and LED lighting. However, sharp practise has seen CHPs often being oversized for the heat

“ *With the cost of panels falling and the continuation of the Renewable Heat Incentive, installation of solar thermal to reduce energy consumption and improve carbon footprints is becoming more popular within leisure centres*

and of course solar thermal.

RHI payments for solar thermal systems that are less than 200kW attract an RHI payment of 10.98p/kWh. This is index linked and guaranteed for 20 years. For installations of 45kW or less, the process

Scheme (MCS) process, similar to a PV scheme.

Solar thermal in leisure centres

Energy efficiency measures have not traditionally been high on the agenda for leisure

demand of leisure centres.

Most medium-sized leisure centres will have circa 300kW of boiler plant associated with the 'wet side' – ie swimming pool and associated areas. The 'dry side' refers to areas such as squash courts, gym, fitness



£6k

The typical annual savings achieved by a leisure centre installing a solar thermal energy system



More leisure centres are installing solar thermal to reduce energy consumption and improve their carbon footprints

studios and sports halls.

The summer baseload of such typical sites is circa 50-100kW and so the 45kW-sized systems work perfectly with the added bonus of simplified scheme accreditation mentioned above.

There are two standard types of collector – flat panel or evacuated tube. Evacuated tubes are slightly more efficient, but normally higher in cost.

With the cost of panels falling and the continuation of the RHI, installation of solar thermal to reduce energy consumption and improve carbon footprints is becoming more popular within leisure centres.

Leisure Energy has recently completed three installations, each comprising 45kW of flat panel solar thermal collectors. These were integrated into the existing pool heating circuit via a heat exchanger and associated pump, pressure vessel, controls, metering and other ancillary equipment

Costs and savings

A system of this type can be installed for around £850 per kW with the system generating savings of about £6,000 per year. Simple payback on the systems installed is expected to be between five and six years based on gas prices in early 2019.

With increases in the RHI payment and Climate Change Levy costs, the payback will reduce. The systems are each expected to receive well over £100,000 in RHI subsidies over their 20-year life.

As flat plate solar panels are relatively maintenance free, they can actually reduce maintenance costs due to the system effectively acting as ‘lead boiler’ resulting in fewer boiler run hours.

At all three of the installation sites other energy saving work was also undertaken such as swimming pool thermally insulated covers, pipework insulation, replacing pumps and motors with high efficiency versions, LED lighting upgrades, together with staff training.

Given local authority budget constraints, Leisure Energy can provide a funded model, which enables the installation cost of new energy conservation measures to be spread over a fixed term period and paid for from associated energy savings – without any upfront payment. This allows for the facility operator/council to use their existing capital and energy revenue savings on customer facing health and wellbeing initiatives. **te**

“

The systems are each expected to receive well over £100,000 in RHI subsidies over their 20-year life

Heat is on to go carbon neutral in Bristol City

Ground source heat pumps are being installed for a sustainable housing development that could deliver big carbon savings

Bristol’s commitment to achieving its carbon neutral pledge by 2030 is being realised with the aid of a sustainable housing development, featuring innovative low-carbon heating.

Bristol City Council’s 133 homes at Ashton Rise are being built using the high efficiency Sig iHouse solution, and heated by individual Kensa ground source heat pumps connected to a shared ground loop array of boreholes. The installation would see each home making lifetime carbon savings of 30 tonnes compared to individual gas boilers, while also removing all local NOx emissions, ensuring local air quality is not impacted by the choice of heating system.

With completion expected in spring 2021, works have commenced on site by developer Willmott Dixon, with the aid of UK ground source heat pump specialist Kensa Contracting, undertaking the heat pump system installation.

The Bristol mayor has set out the commitment of building 2,000 new homes – 800 affordable – a year by 2020. Coupled with Bristol’s 2030 net-zero commitment ahead of any other UK city, the council has taken an innovative approach to reducing the carbon and air pollution from its housing programme early on.

Following the Greater London Authority’s findings

that Kensa Contracting’s communal ground source heat pump design is the lowest cost solution for end users and the most efficient and lowest carbon heating technology, Bristol City Council is leading the transition away from gas for new build developments by using Kensa’s British-manufactured Shoebox ground source heat pumps in the Ashton Rise development.

Due to the stable temperature of the ground all year round, electrically powered ground source heat pumps offer continuous energy and carbon saving improvements as supporting technology and initiatives advance; the introduction of flexible time-of-use tariffs could enable Ashton Rise residents to enjoy even greater savings, while the heating system has been enabled to allow passive cooling from the ground loop, which is naturally cooler than the air in summer, offering virtually free cooling when needed.

Councillor Paul Smith, Cabinet Member for Housing, said: “The work at Ashton Rise brings together two of the council’s top priorities for Bristol – our commitment to build new homes, and to become a carbon neutral city by 2030. As a city, we’re determined to position ourselves as leaders in the housing we build and bring together innovative design and energy efficiency.” **te**



Vilnis Vesma, former energy manager and author of 'Energy management principles and practice', offers an insight into the requirements for streamlined energy and carbon reporting

SECR: the essentials

Streamlined energy and carbon reporting (SECR) is the term commonly used to describe the regime introduced with the Companies (Directors' Report) and Limited Liability Partnerships (Energy and Carbon Report) Regulations 2018, Statutory Instrument 1155. This is not a self-contained set of regulations like the Energy Savings Opportunity Scheme (ESOS); instead, it consists of nothing but dozens of amendments to existing company reporting law.

In short, undertakings covered by SECR simply need to collate annual total energy and emissions data and give them to their company secretary or accountant for inclusion in the annual report that they already have to prepare.

As this is an extension of financial reporting, compliance will be policed by the Financial Reporting Council and not, as one might have thought, by the Environment Agency.

The good news is that in terms of accuracy and

completeness, your SECR reports need only be free of material misstatements, and according to the government's published guidance it is fine for a company to omit 2-5% of its energy or emissions if it considers them not to be material in the grand scheme of things.

Who is affected?

SECR applies to all quoted companies, and to unquoted companies and limited liability partnerships (LLP) that meet two of the following three criteria:

1. At least 250 employees
2. Annual turnover of £36m or more
3. A balance sheet of £18m or more

This is not quite the same as the ESOS regulations, in which an undertaking would be obliged to participate if it met criterion one alone.

Undertakings which consumed less than 40,000kWh in the year being reported do not have to report their actual figures but must still state that they fell below that threshold.

Group reports should include the figures for all subsidiaries apart from those that would be exempt. Under these circumstances a subsidiary need not report its own figures although, of course, it will still need to collate the data for group use.

What must be reported?

The requirement covers energy use and greenhouse gas emissions arising from all use of electricity, gas and transport fuels. Incidentally, the definition of 'gas' is not limited to natural gas but refers to any gaseous fuel, so it even includes hydrogen.

The inclusion of electricity means that SECR differs from emissions reporting.

Somewhat bizarrely, liquid and solid fuels do not have to be accounted for, unlike in the Carbon Reduction

Commitment (which SECR supposedly replaces), ESOS and EU Emissions Trading System. Bought-in heat, steam and cooling are included but not compressed air.

Quoted companies must report global figures but LLPs and unquoted companies only have to declare UK consumption and emissions.

In the main, therefore, any undertaking that already keeps even very basic monthly fuel and electricity consumption records for its fixed assets will have no trouble collating

SECR requires emissions to be reported as well as energy consumption. The necessary factors are published by the government and undertakings would be well advised to set up a methodical procedure for carrying out the calculations, because they must include details of their methodology alongside the data that they report.

Undertakings must report intensity metrics, of which an example would be kWh per unit of saleable product output.

prejudicial to their interests to do so. For example, it might entail disclosing sensitive information about their sales volume. One option is to quote a metric based on financial turnover (which is already disclosed in any case). This may not be meaningful, but then neither is anything else they might report.

Finally, annual reports must now include descriptions of the principal measures taken to improve energy efficiency during the year in question, if there were any.



The idea is that stakeholders will be able to see, once a year, what progress the company is making in energy efficiency. This is actually a somewhat naive and fanciful aim, given all the ways that such simple ratios can be distorted

the necessary energy data.

Transport fuel, of course, is a different issue. As many an ESOS participant has found, transport fuel data is disproportionately hard to collect relative to its importance in the mix. Luckily, if you can reasonably assert that your transport energy and emissions are not material to the overall picture, you can just leave them out.

My advice, therefore, would be to look first at transport fuels, decide whether they are material and, if so, put resources into capturing the data or estimating the figures.

The idea is that stakeholders will be able to see – once a year – what progress the company is making in energy efficiency. This is actually a somewhat naive and fanciful aim, given all the ways that such simple ratios can be distorted by external factors nothing to do with energy performance. Even more implausible is the idea of making 'benchmarking' comparisons between enterprises, but that is the government's stated objective.

Companies are entitled not to report intensity metrics if, in their opinion, it would be

What is the deadline?

Energy, emissions, intensity metrics and associated methodologies must be stated in annual reports covering accounting years starting in April 2019 or later.

So the first wave will be reports for the year ending March 2020 and the last will be those with years ending in February 2021.

This at least leaves plenty of time to get data collection in order. Actual report submission deadlines fall six months later for public companies (nine for private companies). **te**

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Put your motors to the test

A modest investment in equipment for testing electric motors will ultimately save you a lot of time, money and inconvenience

Motors play a critical role in industrial processes, which means that if you are having problems with one of your motors, you need to be able to diagnose the trouble quickly and accurately to keep costly downtime to a minimum. Additionally, according to the Carbon Trust (carbontrust.com), motors and drives use almost two-thirds of the energy consumed by industry in the UK so it is good practice to test motors regularly to ensure that they are in good condition and operating reliably.

If you make a modest investment in a good motor test set, it will pay for itself many times over. But what exactly is a good motor test set and which tests should it offer?

Some of the most useful tests related to motors are those that check insulation resistance, as insulation degradation is one of the most common problems found in motors. Three types of test are used for checking

motor insulation: the standard insulation resistance test (IRT), the polarisation index (PI) test, and the dielectric absorption ratio (DAR) test. IRT is basically an instantaneous measurement where you apply the test voltage and the result is displayed immediately. This is very useful for a quick indication of insulation condition.

The PI and DAR tests involve measuring the way the insulation resistance changes when the test voltage is applied for a period of time – 10 minutes for PI and 1 minute for DAR. These tests take a little longer to perform but the results are more informative, and you can compare them directly with results from 'typical' motors.

Your test set should support all three of these options, with automatic timing and computation of results for the PI and DAR tests. For dependable results, the test voltage should be stabilised, and the test set should have a guard terminal

to eliminate the effects of surface leakage. The results should also be automatically temperature compensated.

You will also want the facility to measure low resistances, so that you can check connections and bonding as high resistance connections often lead to heating and failures. To

basic functions for measuring capacitance, inductance and continuity. And, of course, to ensure that the test set is safe to use even in demanding conditions, you will want CAT III 600V safety rating.

A test set that meets all these requirements is the new MTR105 from Megger.

“If you want to keep your motors in tip-top condition and minimise costly downtime, you won’t find a better option than the new Megger MTR105”

ensure accurate results irrespective of the length of the test leads, the test set should use a four-wire Kelvin measuring technique.

Other facilities you will need include a phase rotation check so that you can be sure motors will rotate in the correct direction, along with

It provides all of the features discussed and many others in a single robust handheld instrument that is fast and easy to use. It has an IP54 'weatherproof' ingress protection rating and a tough, shock-resistant over moulding, features that make it suitable for use in even the toughest conditions.

As an added bonus, it can store 256 test results for later downloading so there is no need to scribble the results on that easily lost scrap of paper.

If you want to keep your motors in tip-top condition and minimise costly downtime, a good motor test set is an investment well worth making, and you won't find a better option than the new Megger MTR105.

*Simon Wood, Megger
Distribution Manager*



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

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Turbocharge your business

Michael Pingram, product specialist for oil-free air compressors at Atlas Copco UK, explains how centrifugal air compressors can benefit high-energy users

Large-scale, high-energy applications such as glass processing, food processing, steel manufacturing and petrol-chemicals face similar challenges to other industrial concerns. However, they face an added dimension: their size means that any failure to address such challenges, promptly and efficiently, will incur correspondingly scaled-up consequences and costs. For example, an unscheduled production stoppage could easily cost thousands of pounds an hour.

Compressor energy and other life-cycle costs

This magnitude factor becomes particularly apparent when implementing, managing or upgrading compressor installations. Controlling energy costs is an obvious concern, not only because of steadily rising electricity prices but also because of social and legislative pressures to go green. The problem is exacerbated in applications where the air flow demand is varying or unpredictable.

While important, energy costs are not the only issue. Crucially, users need to also consider the total lifecycle costs of a compressor installation. Buying in a large compressor, or set of compressors, is a significant investment decision that is rarely implemented due to the costs involved. This pressure can make the procurement

process particularly stressful and prone to error if it has to be conducted through third-party contractors, none of whom can offer a clearly-defined, off-the-shelf solution.

Consultants can be employed, but this raises concerns about high consultancy fees.

Next, there are practical considerations related to operation and installation. High-capacity compressors are large machines, so minimising footprint is important. Could a couple of advanced models replace a larger bank of older-technology compressors? Furthermore, how clean is their compressed air output; considering that modern manufacturing might call for class 0 air?

Last, but not least – considering the possible consequences of any compressor downtime – there is a requirement for reliable, effective and fast maintenance support. The compressor supplier must demonstrate a solid, UK-wide service infrastructure that offers not only rapid callout capability for emergencies but also predictive or preventative maintenance strategies that allow developing faults to be identified and repaired before they can cause failures.

Turbo compressors (otherwise known as centrifugal air compressors) deliver high energy efficiency and flow rates for the industries mentioned, and



In one instance, 26 compressors were removed from a glass manufacturing installation and replaced with seven turbo machines, saving £40k a month in electricity costs and reducing the £65k servicing bill significantly

other large-scale, high energy enterprises. These compressors provide up to 36,000 m³/hr capacity with packages from 355kW to 3.1MW. Crucially, they can be delivered as a single, integrated ‘commercially off-the-shelf’ package with auxiliary systems included.

This type of single-source, packaged solution offers many further benefits. Without need for research and design expenditure, project costs are reduced. Various impeller types, along with motors, coolers, silencers and air filters can be designed by the compressor manufacturer without the complexity of third-party contractor involvement. Savings from these benefits can amount to



The case for centrifugal compressors

The following example demonstrates centrifugal compressors' significant energy advantages over screw types. In it, a centrifugal compressor is compared with a screw compressor pair, where both solutions are rated at 900kW, while operating under reference conditions of 7 bar, 20°C, 0%RH and 1 atmosphere inlet pressure.

- The pair of screw compressors combine to deliver a total of 146m³/min at 7 bar, with an average specific energy requirement (SER) of 7.13 kW/m³/min.
- By comparison, the single turbo compressor could deliver approximately 189m³/min with a SER of 5.044342 kW/m³/min. Accordingly, the turbo solution makes up to 29% more free air delivered (FAD) available while also reducing the SER by 29%.
- Alternatively, the centrifugal compressor could be run at 146m³/min, to match the combined screw compressor output, while reducing SER by 28%.

15-20% of a machine's value, depending on the project.

Energy efficiency

Centrifugal compressors offer high energy efficiencies in process air or bulk air applications presenting a flat load or when providing a baseline flow in mixed installations with VSD screw compressors. This is due to their ample-sized cooling, low pressure drops and an efficient drive train.

Instead of adding extra compressors for expansion projects, a bank of older compressors can be replaced with just a couple of centrifugal types. Combining several flow rates into one or two reduces service costs, while easing regulation and monitoring. In

one instance, 26 compressors were removed from a glass manufacturing installation and replaced with seven turbo machines. This saved £40k a month in electricity costs, while also significantly reducing the earlier machines' £65k servicing bills.

Oil-free air technology

Many applications require absolutely clean air to avoid product contamination and costly downtime. Manufacturers have responded to this need by developing oil-free compressors and blowers.

Compressors must meet or exceed ISO 8573-1 Class 0 specifications in order to satisfy their 100% clean air requirements. The TÜV Institute tests compressors

against the ISO standard to verify compliance. It measures all possible oil forms across a range of temperatures and pressures.

The ideal scenario is where TÜV finds no traces of oil in the output air stream.

Service and support

Investing in a single source packaged solution gives users access to a whole lifecycle service and support strategy.

This starts with the buying cycle. The packaged solution approach streamlines the consultation process. Design engineers can focus entirely on the user's application requirements instead of integrating multiple vendor solutions. This begins with checking the space available

for the installation, and assessing the flow and pressure requirements.

More advanced calculation tools can then be deployed as required. A performance estimate can be generated to analyse customer reference and operating conditions.

Energy audits involve running a data logger for a week to analyse compressed air usage patterns. The resulting, detailed report outlines where running efficiency improvements or energy savings could be made and highlights any non-conformance with ISO standards.

Once delivered on site, start-up can be rapid and fault-free; with all ancillary components already packaged and no onsite assembly required. **te**

Rapid charge points 'to double'

Engenie's plans to rollout thousands of open-access rapid EV chargers has received a major investment boost from Cube. CEO Ian Johnstone says it will use the £35m injection to double the current number of rapid charging stations by 2024

Engenie has secured £35m in backing from infrastructure investor Cube.

The company will use the funds to roll out 2,000 rapid electric vehicle chargers over the next five years.

CEO Ian Johnstone said the rollout will be "fairly linear" out to 2024. The company is installing chargers at 200 sites for pubco Marston's and Johnstone said other deals with local authorities and retailers are in the pipeline.

"We are finalising commissioning dates with grid operators for a large



L to r: Rahul Kumar, Cube Infrastructure Managers; Ian Johnstone, Engenie; Stéphane Calas, Cube Infrastructure Managers

2189

Number of rapid chargers across the country at the end of May 2019

number of sites," he told *The Energyst*. He said the company should have 100 charge points installed by the year-end.

Johnstone acknowledged increasing competition in the EV infrastructure market, with many of the large utilities and fossil fuel companies gearing up over the past year. But he suggested that some players will be more successful than others.

Engenie's model, said Johnstone, "is all around taking the time to select the best site, that will enjoy the highest usage in the future when we achieve mass adoption [of electric vehicles]".

He said that was what helped convince Cube to invest, given the timing risk around

EV charging infrastructure utilisation in a nascent market.

"ZapMap shows there are over 2,000 rapid chargers in the UK," said Johnstone. "But that doesn't mean they are in the right location. Others are busy installing where there is sufficient grid capacity. Instead, we look at reams of data to determine the best place for charging infrastructure ... that will be used a lot in ten years' time."

Asked when Engenie will be profitable, Johnstone said that depends on the "tipping point" for mass EV adoption.

"We would hope to see the best sites breaking even by 2022/23 – but our investment plan doesn't require that – it is a personal view. What will be really important [to

boost adoption] is a used car market for EVs ... that will be a huge thing for car drivers in the UK," said Johnstone.

"Certainly before 2025 there will be enough [electric] cars on the road to drive utilisation at our sites – which will be above average because of the way we select them.

"But whether it is 2022 or 2025, most people now accept that [mass adoption] is going to happen. So now is the perfect time to get on and deploy a network for the UK's drivers."

Pubs the new petrol stations?

Engenie inked a deal with Marston's last year to install rapid chargers across its pub estate.

Customers will be charged 30p/kWh plus VAT and

Marston's will take a cut. But Marston's energy manager, Andy Kershaw said the business isn't banking on "hundreds of thousands of pounds" coming in from charging revenue any time soon.

"For us, it is not about profit, it is about service. In some locations it will give us the ability to extend the trading day slightly. A traditional pub might not open until late morning. But it may now become a breakfast site, or a place to meet for coffee and cake while you charge your car," said Kershaw. "The days of being a traditional boozier are long gone."

Of its £35m investment, Renaud de Matharel, CEO of Cube Infrastructure Managers, said EVs will be "a critical factor" in decarbonisation.

He added: "By investing, we intend to accelerate the deployment of its rapid EV charging infrastructure, providing over the long term, an increasingly essential service to local communities across the UK." **te**

“ ZapMap shows there are over 2,000 rapid EV chargers in the UK. But that doesn't mean they are in the right location ”

£1.7m boost for EV charging technology

Following a major funding boost by the Department for Transport, Franklin will trial fast EV charging across sites on Merseyside

Franklin Energy has secured £1.7m of funding under the Department for Transport's latest drive to improve electrical vehicle charging technology for on-street environments.

In a bid to address concerns surrounding usability, cost, speed and accessibility for EV drivers, a new fast EV charging system, EnSmartEV, has been developed under a partnership with Entrust Microgrid, the project lead, based at the University of Lancaster.

The programme, backed by Innovate UK, will see Franklin trial the technology across two sites on Merseyside through Halton Borough Council.

This will see two EnSmartEV charging hubs introduced into the local area to enable local residents to have improved access to EV charging as well as support the town centre in having publically accessible EV charging points.

The charging hubs will be able to charge any type of EV – with the ability to charge up to six EV's simultaneously.

Franklin Energy managing director Robert Byrne comments: "In order to meet government targets and roll out the drive towards EV ownership, we must have the infrastructure in place that meets the needs of modern life.

"This technology will provide highly efficient, incredibly low-cost charging solutions."

Many existing public EV chargers operate using peak power, burning excessive amounts of fossil fuels. These are slow when compared with high-speed chargers and are therefore considered inefficient.

The new EnSmartEV solution addresses each of these issues. Integrating lithium batteries, which are able to charge EVs with off-peak or low-tariff electricity, the system offers high efficiency at rapid speeds. The modular solution will have the ability to charge up to 20kW.

Xiongwei Liu, founder of Entrust Smart Home Microgrid and the EnSmartEV charging technology system, comments: "This is game changing technology. While using battery storage to charge EV's is nothing new, we are able to

“

Our solution will ease the burden on the grid and manage electricity loads at peak times

maximise the use of DC to DC technology, which leads to ultra high efficiency and very little corresponding power losses.

"In addition, we are able to fast charge up to six EV's simultaneously with the ability to charge all makes and models of EV.

"At the moment, very few people are talking about the impact of EV's on the electricity grid but the reality is that the grid will simply be unable to cope with demand from EV charging.

"Our solution will ease the burden on the grid and manage electricity loads at peak times." **te**

How ultra-low loss transformers can help shape the energy landscape

Energy supply is the UK's second most carbon emitting sector, after transport. It is estimated that the sector accounted for 27% of the CO₂ emissions in 2018. Compared with 2017 statistics, energy supply reduced 7.2% of its carbon, making it the biggest contributor to decarbonisation. This is attributed to the phasing out of coal and increasing the share of low carbon energy sources, such as renewables and nuclear.

The energy sector has been through many transformations that were triggered by two main factors: policy changes and technological breakthrough. Ayah Alfawaris from Wilson Power Solutions discusses two key factors that are now shaping the energy landscape, today.

Delivering "Net Zero"

One of the biggest commitments the UK has made is going carbon neutral by 2050 to combat climate change. Being the first major economy to set such ambitious target poses many challenges that require unprecedented collaboration and drive among regulators, suppliers and operators.

The UK has invested in low carbon energy and enforced high energy efficiency standards, but to date, it has only cut its emissions by 42% compared to 1990 levels.

Energy efficiency efforts usually address what is inside buildings, from LEDs to insulation, but often neglect equipment located



outside of the building, which silently guzzle energy. Distribution transformers are a great example. Ultra-low loss transformers, from Wilson Power Solutions, a Leeds-based transformer manufacturer, create a new opportunity for delivering energy efficiency. These transformers help eliminate 18.5GWh and 5.2 tonnes of carbon annually by reducing energy wastage.

Electrification of Transport

Some 33% of the country's CO₂ emissions in 2018 came from transport, the biggest polluting sector. The government's 'Road to Zero' will help reduce its carbon footprint drastically.

In 2040, all new vehicles will have to be electric in the UK and, when the time comes, drivers will want to spend less than 15 minutes charging their EVs. Many charging points have already started offering rapid and ultra-rapid charging points with capacities reaching 350kW.

Collaboration for infrastructure upgrades has never been more vital.

Ultra-low loss transformers are ideal for EV charging points for two main reasons:

1. They reduce transformer losses to minimise energy wastage for EV charging points;
2. They provide voltage management with built-in voltage tap changers that eliminate the need for additional equipment and associated complexity.

wilsonpowersolutions.co.uk



Delivering Net Zero: Unlocking the opportunity

At a major event, held at Silverstone, business and industry will come together to share tactics in the race to reach net zero



Delivering net zero is the challenge and the opportunity of our times.

Businesses and public sector organisations will be tasked with much of the heavy lifting. How do we get there?

The Energyst is bringing together business and industry to discuss how to deliver net zero on 28 and 29 April 2020 at Silverstone.

Two events in one

Delivering Net Zero: Heat/Power/Transport aligns the Energyst Event and EV Event in a single venue. The conferences and exhibitions will run side-by-side, providing delegates with a forum spanning convergent energy vectors.

An extensive two-day conference programme



An extensive two-day conference programme focusing on key aspects of decarbonisation is the cornerstone of both events

focusing on key aspects of decarbonisation is the cornerstone of both events, arming delegates with expert insight and intelligence to map the journey ahead.

Expert-led sessions will highlight proven, cost-effective opportunities for businesses to make both step change and incremental improvement – and insight on how to minimise risk and maximise effectiveness.

Energyst Event seminar sessions span energy efficiency, renewables, flexibility, storage, private wires and microgrids, green gas, heat networks, renewable heat, decarbonisation-as-

a-service and financing decarbonisation.

EV Event seminars cover everything businesses need to know about electric vehicles and related infrastructure: From vehicle procurement and funding models to incentives and billing, through charging infrastructure and service models, to site considerations, capacity and bundled energy services, as well as smart charging, vehicle-to-building and vehicle-to-grid. **te**

The event is free to attend. Register at theenergystevent.com

If you would like to submit a topic for discussion, or are interested in speaking, please email Brendan@energystmedia.com

the energyst event



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the EV event

Legrand's new guide to energy efficiency

With a continuing focus on energy efficiency, Legrand UK has launched a new guide that outlines the key efficiency drivers and the range of products and solutions on offer, to help specifiers to select from the options available to them, relative to their budget.

The eight-page guide, entitled *Navigating through the energy efficiency maze*, explores the key drivers of energy efficiency, providing a simple four-step vision of how to approach an energy



Legrand's new guide advises on how to approach an energy efficiency plan

efficiency plan, before going on to explore some of the key technologies that can help make it happen.

Mitra Goodger, energy efficiency and sustainability manager for Legrand UK & Ireland, said: "Lean growth is at the heart of the UK government's industrial strategy and Legrand has many products that can help businesses to reduce their energy usage in everyday tasks."

From lighting management distribution systems, to

electrical power distribution via busbar technology and cast resin transformers, there are numerous products available to meet the needs of each and every application.

The paper is designed to arm specifiers with the information they need to find the right solutions for a project and to achieve greater efficiencies. Legrand also offers an energy efficiency CPD seminar.

Download the guide at: legrand.co.uk/energy-efficiency

Lighting project cuts operating costs by 40%

Ecusol, a North East-based energy reduction and renewable products provider, has completed a project installing an energy-efficient LED lighting system for Almet Sheetmetal in Washington, Tyne & Wear.

The metal fabricating company needed to dramatically reduce its energy costs while improving the lighting within its new factory.

Shortly after taking ownership of its premises, Almet Sheetmetal received its first energy bill and was shocked at the cost.

Following a free survey, Ecusol advised that the high energy usage was due to the factory's metal-halide lights, an inefficient lighting solution where approximately 75% of the energy consumed is wasted as heat.

To alleviate this issue, Ecusol proposed the installation of its range of energy-efficient LED lighting, which is proven to be up to 90% more efficient than traditional bulbs.

Ecusol managing director Brad Patchcott said: "The new lighting system has

provided dramatic cost savings and increased light levels. In hard numbers, Ecusol has reduced the annual lighting energy consumption by 66% and reduced expenditure by more than £4,000, as well as reduced the company's carbon footprint, saving over 15 tonnes of carbon annually."

Almet Sheetmetal managing director Paul Almond added that the level of light had "dramatically improved" and overall running costs have "reduced by approximately 40%."

LED batten provides 65% energy savings

A new design-driven LED batten that offers a sleek and sophisticated lighting solution, based on long-life, energy-efficient LED lighting technology, has been added to the Goodlight range.

Designed as a direct drop-in replacement for fluorescent tubes and battens, the LED batten delivers over 130Lm/W providing optimum light output, leading to direct energy savings of up to 65%.

Minimalistic in its design, the Goodlight Batten Pack is a point-for-point retrofit replacement for outdated fluorescent tubes and batten fixtures. Available in two sizes, the 4ft LED batten draws 25W or 40W and provides 3,000Lm and 5,200Lm of light output respectively. The 5ft LED batten draws 30W and delivers 3,600Lm or 50W providing 6,500Lm. The Goodlight Batten Pack has been designed as a single body, incorporating the LED light source, diffuser, end caps and LED driver. The technology is virtually maintenance free, with a lifespan of 50,000 hours.

Switch2 Energy wins contracts with Fife Council

Switch2 Energy has secured seven contract wins from the Fife Council Heat Metering & Billing Services Framework, as well as achieving approval to supply an extended range of heat network services and products.

The contract will include all heat metering requirements (from bulk metering in the plant room through to pay-as-you-go smart meters within homes); heat interface units (HIUs); billing



solutions; and maintenance and optimisation services.

Switch2's optimisation services will enable local authorities to bring down

the cost of operating heat networks by gaining full real-time visibility of performance.

The solution is delivering improvements for UK heat networks by combining advanced data analytics from heat metering, building energy management systems and sensors to inform continuous optimisation of network performance. This will lead to efficiency and asset life improvements, while reducing call outs.



Educating on the benefits of efficient lighting

Lansbury Lawrence Primary School in east London is expected to achieve savings of almost £9,000 per year following an upgrade to LED lighting financed by the London Borough of Tower Hamlets' Carbon Offset Fund.

The school was designed to provide open spaces for learning with large windows to maximise levels of natural light and, nearly 70 years later, students are still benefiting

from its Modernist design. Nevertheless, utility bills are a major overhead for the school, following behind salary and PFI costs.

With running costs increasing by 5-10% a year – in a climate of falling income – there was real pressure on the school's management team to identify ways to make operational savings.

Sensibly, the school had invested in new housing and

diffusers for its lighting a few years ago. As such, it appeared that a straightforward bulk retrofit of LED lighting would be all that was needed to make a real impact on its energy bills.

The London Borough of Tower Hamlets set up the Carbon Offset Fund to support projects such as this, thereby providing grant funding for eligible projects.

Salah Ahmed, school business manager at Lansbury

Lawrence, prepared a tender document to identify the right supplier for this project and selected Energys Group from a shortlist of four organisations.

Commenting on the installation, he said: "Energys Group provided the right mix of cost-competitiveness and quality within their tender response and we were particularly pleased to see their commitment to post-installation aftercare."

The upgrade included both internal and external lighting for the whole school and the LED retrofit tubes, LED linear fittings, LED panels, LED wall lights, emergency light fittings, LED floodlights and outdoor wall lights were all provided from Energys Group's own range and all come with a five-year guarantee.

Students will now benefit from all the known benefits of LED lighting, including reduced eyestrain and improved alertness and cognition.

Smart battery storage could lead to 70% reduction in energy costs

Battery storage firm Puredrive Energy has signed a strategic partnership with The MAXIMeyes Group to create a platform from which consumers can reduce their dependency upon the grid, ensuring that fuel poverty can become a thing of the past.

By using smart battery storage technology, and still drawing power from the grid, savings of up to 70% are anticipated.

Batteries allow energy from the grid and other green technologies to be stored and consumed as and when the building or the lifestyle requires electricity. Battery systems range from 5-30kWh, depending upon demand.

The system tops up its battery levels by downloading

energy from the sun and from the grid when electricity tariffs are at their cheapest, as well as when usage is at its lowest.

The property can then consume that electricity at peak times, when the requirement is at its highest.

With buildings able to source and consume electricity in this way, the choices are there for the consumer to make new decisions and break the stronghold of the big energy companies.

The battery storage technology has applications in a wide range of environments, including industry, manufacturing, healthcare, commercial property, property development, residential housing and social housing.

Cool London development

Trox air conditioning systems are ensuring a premium occupant experience at the prestigious redevelopment project at 21 Dartmouth Street, situated in the heart of St James's Park, between Buckingham Palace and the Palace of Westminster.

The air conditioning solution, including Trox X-Cube air handling units (AHUs) and X-Aircontrol modules, with the X-Aircontrol Zonemaster, is enabling high levels of efficiency alongside optimum levels of comfort.

The building is divided into 20 X-Aircontrol zones, each of which has a Trox TZ Silenzio supply controller and a Trox TA Silenzio extract controller.

The X-Aircontrol

zone modules combine information from humidity, temperature and PIR sensors and ensure the perfect interaction of all air handling components in a room.

Inherent within the Trox system is a fan optimisation strategy, controlling fan speeds based on damper blade position, which enables energy consumption to be reduced significantly.



Who would you least like to share a lift with? David Cameron – anyone who puts leaving the EU to a public vote and immediately resigns deserves to take the stairs. However, I would always take the stairs. Awkward conversations in confined spaces isn't my thing. Plus, it's a great workout, saves energy and there's no risk of breaking down.

You're god for the day, what's the first thing you do? After creating a world we all care about, banning shameless abuse of power and making everyone feel safe, I'd move onto those really annoying little things in life: I'd make hangovers a thing of the past; put less calories in a custard donut than in kale; and make Liverpool FC win the Premier League three seasons in a row.

If you could travel back to any historical period when would it be and why? I'd go back to the American Wild West and order a whiskey in a saloon. Who doesn't dream of being Clint Eastwood in *The Good, The Bad and The Ugly*?

Who or what are you enjoying listening to? I have a really eclectic taste in music – everything from Ibiza classics to Elbow. When I am on the road, I mainly listen to 5 Live so I can catch up on the latest sport and news.

Who doesn't dream of being Clint Eastwood?



Pic: United Artists - MGM

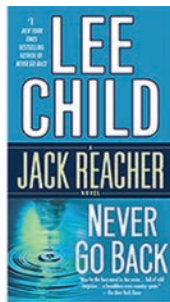


Andy Kershaw

Marston's Group head of facilities and capex on why he always takes the stairs, the importance of being 'green', and being Clint Eastwood in a Wild West saloon

What unsolved mystery would you like the answers to? What really goes on in the Bermuda Triangle.

What would you take to a desert island and why? Bear Grylls – he'd transform me into a born survivor and then get me out of there when I'd had enough of island life.



What's your favourite film (or book) and why? I really enjoy the Jack Reacher series by Lee Child. The books are real page-turners, and Reacher's unique ways often keep me gripped until the early hours of the morning.

If you could perpetuate a myth about yourself, what would it be? I would be the mastermind behind LED lighting. It has transformed the lighting arena and maybe I would now be a millionaire if I had thought of it.

What would your super power be and why? I would be called 'Captain Grub' and my



I'd go back to the American Wild West and order a whiskey in a saloon

superpower would be creating food wherever it is needed in just one click. With everything that we have, there should not be anyone in our world who struggles for their next meal.

What would you do with a million pounds? I'd try and turn it into £2m.

What is your greatest extravagance? The only thing I really splash out on is my car (currently a Mercedes E-Class). Oh, and a nice bottle of whiskey every now and again.

If you were blessed with any talent, what would your dream job be and why? I would love to have a craft like carpentry, where I could take time out to create something amazing from scratch and then really appreciate the end product.

What is the best piece of advice you have ever been given? An ex area manager of mine called John Brierley taught me not to be afraid to look at things differently to make a difference. It has always stuck with me, and that is definitely how we have approached sustainability at Marston's.

Being 'green' is challenging in our industry, so we have had to think outside the box to make the great progress we have.

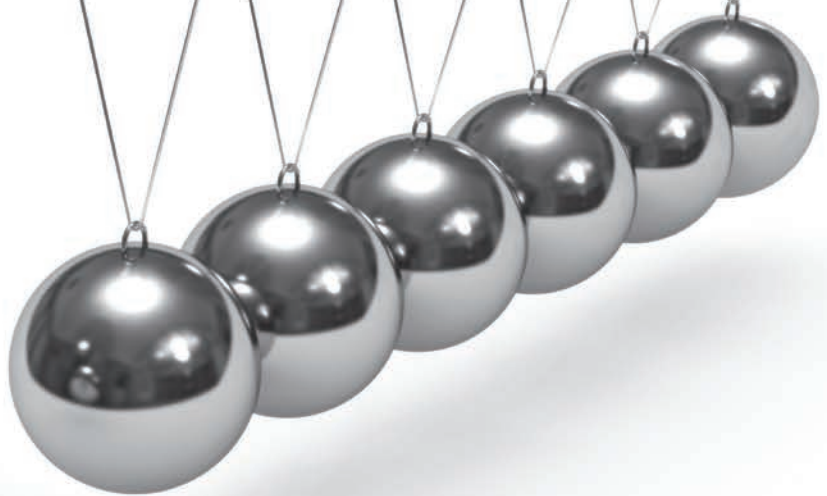
What irritates you most in life? People who over promise and under deliver – it can cause so many knock-on effects on a project. It is really important to me that I set realistic goals, keep stakeholders updated along the way and, ultimately, deliver what I set out to achieve.

What should businesses be doing to help themselves energy-wise? There are huge opportunities out there – many in the most unlikely places – so look at everything and leave no stone unturned. Making great connections and working with the people around you helps, too. The Energy team at Marston's sits within my broader maintenance team, and we have seen so many benefits from the two working so closely together.



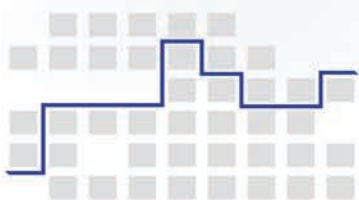
What's the best thing - work wise - that you did recently? We have achieved so much over the past 12 months, but the highlight is definitely being the first hospitality company to deliver zero waste to landfill (two years ahead of our target). Picking up two big awards for our efforts – the EMA Energy Team of the Year and the MRW National Recycling Award for Partnership Excellence with UKWSL topped it off. **te**

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