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Green energy

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Warm words and cold realism

The Committee on Climate Change (CCC) has advised government to set a net zero greenhouse gas emissions target by 2050, rather than its previous recommendation of 80 per cent – and the government appears to have accepted. This is a recurrent position in UK politics. That is, to lead the world in targets and ambition. Unfortunately, rhetoric is not a known form of decarbonisation. While it is admirable to have high aspirations, a methodology to painlessly raise the standards making the UK built environment low carbon is urgently required.

One sector that has been active is the power sector, where the improvement in the carbon content of electricity generation is impressive. However, there is little to celebrate elsewhere. Lord Deben, chairman of the Committee on Climate Change, made the point in a report to the government last year. “There is a danger that progress in decarbonising electricity is masking a lack of progress elsewhere. The legally binding carbon budgets will only be achieved if effective policy extends beyond waste and power, into sectors that have not so far achieved significant reductions.”

The lack of progress includes buildings – commercial and domestic; agriculture, construction, transport – which EVs cannot solve overnight in terms of storage and low carbon generation capacity and there is also the thorny question of aviation and how to tackle the issue of large scale zero or ultra low carbon heat.

The annual Energy Barometer survey of the Energy Institute’s members reflects scepticism about the UK meeting its 2050 emissions target, with more than two-thirds suggesting that we will fall short. And the survey was conducted before the net zero announcement, so this was doubt about hitting the 80 per cent reduction

target. Targets rise and those signing up to them will be long gone by 2050. There is a need to get serious and form a strategy about how it is to be done. The CCC is convinced that nuclear power and carbon capture with storage or usage are necessary tools to achieve net zero, yet implementation of these technologies has reversed in the past few years.

“While it is admirable to have high aspirations, a methodology to painlessly raise the standards making the UK built environment low carbon is urgently required”

Many reports highlight the potential for ramping up energy efficiency both in homes and businesses and there are fine examples of best practice in all sectors. Yet concurrent to the exemplars, I regularly hear of manufacturing companies’ making vast savings by employing variable speed drives, widely available for most applications for over 30 years. Zero carbon is achievable and perhaps management and householders in the run up to 2050 will act differently than at present. But lofty ideals need to be grounded by direction, education and action; elements that often appear to be missing from government thinking.

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the energyst

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Statkraft strikes gigawatt deal with Statera Energy

Statkraft has struck an agreement with Statera Energy to bring a gigawatt of gas and battery storage into its virtual power plant (VPP).

It is expected Statera will amass that portfolio over the next three to four years.

The firm already operates some large storage facilities, such as the 49.9MW

Pelham battery near Bishop's Stortford, and a similar unit at Creyke Beck, co-located alongside a 49.9MW gas peaker.

Under the plan, Statera will add new storage and gas assets to Statkraft's VPP as they come online, and Statkraft will optimise and trade their flexibility.

Given limited visibility of future revenues, the 15-year agreement with a state-backed utility provides Statera and its investors with additional confidence to build out the portfolio.

Providing route-to-market services is one of the ways in which Statkraft aims to build a multi-gigawatt VPP in the

UK. Its German VPP currently stands at about 12GW.

Virtual power plants aggregate lots of distributed generation and use their power to trade into wholesale markets or balance the power system using algorithms and human traders to determine where the power will fetch the best returns.

"Statkraft recognises the importance of flexible power generation for the provision of secure energy supply in the years to come until multi-day mass energy storage becomes economically viable," said Duncan Dale, head of Statkraft's UK markets business. "It is vital that any new generation capacity is highly efficient and ultra-flexible, like Statera's."

He said the utility had partnered with Statera due to its "relentless optimisation" of projects.

"Everything about these projects suggests that new efficiencies can be made, which means lower carbon emissions and lower costs to the consumer," said Dale.

"The energy market and the UK's transition to a low carbon future should benefit greatly from unlocking this potential."

SSE to close Fiddler's Ferry coal-fired power station

SSE is set to shut down Fiddler's Ferry power station by 31 March, taking 1.5GW off the system.

The company has been mulling the decision for several years as Fiddler's Ferry became increasingly reliant on ancillary services to make revenue. It said the power station's 'limited success' in the capacity market and ongoing heavy losses made up its mind. SSE will consult with employees and try to redeploy people.

Stephen Wheeler, managing director of Thermal Energy at SSE, said the station was "unable to compete with more efficient gas and renewable generation".

He added: "We have a talented and dedicated team at Fiddler's Ferry and our priority is to support employees and ensure they have a range of options available to them for the future. SSE is proud of the social and economic contributions the station and our employees have made for the local area and wider society."

All coal generation is set to come off the UK system by 2025.



Plc CreativeCommons_Benkid77

Banks ‘won’t lend on a merchant wind farm’

Banks are unlikely to put debt finance into merchant – or unsubsidised – wind farms, according to a major renewables infrastructure fund.

“Our approach is completely unlevered,” Laurence Fumagalli, partner at Greencoat Capital, told Aurora’s Summer Renewables Conference.

“You won’t find a bank lending you any significant amount on a merchant wind farm.”

Even where a project secures a government-backed Contract for Difference, the same applies, said Fumagalli.

“[Greencoat] only invests in merchant wind farms on an unlevered basis. Frankly, that is the only way I would invest in a CfD wind farm.”

The conference discussed the impact of price cannibalisation as growing renewables penetration increases curtailment and drives down the wholesale cost of power, creating uncertainties for investors in long-term power projects.

Fumagalli said the key element for investors is “making sure you have enough of a



There will be a shift in relevance of the wholesale power price to the investment case. We will have to learn a lot more about ancillary markets

return in the period that you have visibility over”. Investors, he said, “accept the back-end can be unknowable, provided they have [secured] returns in the early years [of a project]”.

ScottishPower Renewables CEO Lindsay McQuade said the merchant model “introduces an awful lot of risk” for investors.

“There will be a shift in relevance of the wholesale power price to the investment case and we will have to learn a lot more about ancillary markets,” she suggested.

Brian Davis, vice-president Energy Solutions at Shell International, said the industry would need to rethink some of the market’s current fundamental mechanisms.

“How does dispatching in a merit order work in a world where assets are essentially zero marginal cost?” he asked.

Renewable UK deputy CEO Emma Pinchbeck suggested government would need to “redo electricity market reform” to create more suitable structures for renewables financing and flexibility markets.

Second-life battery firm lands £5m

Connected Energy, the company that uses second-life electric vehicle batteries to provide energy storage solutions, has received £5m investment from Engie, Macquarie and Japanese trading giant Sumitomo Corporation.

The cash injection is Connected’s second in two years. Engie and Macquarie invested £3m last year in the Newcastle upon Tyne-based firm, which takes second hand battery packs from Renault electric vehicles to create storage systems ranging from 60kW to megawatts.

CEO Matthew Lumsden said the company would use the cash to expand.

“The time is now right for us to scale up the business and the investment will enable us to do so. We have some exciting times and projects ahead of us and look forward to further capturing the benefits of the circular economy.”

The firm has installed 11 of its E-STOR systems to date.

Energy Institute: Government should incentivise flexibility

An overwhelming majority of Energy Institute members say government should incentivise flexibility, either through markets or other forms of support.

Polled for the Institute’s annual energy barometer, members suggested minimal progress has been made in energy system flexibility, and 82% support flexibility incentives.

EI members view lack of political will as the main

barrier to scaling up flexibility. Other barriers were ‘lack of integration between energy systems’ and ‘current market structures around flexibility’, both of which were identified by about a third of respondents.

Peer-to-peer energy will be the least attractive future energy service to consumers, tariffs that reward flexible demand the most attractive, according to the poll.

Meanwhile, they believe

grid-scale battery storage and demand-side response (DSR) have the greatest growth potential over the next 10 years.

Some 62% of members said tariffs that reward householders for flexible demand (dynamic time-of-use tariffs) are likely to be attractive to consumers by 2030.

Only 15% said peer-to-peer would be attractive. Fewer than a third thought

electrification of heat and transport would be attractive, which appears at odds with carmakers pushing en masse to electrify their models.

Members were less certain about technologies with the greatest short- to mid-term potential. Grid-scale battery storage was cited by 32%, non-domestic DSR by 26%, likewise small-scale battery storage (26%). Vehicle-to-grid was cited by 23%.

Engie acquires electric vehicle charging firm Charge Point Services

French-owned utility Engie has acquired electric vehicle charging provider Charge Point Services (CPS), which owns the Genie Point nationwide EV charging network.

The charging company's business customers include Ford, Microsoft, Waitrose, Morrisons and Siemens, and it works with about 30 local authorities on rolling out charging infrastructure.

Engie said the deal buys it 20,000 Genie Point network customers and a cloud-based data and control platform. It will create a combined public rapid charging network of some 400 stations that can charge cars in less than an



Engie is scaling up its EV ambitions

hour, plus a further 500 'fast' stations by the year end.

Engie UK & Ireland CEO Nicola Lovett said the acquisition scales up its EV ambitions, and means it can

provide energy and transport solutions to its business and public sector customers.

CPS managing director Alex Bamberg said the deal enables it to become

“a major player in electric vehicle fuelling in the UK”.

Engie said it is the world's second largest provider of EV charging stations, with 75,000 installed worldwide.

Locally, the firm was appointed last year by the West Yorkshire Combined Authority to install 88 rapid charge points throughout the region. Engie will install, own and operate the charge points for at least 10 years.

In June, Engie, alongside Italian utility Enel, struck a deal with Fiat Chrysler to provide customer charge points for its forthcoming Fiat 500 BEV and plug-in hybrid Jeep Renegade PHEV.

Tesco cuts £37m through energy efficiency

Tesco's energy efficiency initiatives have yielded £37m in two years, according to the company's annual report.

Across the group, the retailer now procures 58 per cent of electricity from renewables (up from 55 per cent last year) against a target of 65 per cent by 2030 and 100 per cent by 2050. The retailer committed to buy 100 per cent renewable power in the UK and Ireland in 2017.

Meanwhile, Tesco has reduced carbon emissions by 31 per cent against a 2015/16 baseline. It has committed to cut emissions by 35 per cent by 2020, 60 per cent by 2025 and 100 per cent by 2050.

The company's Little Helps Plan, published alongside its annual report, also states that supply chain emissions were down 6.2 per cent in 2017/18 against a 2015/16 baseline.



Bentley installs 2.7MW solar carport



Bentley Motors has installed a 2.7MW solar carport at its Crew headquarters. Carport specialist FlexiSolar believes it is the largest of its kind in the UK. Bentley hopes it will reduce its carbon footprint by 3,300 tonnes a year, depending on light levels and output.

Work started on the project in April 2018. It is being financed by a power purchase agreement (PPA) and takes Bentley's installed capacity to 7.7MW, following a rooftop installation in 2013. The company, a century old this year, said completing the project means that means that all the electricity used to manufacture every Bentley is solar or certified green.

“It's important to look ahead and prepare the business for the next 100 years by investing significantly in our products, our people and our site infrastructure. This includes new initiatives that reinforce our commitment to the environment,” said Peter Bosch, Bentley's member of the board for manufacturing.

Brown power can receive smart export guarantees

The government has lowered the threshold at which suppliers have to offer customers with small-scale generation export payments. Meanwhile, it says brown power can receive those payments where co-located.

Suppliers with 150,000 customers will need to offer some form of payment for power exported by 1 January 2020. The rate is not set – just more than nothing at all times of export and metered generation. The government said it will review potentially setting minimum tariffs if the market doesn't deliver a competitive range of options.

Suppliers can decide how to set up Smart Export Guarantee (SEG) tariffs – for example, flat payments or time of day. Non-domestic suppliers are excluded from the obligation but can offer SEGs if they choose. There is no requirement to meet any particular energy efficiency standards to receive export payments.

Government said it recognises that community generation schemes may find it difficult to get off the ground

without the kind of investment certainty provided by Fits. It suggested power purchase agreements (PPAs) may be a better option for those projects but added it is exploring new public-private models for these schemes that might make them attractive to investors.

Generators receiving SEGs can also receive other support measures. Meanwhile, SEG payments can also be made on grid-sourced electricity where storage or a non-low-carbon generator is co-located with the SEG installation. Suppliers do not have to make SEG payments on the 'brown' element of exported power though they can if they like, but would require separate metering if they want to claim REGOs.

Ofgem will report annually on how the SEG scheme is working, and what suppliers are offering small generators.

The arrangements apply to anaerobic digestion, hydro, micro-combined heat and power (with an electrical capacity of up to 50KW), onshore wind, and solar photovoltaic exporters with up to 5MW capacity.

Project Terre balancing market launch delayed

The launch of the European balancing scheme slated to go live at the end of this year is set to be pushed back until June 2020 at the earliest.

Project Terre (Trans European Replacement Reserve Exchange) obliges National Grid and other transmission system

operators to collaborate to build a European balancing market that will facilitate balancing in different regions.

National Grid ESO said the French transmission system operator, RTE, was not ready to go live, effectively blocking the UK's route to market.

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Seven sign up to DSR assurance scheme

The Association for Decentralised Energy has launched an assurance scheme in a bid to improve market transparency and trust in demand-side response.

The scheme is based on the ADE's code of conduct, which sets out minimum standards that DSR aggregators must meet to achieve Flex Assure status.

The association spent two years developing the code with industry in a bid to improve outcomes for businesses that provide flexibility either through load or generation assets.

While *The Energyst's* annual DSR survey has consistently found broad satisfaction from those that provide flexibility –



ADE's Flex Assure aims to give businesses greater confidence in signing flexibility contracts

most of which is via aggregators – some businesses have reported bad experiences with certain aspects, such as misleading sales, lower than anticipated returns and poor dispute resolution.

Businesses have also suggested that it is also difficult to compare like for like as aggregators offer different services and terms.

The Flex Assure scheme aims to address those aspects via a common set of standards through which businesses can compare aggregators and their claims, giving them greater confidence in signing flexibility contracts. The code covers:

- Sales and marketing: reps must be properly trained and provide honest and factual marketing material to customers. Sales records must be kept.
- Technical due diligence: critical energy assets must be safeguarded from the threat of cybercrime, requiring best practice to protect customer's data and infrastructure.
- Proposals and pre-contractual

information: the pre-contracting process must be transparent, not make false promises to customers and be representative of true savings and payback to customers.

- Customer contracts: contracts must be accurate and clearly indicate any potential obligations customers may be committing to.
- Complaints: there must be clear, transparent processes for recording, processing and responding to complaints.

To date, seven firms have applied to join Flex Assure: Centrica Business Solutions, Enel X, Engie, Flexitricity, Grid Beyond, Kiwi Power and Npower Business Solutions.

Reading University hits decarbonisation target

The University of Reading says it has reduced its carbon footprint by 40 per cent in about 10 years – and should hit 45 per cent by 2021.

Dan Fernbank, the university's energy and sustainability manager, said students, staff and the community expect environmental leadership.

"With a large and evolving estate, there is always more work to be done and we will

continue to run a strong sustainability programme to deliver lasting change. We are committed to embracing new and innovative ways to help the university wipe out its carbon footprint."

In the past year, the university has extended its district heating scheme and added further solar PV across the campus. It has also introduced an app that rewards staff for taking environmental actions, while a furniture and equipment recycling scheme has saved approximately £100k over two years.

Fernbank added that the university has cut waste produced per person by 17 per cent, with only 1 per cent of waste now going to landfill.

He said one of the tasks for the year ahead is to gauge how the university's energy centre, which provides heat and power to 16 buildings, might be decarbonised.



The University of Reading is committed to offsetting its carbon footprint

Viridor plans to supply businesses via private wires



Viridor plans to build a new plastics recycling plant and more energy parks as the energy from waste (EfW) business continues to drive profits at Pennon Group.

Posting annual results, the company said the plastics processing facility would be co-located with its new Avonmouth EfW, using heat and energy offtakes.

The company believes creating energy parks – supplying heat and power via private pipes and wires to local businesses and potentially building wind and solar assets as well as supplying waste-derived energy – will increase profit at its EfW sites by up to 10%.

"We already have several such connections, including our Runcorn ERF that has a heat and power offtake to Inovyn, Peterborough ERF where we provide a heat connection to a council depot, and our landfill gas engines and ERF at Beddington, which provide heat offtake into a community heating network," stated the company.

"We believe there is significant potential to do more with energy parks supporting Viridor's own activities, other Pennon Group operations such as South West Water's treatment plants, or third-party energy intensive facilities."

Whey to go: Cheesemaker turns waste into energy



Say cheese: Wensleydale Creamery's David Hartley (left) with Iona Capital's Mike Dunn

Iona Capital has struck a deal with Wensleydale Creamery in the Yorkshire Dales to use whey by-product as feedstock for its Leeming biogas plant.

It will produce 10,000MWh of thermal power, enough to heat 800 homes per year.

The fund manager has already established nine anaerobic digestion facilities across Yorkshire, investing £100m.

Mike Dunn, co-founder of Iona, said: "Once we have converted the cheese by-product supplied by Wensleydale into sustainable green gas, we can feed what's left at the end of the process onto neighbouring farmland to improve local

topsoil quality. This shows the real impact of the circular economy and the part intelligent investment can play in reducing our CO₂ emissions."

The Wensleydale Creamery's managing director, David Hartley, said: "The whole process of converting local milk to premium cheese and then deriving environmental and economic benefit from the natural by-products is an essential part of our business plan. To sign this agreement and have the opportunity to convert a valuable by-product of cheese making into energy that will power hundreds of homes across the region will be fantastic for everyone involved."

SEEIT strikes Tesco solar deal

SDCL Energy Efficiency Income Trust (SEEIT) has struck a deal with Tesco to deploy solar PV projects across some of the retailer's properties.

The two have agreed a power purchase agreement for each individual site, with the PV to be installed in 1MW batches.

SEEIT said the first phase is for about 5MW, with additional projects scheduled under a framework.

SEEIT will install, own, operate and maintain each project and has partnered with Kingspan for engineering, design, operation and construction. Kingspan will also handle O&M.

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A big carrot: Octopus seeds new business energy verticals

The Energyst sat down with Octopus Energy for Business director Zoisa Walton to discuss new approaches to business energy procurement, and why she sees the SMEs of today as the I&Cs of tomorrow

Octopus Energy for Business plans to quadruple its customer base in the next couple of years. Director Zoisa Walton thinks creating products for business verticals will help power growth.

The company has just launched a new tariff for vertical farmers – companies developing novel agricultural methods, and who tend to grow indoors (Bristol-based Lettus Grow is a good example).

Powering indoor lamps burns a lot of energy, which can make up to 40 per cent of operating costs, hampering the sector's growth potential, according to Walton. She says Octopus' new tariffs – one avoids evening peak costs, the other priced half hourly – enable them to cut energy bills by 8-12 per cent.

She says that is quite a big carrot, literally.

"Currently, vertical farmers might be [billed] using average energy pricing, but through these tariffs we can help them flip the day into night," she says. "It doesn't matter to a carrot if it is day or night [when the lights are on], because it is an artificial environment. So using these tariffs, and by altering the circadian rhythm of the carrot, they can cut their costs, which helps them to innovate and scale more quickly."

Since launching in January 2018, Octopus Energy for Business has accrued 5,000 customers, mostly SMEs, supplying them with 100 per cent renewable power. Walton, a country director at Dutch



The new tariffs – one avoids evening peak costs, the other priced half hourly – enable vertical farmers to cut energy bills by 8-12 per cent

utility Eneco prior to joining Octopus, has significant experience of the industrial and commercial energy market. But she believes the SME to mid-market is where opportunity lies.

"We call them the industrial and commercial customers of the future," says Walton.

She thinks Octopus can amass 20,000 of them over the next 12-24 months and creating niche products is a key strategy. The company already has Arsenal FC on its books, and Walton hinted further products for sports venues and breweries may be in the offing.

Local energy

Local energy models and tariffs are another strategic aspect. The company launched its first local tariff in Leicester, using a local solar asset to supply local firms. Walton says the reaction has been "fantastic", with hundreds of businesses signing up within the first few weeks, and Octopus targeting a further 500 by the year end.

"They are extremely engaged and extremely loyal – and they want to know what comes next," says Walton. In future, that may be packaging on-site solar or other generation assets to business customers, says Walton. But for now, replicating the model in other cities

Zoisa Walton:
'We have to get businesses engaging with time of use and dynamic tariffs'

takes priority and Brighton is next on the roadmap.

Sustainable growth

Though Walton has ambitious targets to hit, she says Octopus will not undersell itself.

"I want to achieve that scale of growth using our technology and insight, and by adding value, not from buying contracts."

She says that if businesses can adapt to time of use tariffs and change their behaviour as a result, the GB system will become smarter and leaner that much sooner – laying the foundation for SME involvement in things like demand-side response.

"That will come for small businesses, but first we have to get them engaging with time of use and dynamic tariffs," says Walton. "That is what we do." **te**



A global peer-to-peer energy exchange?

Energi Mine is working on plans to launch 'a global energy exchange that enables peer-to-peer trading' underpinned by blockchain.

Brendan Coyne reports

Chief executive Omar Rahim, a former energy trader with Engie, SSE and Vattenfall, says Energi Mine is building “an AI-driven marketplace where trades can occur between two parties”.

He says the aim is to match business-to-business buyers and sellers, and while the goal is to shift the balance of power towards end users, Rahim says generators will benefit too.

“If you are asset owner, you might have an index-linked product, perhaps a three, five or 10-year power purchase agreement (PPA). But there is very limited optionality [within that], it is difficult to squeeze out extra value,” he suggests. “We want to change that and give generators access to end users.”

Weekly contracts

Rahim says both parties will benefit from a more efficient route to market.

“At the moment, end users do not have a lot of say. We call it trading in slow motion. To buy energy they have to assess 40-page supply contracts, line them up against each other, and it takes months. We are standardising these contracts so that can be done in seconds,” claims Rahim.

Via the platform businesses could “buy from a different seller every week if they wanted”, rather than sign multi-year contracts.

Transparency

Moving to an exchange-based model will create

price transparency, Rahim believes, which is lacking in the current market.

“A broker is typically dealing with procurement for the consumer, who probably doesn’t have a good handle on true prices. They take the broker’s word, who in turn is taking the supplier’s word,” says Rahim. That creates “a huge opportunity” for margin padding, he adds. “So moving onto an exchange-based platform creates a benchmark in each of the respective markets.”



We are unapologetically on the side of the consumer and want the industry to be shaped around that
Omar Rahim, Energi Mine

Regulatory risk

Is the UK ready for a peer-to-peer exchange? Rahim says regulatory risk is “one of the most acute” challenges to work through.

“Generally, regulators want more competitive markets. They want to see this model – Ofgem’s annual report quite deliberately mentions peer-to-peer markets and how they can be a good thing,” says Rahim. “But they want to see business models that can be successful. They need credible partners that can execute and deliver more credible markets.”

He says that is “the gap Energi Mine is looking to fill”, but that the company will move at its own pace.

“We are planning on launching

something very soon and will make a very big announcement in six to eight weeks,” says Rahim. “We’re not waiting for regulation to catch up. We are pioneering and keeping regulators abreast of what we are doing.”

Big Bang

Rahim thinks regulators will not stand in the way, provided platforms are sufficiently robust and demonstrably benefit consumers.

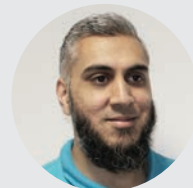
“We look at this pretty simply as sell-side and buy-

says. “The energy industry is due its Big Bang moment.”

Liquidity

If the platform is to be more than a damp squib, it will require liquidity. Rahim believes buyers and sellers will provide that due to mutual benefits, which, he reiterates, can be “significant” for generators too.

“If my asset is locked into a 10-year PPA I am not seeing any upside beyond what’s on my contract. The market price could double and I don’t see a



penny of that as a generator,” says Rahim. “That cannot be right. So generators also want more reflective prices. It all boils down to liquidity, but with enough buyers and sellers, an efficient marketplace benefits all parties.”

Market-driven

On the buy side, Rahim says Energi Mine, through its brokerage business, has created a working group of large energy consumers to help shape its designs.

“We have the ear of some of the largest energy consumers in Europe. When we mention the idea of moving to a fully transparent, liquid energy exchange, it really excites them.” **te**

The eye-opening world of true data visibility

Mark Robinson, Managing Director at SystemsLink



Energy management software may be well established in the marketplace, but the goalposts have drastically changed in recent years, and so too has the approach to energy data. Energy professionals across the private and public sector now have a whole raft of issues to handle: compliance, cost control and carbon reduction battle for attention as organisations are compelled to drive down consumption and get to grips with their energy usage across often complex portfolios.

A decade of development means that monitoring and targeting systems have evolved to support energy professionals, yet too often they remain an unlocked opportunity to deliver tangible savings.

Data is king

Having a good handle on an organisation's energy data is crucial - only by understanding something is it possible to effectively manage it and drive change. Yet this isn't always a simple step to take, particularly for organisations with large and complex site portfolios.

Organisations now have access to more energy data than ever before. The introduction of P272 means half hourly data is available for a vast number of non-domestic energy users, but making sense of it can be an arduous task for stretched energy managers who often have to process hundreds of spreadsheets for hundreds of properties to get a full view of their utilities usage. Monitoring and targeting software simplifies that task by bringing together realms of data into one place and making it easier to extract actionable insight.

Energy management software like SystemsLink collates utilities data from multiple sources and for multiple sites into one place.

From supplier invoices to data from half hourly and AMR meter reads and building management systems, organisations can automatically import data to track utilities across a portfolio, creating clear profiles and patterns from a meter-by-meter basis upwards to easily identify anomalies and wastage - placing the emphasis on action rather than data processing. However, it's what organisations do with the data that counts.

Monitoring and targeting can achieve up to 10% savings on annual energy costs, with up to 25% savings realised through continued focus on energy wastage and acting on opportunities to reduce it.

True data visibility

One of the primary benefits of energy management software is the ability to effectively profile sites, establishing patterns and benchmarks while creating tolerance levels. These can then be monitored on an ongoing basis through interval data collection, identifying anomalies that suggest wastage immediately to be dealt with.

Such enhanced visibility also enables organisations to rank sites by performance, simply compare individual or multiple sites with targets or benchmarks and run trend analysis and comparison with previous performance. Energy or facilities managers can also set up alarms and tolerance checks, using real-time management information to identify consumption issues or equipment faults and act swiftly to resolve them.

Armed with such information, teams can focus on implementing the behavioural change or energy efficiency measures needed to avoid wastage, drive down consumption and improve consumption profiles to reduce both consumption and cost.

Powering energy management in the public sector

Over half of England's largest 150 councils use SystemsLink to manage their energy data, along with 63% of Scottish councils and over half the councils in Wales. From easier portfolio management and spotting cost-saving opportunities to simplified tenant billing and Financial Exports or compliance, SystemsLink has bespoke modules to help power energy management programmes in the public sector and drive down costs across all types of portfolios.

"SystemsLink have already helped us to create thousands and thousands of pounds in savings on Council energy bills, with more predicted as we find out more about what SystemsLink can enable us to do." - Durham County Council



Streamlining processes

Operational processes can be simplified with the right software. One example is Display Energy Certificates (DECs) for public buildings: producing annual certificates and Advisory Reports based on the actual amount of metered energy used over the last 12 months can be a taxing process for councils and local authorities. However, software that gathers reliable data for each site can make this a far more straightforward process - particularly when tools are available to maintain an up-to-date database of existing information, current ratings and due dates for each individual site.

Financial processes and billing can also be simplified, from validating the complexities of utility invoices (identifying discrepancies and consumption anomalies) to producing invoices for tenants. From local authorities to property management companies, apportioning costs to individual sites or within buildings based on accurate data can make significant administrative savings and ensure that billing processes are automatically reflected in accounts systems.

Simplifying compliance

Both public and private bodies are required to provide an increasing amount of data on their energy consumption to comply with reporting schemes - further adding to an ever-growing workload for many stretched teams.

In 2019, compliance requirements are set to increase for many organisations: along with the Energy Savings Opportunity Scheme (ESOS) Phase 2 deadline in December 2019, requiring eligible companies to submit detailed energy audits on their consumption and opportunities to boost energy efficiency, around 11,000 organisations will need to comply with new reporting regulations this year, requiring a strong grasp of consumption data across portfolios.

The new Streamlined Energy and Carbon Reporting (SECR) Framework requires organisations with over 250 employees (or a turnover of £36 million/balance sheet of £18 million) to publish data on their energy usage and emissions in their annual reporting. This new piece of regulation applies to a far greater number of companies that were required to report this information than under the previous Carbon Reduction Commitment Energy Efficiency Scheme (CRC-EES), meaning many may not be routinely capturing data. To avoid SECR being an annual headache, putting in place continuous monitoring allows organisations to record this data and identify opportunities to reduce usage year-on-year (and, through SECR, place these achievements into the public domain).

Energy management software is an invaluable tool to manage compliance, from extracting annual reports and maintaining records that are easily auditable and correctly formatted for evidence packs.

Prioritising action

Faced with such a broad remit and ever-increasing workloads, finding ways to minimise data processing and administrative tasks to free up time to focus on action is crucial. The right energy management software transforms data into actionable insight and simplify arduous financial and reporting processes, making it easier to target time and energy to driving down consumption, cutting carbon and delivering cost savings at a time when reducing energy bills is a top priority for organisations of all sizes. Realising the benefits of true data visibility has never been more important.

After serious growing pains, Yü Group promises prudence

Business energy and water supplier Yü Group had enjoyed meteoric growth, until an accounting hole discovered last October sent shares crashing. As it continues to rebuild, the company says lessons have been learnt. Brendan Coyne reports

Business energy and water supplier Yü Group said it will grow at a slower pace after suffering the affects of rapid expansion without sufficient checks and balances.

The company posted a net loss of £6.3m for full year 2018 and restated 2017 profit to £700,000 as a result of serious accounting issues discovered last year by incoming CFO Paul Rawson.

Those problems stemmed from taking on too many customers with poor payment records and inadequate controls and processes.

Last October, the company's share price collapsed 80 per cent on the news. It has since partially recovered, though remains a fraction of its March 2018 peak.

It also attracted the attention of the Financial Conduct Authority, though the FCA said in May it had discontinued its investigation.

"The group has expanded

significantly, from revenues of less than £4m in 2015 to revenues in excess of £80m in 2018. The board recognises that this rapid growth, despite continued investment, outstripped the capabilities of the Group's systems and controls," said chairman Ralph Cohen in the company's annual report, published at the end of May.

The firm appointed PwC in November 2018 to lead a review of accounts and business. Following the review, Cohen said the board is "confident that our controls and processes are more robust and that the necessary foundations are in place to deliver, in a controlled manner, the future growth of the business".

He added that Yü Group is now "more selective" in taking on new customers.

CEO Bobby Kalar owns 53 per cent of the company's shares. Despite suffering a significant

financial hit from the share price collapse, Kalar said there remains "a huge opportunity to grow our business".

He added that Ofgem's moves to tighten up licensing rules for new suppliers should also ease competitive pressures, though market volatility remains challenging.

Risk management

As commodity prices have increased, Kalar said more businesses are turning to third party intermediaries. However, Yü's business via TPIs has diminished as it focuses on less risky, better margin customers.

"We are working hard to be selective in what contracts we take onboard, with particular emphasis on credit risk, sector and margin," said Kalar. As a result, average monthly bookings

Bobby Kalar: 'A huge opportunity to grow our business'

for the first four months of 2019 are "significantly down" and year-on-year growth rate will likely be "significantly below" previous years, he added. The company is targeting a margin of 7.5-10 per cent for full year 2019.

CFO Paul Rawson said it would "take time" to roll off low margin contracts taken on in 2017 and 2018 in a bid for growth.

Yü Group's share price climbed 20 per cent on the back of the report. **te**



Collapsed energy suppliers leave £172m bill

UK energy customers are facing a potential bill of £172m from the collapse of 11 suppliers since January 2018, says Citizens Advice.

The charity says that was the total in unpaid industry bills left behind by failed suppliers – a cost that will likely be paid by consumers through their bills. It comprises £120m to cover Renewables Obligation, Feed-in Tariff and supplier of last

resort levies (which will be passed through to consumers under Ofgem processes) and £71m of outstanding service costs, such as network charges and metering services (less 10 per cent likely to be recouped)

Citizens Advice is calling for legislation to ensure more regular payment of industry costs – in particular the Renewables Obligation – to prevent big debts being left to be paid by consumers.

Citizens Advice also estimates that at least 32,000 have been left open to potentially aggressive debt collection practices by the administrators who took over these companies.

When energy suppliers fail, Ofgem appoints a new supplier for customers to ensure a continued energy supply, while the old supplier is taken over by administrators.

Administrators are not

bound by the same rules as suppliers licensed by Ofgem. This means they can pursue debts much more aggressively and can lead to people being contacted by debt collectors and asked for sums they can't afford at very short notice – with the risk of big hikes in what they owe.

Government should legislate to apply the same rules to administrators as to suppliers, said Citizens Advice.

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Bristol has agreed plans to 'decarbonise, decentralise and democratise' the city's energy system. Now it is trying to find a partner to fund its ambition. Brendan Coyne reports

Bristol's £5 billion decarbonisation plan

In recent years, Bristol City Council has invested around £50m in energy projects, ranging from wind and solar to district heating. Now it is planning to step that up by two orders of magnitude and decarbonise the entire city.

Bristol's City Leap programme aims to find financial, technology and services partners to deliver its bold ambition. Following the launch of its prospectus last

Leap project. "But it was a fascinating exercise. What we got back was astounding – and we came away with a menu of emerging options to formulate a master plan."

From those options emerged a preferred approach: a joint venture with an institutional partner, or consortium, to fund everything from a massive heat network expansion, through renewable energy

exercise to find that partner".

As cabinet meetings go, "it was one of the most exciting I have ever been in," says Sterling. "Our politicians are really engaged in doing this, delivering something transformational to meet our decarbonisation targets."

While Bristol has undertaken more energy projects than most over the past decade, much of it has been "in a piecemeal fashion, based on specific technology to solve particular challenges", Sterling admits.

"City Leap is about bringing all of that together and transforming the system for Bristol – creating a decarbonised, decentralised and democratic system," he adds. "So we need a partner that can look at a strategic level across the whole system."

Unlocking investment

While the City Leap prospectus looks out to 2027, outlining an £875m investment plan, Councillor Kye Dudd, cabinet member for Energy

and Transport, says the council estimates it will cost approximately £5bn to fully decarbonise the city's energy and transport system.

"All the enabling technology is there," says Dudd, "the only piece that is missing is the investment."

If government is serious about hitting net zero by 2050, says Dudd, it needs to immediately "step up" with funding. "But we in Bristol are not waiting around for that – it is a climate emergency. Hence developing policy like City Leap; a partnership between the council and strategic investors to help us drive change."

That strategic partner – potentially an institutional investor – must share Bristol's values and ethos, says Dudd.

"They have to be in it for the long-term and share the journey," he says. "We accept they need to make a return; there must be some margin in it for them, but we will need a partner that is willing to commit long term to Bristol."

“ we need a partner that can look at a strategic level across the whole system James Sterling, City Leap



year, 180 organisations from around the world have expressed interest in working with Bristol – and the council has met each and every one of them.

"That was 180 important meetings that weren't previously in the diary," says James Sterling, who manages engagement and partnerships for the City

(including marine energy) and battery storage, to a city-wide energy efficiency programme.

Political will

Cabinet gave the plan the green light on 2 April, says Sterling, "and we now have approval from the mayor to go forward and undertake a procurement

Bristol has already invested £50m in energy projects including district heating and solar

Underneath the investment framework, delivery work is open to all parties, says Dudd. “SMEs, local businesses, communities: We want the widest possible involvement.”

Spend to save

Investing £5bn means one way or another, ratepayers will have to pay it back. But Dudd believes residents will benefit financially. He cites the council’s district heating schemes in Hartcliffe and Redcliffe, commissioned in 2015/16, which predominantly heat social housing.

“The city centre and Redcliffe are my wards,” says Dudd. “I had residents coming into surgeries to complain because their bills had been cut in half – they said they must have been overcharged previously. They could not believe a physical intervention could reduce bills by that much.”

Similarly, says Dudd, by decarbonising the city, “we can reduce bills and protect people from market volatility,” while the council will also make a margin to recycle into other initiatives. James Sterling adds that investing in energy efficiency and generation across the council’s estate will also create revenue and savings that can be passed on to ratepayers.

Business engagement

While the council has control over its own estate, it needs businesses to get on board. Although engaging with firms to decarbonise is high on the agenda, the council can also pull some levers. For example, planning conditions require any new city centre development within the planned heat network expansion to connect to it. As such, the council has just signed its first commercial customer, a private



City-wide smart network

The City Leap prospectus outlines a broad range of projects to take forward, with approximate investment values out to 2027 for district heating (£300m) domestic and commercial energy efficiency (£400m+) and renewable energy (£40m).

It also outlines a £125m plan for a city-wide smart energy system, combining demand-side response, storage, electric vehicles and vehicle-to-grid, networked heat pumps and smart appliances.

development of 350 homes, “which we hope will be the first of many”, says Sterling.

Heat networks

Heat is regarded as the most difficult aspect of decarbonising the economy. If Bristol can secure a suitable financial partner, the plan is to extend the heat network all the way

out to five energy-from-waste facilities, clustered eight miles north-west of the city, at Avonmouth. “That’s a long dig,” admits Sterling. “But our calculations indicate the waste heat from those plants would deliver 40-45 per cent of the city’s heat load.”

At present, the city’s heat networks are

“All the enabling technology is there, the only piece that is missing is the investment”
Cllr Kye Dudd, Bristol City Council



Incentivising behaviour change

Alongside infrastructure, Bristol is also trialling initiatives to incentivise energy efficient behavior.

The council recently signed-up to pilot Energi Mine’s blockchain-based rewards system, whereby staff earn redeemable points for making energy efficient choices.

Councillor Kye Dudd says the concept is win-win: the council saves money on its energy bill, and “hopefully some of those positive behaviours will overlap into people’s home lives and in time influence friends and relatives”.

In the long run, he says, “behaviour change at a city-level will be key” to hitting Bristol’s carbon goals.

largely biomass and gas powered, but Sterling says the long-term plan is to phase out natural gas. He points to the Geneco biogas operation with Wessex Water and says sewage could also fuel heat networks in future, while local solutions like ground and watersource heat pumps will play a key role.

What next?

Since gaining cabinet approval, Bristol has been working on “a robust procurement process that ensures a good quantity of quality bids from organisations that could play that strategic partner role”, says Sterling.

“We only get one shot, so it’s important that process is right to ensure we form the best partnership that delivers all of our objectives; environmental, social and economic,” he says. As such, the tender launch date is not yet firm, but Sterling suggests it will be in the fourth quarter.

Other councils serious about decarbonising will no doubt be watching closely. **te**

Ready to flex? Unlocking the power of flexibility in our low-carbon future

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

Challenge and opportunity

Disruptive trends – whether economic, social or environmental – are dramatically changing the commercial landscape for all of us. If we continue to behave in the same way, we can wave goodbye to business as usual.

Our natural resources are getting scarcer and more costly. Our global population is getting wealthier and more urban, making the scarcity of resources more acute as increasing numbers of people buy into our fast-retail consumer culture and energy-intensive lifestyles.

Meanwhile, our window for tackling climate



change is rapidly closing, with just 11 years to take effective action left according to the UN Intergovernmental Panel on Climate Change (IPCC). At the same time, our world is being revolutionised in the post-digital era, transforming whole sectors at an increasing pace.

All in all, we face many challenges, and some that aren't immediately the preserve of an energy or facilities manager to grapple with. However, for those who are switched on to the possibilities of the low-carbon economy, there is the opportunity to make great strides through energy flexibility, starting with just one change.

Many organisations are already familiar with the concept and practice of flexibility in different areas of their business. Some have introduced flexibility into the way they manage their premises, with new practices such as hot desking helping to make the most of the office space that they have. Others have brought more flexibility into

the way they manage and motivate employees, with studies showing the positive impact of more flexible working practices.



The same approach – not simply switching to low-carbon energy sources, but flexing the way that they use and manage energy – is opening up new opportunities for businesses to drive sustainable growth.

Adopting a flexible mindset

To start taking hold of these opportunities, businesses need to shift the way they think of themselves, the way they see energy, and the way they use it.

Firstly, they need to change the way they think about their own business,



practice of simply switching it on and off, businesses can start to actively 'flex' the times at which they choose to use energy to respond to the market's rising and falling prices.

Digging a little deeper

Many energy managers, who understand the great benefits of energy flexibility, are worried that their business is simply too rigid to flex. The idea that there might be spare energy capacity in the business is often dismissed by senior management.

But looking at capacity differently might uncover some surprise 'extra' capacity within existing assets and business operations. Finding demand capacity – which can be created simply by dialling back unnecessary energy use, or switching the time that activities take place to move away from demand peaks – is as simple as making one change to an asset that you already have in your operations. Anything that consumes energy, whether it is lighting, heating, machinery or air conditioning, can reduce or shift usage from demand peaks.

Supply capacity, on the other hand, could simply involve switching on a back-up generator to create energy to share, or storing energy from an onsite renewables source to sell later.

The reality is that most businesses have some spare capacity in their energy operations, even if it isn't immediately obvious where it might be. This means that – perhaps with some assistance to review operations and reveal which assets offer the most flex potential – they can join the many other businesses who are flexing

energy right now. Often by making just one change to a sole asset, these organisations are releasing, sharing and monetising the spare capacity that exists within their business.

Generation Electric

The current conditions are ideal for energy sharing. Regulations are in place. New technologies are ready to go. New markets are emerging all the time.

This is good news not just for the businesses who are getting involved, but for the UK as a whole as we continue to shift to a low-carbon economy.

In fact, the National Grid is banking on the flexibility potential which lies latent in businesses across the country. As we continue to transition to a low-carbon energy mix, as much as 50% of the balancing action which is needed to keep the grid stable will come from the external response of businesses who start to make these simple changes.

At EDF Energy, we're seeing a new generation of businesses emerge who are not only recognising the opportunities presented by the low-carbon economy, but who are beginning to tangibly benefit from it.

There is no single common denominator that unites these businesses: they are not from a single sector, they are not defined by their ownership structure, and they are not defined by their size.

Instead, the thing that unites them is their ambition: to drive sustainable growth while creating increased value for their shareholders, customers, and the nation at large. We call these businesses 'Generation Electric' because they are part of a global movement to use, generate and share low-carbon electricity.

Everyone is welcome to join this movement. If you're interested in working out what change is right for your business right now, get in touch at: energysolutionsales@edfenergy.com or find out more about the power of flexibility at: edfenergy.com/positivedisruption



from being a consumer of energy to a proactive 'prosumer' of it. A business that thinks in this way may begin to produce and use their own energy, generated through solar panel installations for instance.

Bound to this change comes another; seeing low-carbon energy as a valuable 'commodity' rather than a mandatory 'cost'. This means that the business may begin to store the energy they generate to use when the market is experiencing high prices, or even choose to sell it to make an extra profit.

Thirdly, these organisations need to alter the way in which they use low-carbon electricity. Moving away from the passive



Local flex: eyes on the prize

Centrica aims to prove local energy markets can deliver the flexibility required in a decarbonised, decentralised system and an electrified economy. Brendan Coyne reports

Centrica is working to build a viable system to enable local energy balancing and trading, involving small businesses and households. Its test bed is Cornwall.

Whereas other platforms are trying to match buyers and sellers of flexibility, Centrica has bigger plans – if it can prove its model works.

Flexible approach

The local energy market plan involves two streams. First is a ‘quote and tender’ model, where “Western Power Distribution will place a bid onto the platform and

sellers will place offers. WPD can review the offers and then make a commercial decision on whether to contract with those assets,” says Cornwall Local Energy Market product manager Sam Wevers.

That is the relatively straightforward aspect, and other companies are working towards broadly similar platforms.

The second is a more complex model, aiming to deliver a pay as cleared market-based mechanism for flex procurement by multiple parties, rather than tendering.

A key aspect is to ensure the platform neither violates substation



Sam Wevers: “We have to get it right in Cornwall first”



headroom nor creates conflict between network operators and system operators, rules Centrica has been working on with National Grid and WPD for more than a year.

Assets required

The plan is to run auctions from three months out to intraday, giving buyers and sellers some flexibility on bids and buys. Centrica is keen to engage with all parties to ensure liquidity.

The product is “intentionally a broad church” to maximise participation, says Wevers.

Asset requirements are a 20-minute response time with delivery in half hour blocks. “Essentially constraint management type capabilities, not the kind of requirements demanded for frequency response, for example,” says Wevers.

That could be batteries, CHP, biodiesel gensets, industrial load, “any demand or generation

Making SMEs part of the future grid

As part of the trial, Centrica has been engaging local businesses, auditing their energy consumption, assessing potential to provide flex and installing new kit where applicable.

The Carbis Bay Hotel in St Ives, for example, is part of the trial and has installed two 35kWe CHP units – which provide heat and power to the 46-bedroom hotel, its swimming pool, plus 17 self-contained cottages and eight new luxury lodges.

Dan Allister, the hotel’s senior

marketing and development manager, says it needed to centralise heat infrastructure instead of “bolting on” boilers as the site expanded. Even with the new lodges, the energy centre is expected to reduce the hotel’s energy bill by £30k/year, cut maintenance bills and save 70 tonnes of carbon per annum.

The carbon aspect is increasingly important for the hotel’s marketing, says Allister. “But not just as a PR exercise,” he says, adding guests who may be paying £1,000 to stay in beachfront lodges increasingly

care about environmental credentials, “so sustainability is very important to us”.

Allister says there are other benefits. “The local grid supply is poor. We have suffered outages – and this gives us the opportunity to get some resilience and consistency,” he says.

The set-up also enables the hotel to feed surplus electricity back into the local market as of this summer. Allister is comfortable with the requirements of becoming a flexible energy provider and says the experience

from Centrica’s trial will help shape its involvement in future smart grids.

A licence to save money

Printing firm Deltor Communications is also part of the trial. Managing director Sam Shannon says clients are increasingly environmentally focused, driving the company to cut its carbon footprint wherever possible. Moreover, the firm is ISO14001-certified, which requires continuous improvement.

“We heard funding was



asset that can be flexible – we are tech agnostic”, says James Atkinson, energy engineer and commercial analyst for the LEM.

Local trial, international scope?

Unlocking assets capable of managing constraints will be necessary as heat and transport electrify, increasing congestion on low voltage networks, says Wevers.

“So that’s our aim: to work out how to enable distributed energy resource

to access national markets in a way that doesn’t conflict with local substations.”

Given the pressure on Cornwall’s grid infrastructure, the county is a fitting place to trial a local energy market. But if it can hone and prove its model, Centrica hopes to commercialise the technology with other network parties and potentially overseas.

“But we have to get it right in Cornwall first,” says Wevers. “We need to take one step at a time. At this stage the focus is on bringing new projects on board, growing the footprint – and being able to show other interested parties a working model.”

Part of the challenge is technical, particularly low voltage network data. The other is commercial and setting out rules everyone can agree on.

“This is a new market model. We are trying to do things in reality that have only been talked about in abstract. Taking Beis policy goals and putting them into a platform is tricky, as is building a platform and coming up with the clearing engine. It is hard and we don’t have all the answers,” says Wevers. “But that’s why it is fun.”

The potential prize is also worth the effort, he adds. “We’re trying to see how a multisided

market for flexibility services might work in the UK – and how different types of prosumers, aggregators, suppliers, and generators might be able to play in that market,” he says.

“There are very few, if any, projects doing that at this level of complexity. It is an opportunity to see how the energy market might look in the next few years: All different types of actors playing in a single platform that is efficient, transparent and drives value for consumers and the system.”

Enabling flex connections

As part of the project, which is co-funded by the European Regional Development Fund, Centrica has installed 100 residential batteries, which will provide flex into the local market. It has also installed flow batteries (relocated from a previous project) at a working farm in order to store and shift power from its 150kW PV array.

There is also potential for Cornwall Council to install a battery adjacent to the now defunct Wave Hub, a socket for testing wave energy devices that did not materialise as



James Atkinson: “making the case for non-firm connections”

anticipated, but which has a 30MW export agreement with WPD. The council has consent for up to a 5MW battery and is in commercial discussions with Centrica.

Should it go ahead, the battery – located at one of the most constrained parts of the network – would be able to wrap £189/MWh red band credit from WPD into its revenue stack, according to Atkinson. “I think that is the highest in the UK, so the battery would provide some really useful services from day one.”

Atkinson says if the battery – and the broader trial – can prove that DNOs can use flex to alleviate constraints, allowing more people to connect to the network, “they can start to offer non-firm connections as business as usual”.

“As soon as they have that proof point and you have this liquid market, instead of spending millions or billions to upgrade their substations, they [can instead] pay people to use the network in a smarter way.”

That approach could deliver “huge” cost savings, says Atkinson, “if and when we can prove it”. **te**

available as part of the trial, applied to take part and Centrica came in and installed its Panoramic Power monitoring system,” says Shannon.

The system, which involves clip on sensors and analytics, highlighted inefficiencies in Deltor’s operation, and helped justify investment in a variable speed compressor. It also helped the company to identify and fix air leaks throughout the factory, plus equipment that was drawing



Sam Shannon: “We were basically bleeding money”

power unnecessarily.

“That created big savings, particularly the air leaks, because we were basically bleeding money,” says Shannon. Once those losses were quantified in financial terms, the investment decision was easy, he adds.

As a result, Shannon says the company has reduced power consumption by 11 per cent. “Compressed air was our biggest draw, about 50 per cent of the business consumption. It’s huge, so the variable speed compressor has made a massive difference for us. We

have actually installed another huge press and not seen any rise in energy bills, because one has counteracted the other. So for customers, per sheet of paper, we have reduced its carbon footprint. And we are using the savings to fund growth.”

Shannon says payback on the compressor is “ridiculously quick, a year and a half”.

Quantifying credentials

The company’s clients include the Houses of Parliament, the Eden Project, universities and local councils, for whom sustainability credentials affect business decisions. “We want to tell clients we are the greenest printers in

the South West,” says Shannon. “We believe we are – and we can quantify that. If the University of Exeter comes to us and wants to know the carbon footprint of its prospectus, we can tell them – not many others could.”

The company also uses the Panoramic Power app to monitor generation from its 120kW rooftop PV. Shannon says investing in battery storage is next up for consideration.

“We would love to do that, or another form of generation. We use all the energy we make [via PV]. We operate 24/7 but most of our workforce are in during peak demand – and that is costly.” **te**

Net zero: How to tackle heat?

Heat is the toughest aspect of decarbonisation. Brendan Coyne asked utilities, investors and industry associations for some thoughts on how to do it

According to Committee on Climate Change CEO Chris Stark, “it will be extraordinarily difficult to hit 2050 [net zero] without a plan in place for heat very quickly”. So what are the options?

Hydrogen

There is a lot of faith being pinned on hydrogen, and the Committee’s report suggests in one net zero scenario that around 270TWh will be needed to help decarbonise peak heat, industry and transport. But that comes with a number of financial, technical and regulatory hurdles (see p26).

The gas networks are keen to use hydrogen as a replacement for natural gas, with projects such as H21 (which envisages switching Leeds to hydrogen) and Hydeploy (taking place at Keele University) touted as pathfinders. Government is also keen, with energy minister Claire Perry stating there are “enormous opportunities to work with the hydrogen economy”. Meanwhile, energy companies such as Shell (see p34) and Vattenfall

(see bit.ly/2DGNrkU) have suggested that hydrogen, particularly if produced by electrolysis rather than reformation, could deliver benefits across industries and economies.

Others believe hydrogen for heat is a waste of resource, particularly if carbon capture and storage (CCS) is required to bury emissions from hydrogen production via steam methane reforming (SMR).

“The Committee on Climate Change rightly states that CCS is a technology that has to be used in the right places,” says Tim Rotheray, director of the Association for Decentralised Energy (ADE). Heating homes with hydrogen is not one of the right places, he suggests.

“That would be an extremely poor use of the resource, because it is too valuable to aviation and heavy industry, where it makes much more sense. So government needs to think very carefully where to deploy it.”



Tim Rotheray:
“Hydrogen has to be used in the right places”

Rotheray says lobbyists will always forward their own interests, “as do we”, but he questions the credibility of some of the gas networks’ plans.

“The question is, if you have a high value fuel that can fly planes and power ships ... do you use it to heat air to 21 degrees? My expectation is that you do not.”

Heat networks

Rotheray and the ADE have pushed hard for heat network support and suitable regulatory frameworks for several years.

Heat networks can reduce carbon emissions from heat due to the efficiencies of centralised plant.

But most use natural gas, usually via combined heat and power (CHP) plants. How to decarbonise them?

Rotheray suggests waste heat is one under-utilised option (Bristol City Council thinks waste heat from incinerators can provide 40-45 per cent of the city’s heat load, see p18). Another is large-scale heat

pumps. Rotheray says industry is working on solutions, but “government needs to put policy in place to ensure that heat resources are exploited”.

Merit order

Vattenfall is grappling with how to decarbonise heat networks, having committed to do so by 2040 in Holland.

Bart Dehue, sustainable heat programme manager at Vattenfall, says some of the heat in its Dutch networks currently comes from incinerators – and WBR, the Rotterdam heat company, has plans to build a 40km pipeline to take heat from waste plants and refineries in Rotterdam to Lieden to replace the current gas source.

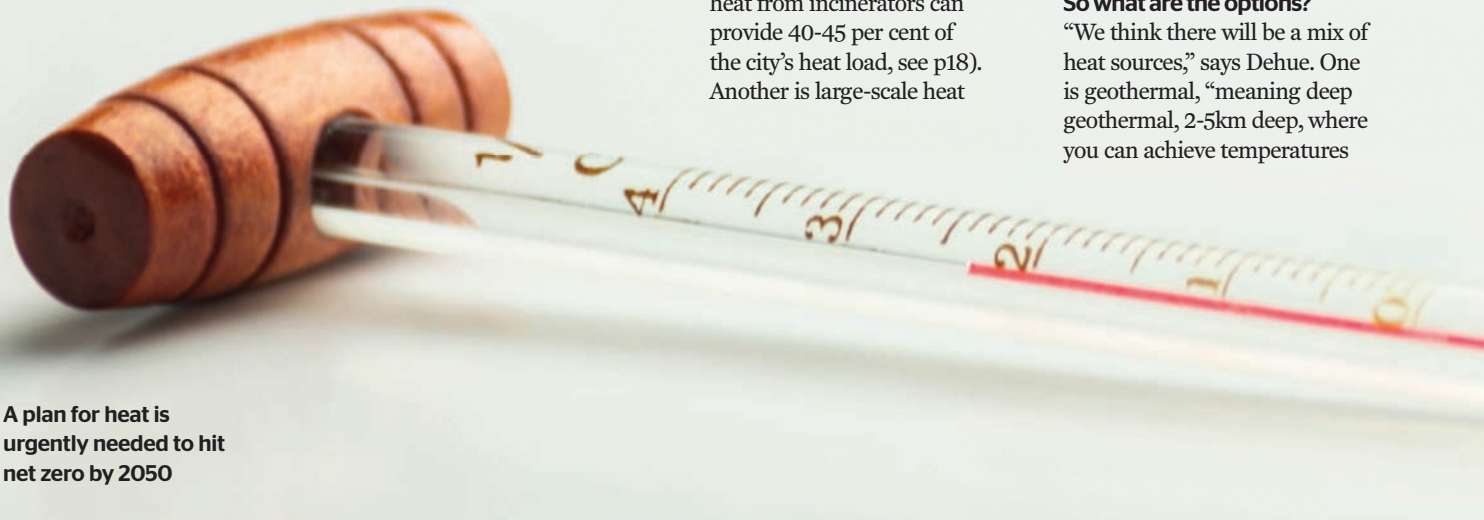


Bart Dehue: “We think there will be a mix of heat sources”

In Amsterdam, heat comes from a mix of waste and gas CHP. That saves about 50 per cent CO₂ compared with a domestic gas boiler, says Dehue. “That’s nice but it has to go to zero. That is our ambition by 2040, so no more room for natural gas.”

So what are the options?

“We think there will be a mix of heat sources,” says Dehue. One is geothermal, “meaning deep geothermal, 2-5km deep, where you can achieve temperatures



A plan for heat is urgently needed to hit net zero by 2050

of 100 degrees plus,” he suggests.

Amsterdam also has a lot of data centres, whose low temperature heat, typically 20-30°C, could be boosted by a large industrial heat pump to 65-70 degrees.

“We think that is probably a cheaper way [than putting heat pumps into every house],” says Dehue.

Another option is to take heat from water bodies. “Holland has quite a lot of water,” notes Dehue, especially sewage water, which has a higher temperature throughout the year than surface water, that could be combined with a heat pump.

Biomass will also likely play a significant role, he says, and Vattenfall has proposed a ‘transitional’ biomass scheme in Amsterdam to replace the current gas power plant.

“The UK has an equally fierce debate [around the sustainability or otherwise of biomass]. In our view, it has an important transition role. I think the other options [detailed above] can become very important in the long term. But they are very difficult to implement at large scale in the short term,” he explains.

“So if you want to get rid of natural gas, large scale, in the short-term, we see no other alternative to biomass.”

How long might that transition period be?

“The honest answer is that it depends on how fast we can deploy other alternatives. If geothermal is very successful, than by 2040, we may no longer have to use biomass. But it could also be a mix so that



Doug Stewart:
“Who will build the anaerobic digestion plants?”

[other sources] come in the merit order before biomass – and that works, because pellets are expensive, versus geothermal, which would always have to be dispatched first,” suggests Dehue.

Over time, geothermal could

therefore become baseload, then heat from data centres and water sources in conjunction with heat pumps, which require some electricity, and therefore some cost, and then biomass.

“So as we inject more heat sources to the mix, biomass will step from baseload to towards peak production only in the colder months, gradually to the point that you do not need biomass at all,” says Dehue. “This could be around 2040 ... but we do not yet know how successful geothermal will be in this area.”

Green gas

Biogas may also have a role to play in decarbonising heat. Doug Stewart, CEO of energy supplier Green Energy UK, says there has been a fourfold increase in production of biomethane since 2015, to 2.5TWh – the equivalent to supply a million homes, he says. Yet in the context of UK gas demand (800TWh+) that is tiny. As such, businesses that seek to decarbonise gas must pay a premium, though it is less than 10 per cent compared with standard methane, suggests Stewart.

While many biogas producers have largely burnt gas in CHP engines to generate electricity,

Stewart thinks “in time” more producers will start injecting biogas into the grid – and will need to do so if the government is serious about net zero. But, given the current economics and incentives, Stewart questions, “who will build the anaerobic digestion (AD) plants?”

That is a good question, says Richard Barker, adviser and investment committee member at Iona Capital, which has invested in a significant chunk of the UK AD fleet. Barker who used to run BioGen, the UK’s biggest AD producer, has both a practitioner and investor perspective – and he says the answer is not straightforward.

“A lot of [AD] projects are not making money,” says Barker. Food waste AD makes up the lion’s share of UK biogas production.

“For me, that is quite a sick sector,” he adds.

“The majority of the 300+ food waste AD projects in the UK are not full – there is not enough food waste to fill them.” At least, “collectable, suitable” feedstock. Meanwhile, gate fees have collapsed from £40-£70/tonne, to “quite often less than £10/tonne”, says Barker, “sometimes zero”.

He thinks that makes consolidation inevitable. Meanwhile, Barker believes gas prices will have to “at least” double for many AD operators to inject gas to grid rather than burn for electricity. That may require a significant environmental levy on gas, or other incentives.

“When I see headlines around ‘enough biogas for one million homes’, that’s great,” says Barker. “But it’s a rocky market. It started as a cottage industry and has not

yet professionalised. There will be casualties along the way.”

From an investor’s perspective, Barker suggests “the battle for renewable heat and energy will be won at micro scale”. That is, “corporate rooftops, behind the meter commercial batteries”, and other pools of distributed assets. In commercial terms, he

says the winners of that battle will be “fund managers and players that can aggregate loads of distributed energy solutions, implement effectively, and then find innovative financing approaches to push them into the big financial markets”.



Bean Beanland:
“Heat pumps can be part of the solution”

Heat pumps

Bean Beanland, chairman of the Ground Source Heat Pump Association, thinks heat pumps can be part of the solution. But the rate of installs to date is nowhere near that envisaged by the Climate Change Committee’s report. Beanland says uptake has been hampered by flawed building regulations, specifically carbon factors as set out under Standard Assessment Procedure (SAP) within Part L. Under those rules, grid electricity is has been recognised at 519g/CO₂/kWh. Because heat pumps use electricity, it pushes up their recognised carbon emissions, while over-rewarding other technologies, says Beanland.

Government has consulted about reducing that figure to 233g/CO₂/kWh, and the Greater London Authority is moving to implement the factor for new planning applications from 1 January. Beanland believes commercial projects will then favour heat pumps over other technologies.

“The fact that heat pump sector has survived in the UK is a miracle, but it’s the light at the end of a long tunnel,” he says, “and the supply chain is gearing up.” **te**



Richard Baker:
“The majority of the 300+ food waste AD projects in the UK are not full”

Green hydrogen: Industrial challenge

'Green' hydrogen could be a significant pillar of a decarbonised economy. But there are significant challenges to overcome.

Myles Mantle, project development and finance partner at law firm Haynes and Boone, provides the lowdown

On 15 June, at the G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth in Japan, the EU, US and Japan announced their trilateral cooperation on hydrogen and fuel cell technologies, that hydrogen and fuel cells are part of a sustainable energy portfolio key to opening up opportunities and value in transportation, industry and other sectors, as well as enabling reliable, clean and affordable electricity.

This announcement coincides with a report from the IEA, entitled *The Future of Hydrogen*, and the announcement that there are now 60 major global corporations signed up to the Hydrogen Council.

This all points towards serious support for hydrogen production and utilisation, and in particular where that production and utilisation is CO₂ neutral.

Production and utilisation

Currently the majority of global hydrogen production is from:

- Natural gas – through steam methane reformation (which releases significant amounts of CO₂). This

method accounts for about three quarters of global production of approximately 70 million tonnes; and

- Coal – through gasification (reacting coal with high-temperature steam plus oxygen under pressure, and then reacting the resulting synthesis hydrogen and carbon monoxide gas with steam to separate the hydrogen).

'blue' hydrogen (not grey, but not quite 'green' either).

At the same time, water electrolysis (which only requires water and electricity) is being developed as a promising solution for production of 'green' hydrogen, on the basis that the electricity comes from renewable sources. Currently only 0.1 per cent of global hydrogen production is from electrolysis and a

proton exchange membrane (PEM) electrolyzers. The main drawback to PEM so far is the high cost of use, although this is rapidly falling, and projections by the International Renewable Energy Agency (IRENA) are that the cost will be equivalent to ALK or lower within the next six years.

Other technologies for extracting 'green' hydrogen, including biomass

“ *The main drawback to PEM so far is the high cost of use, although this is rapidly falling, and projections by IRENA are that the cost will be equivalent to ALK or lower within the next six years - Myles Mantle*



Both techniques result in 'grey' hydrogen (ie hydrogen production resulting in excess CO₂ or CO as well as other pollutants).

Given the desire to produce CO₂ neutral H₂, various initiatives (eg the Carbonnet project in Australia or the H-Vision project in Rotterdam) are looking at sequestering the produced CO₂ or CO using carbon capture storage (CCS) techniques, the resulting production being labelled

small proportion of that utilises renewable energy, but this is expected to rise dramatically with new technology, cost reduction and the presence of so many major industrial participants.

Currently most electrolysis is through alkaline (ALK) electrolyzers.

A newer technology that may deliver faster dynamic response times, larger operational ranges and higher efficiencies with very high gas purities is

gasification, biomass derived liquid reforming, thermochemical water splitting, photoelectrochemical water splitting and photobiological processes look very promising but are largely in the research stage. Also being researched for potential production is naturally occurring hydrogen at various locations around the world.

Currently the produced hydrogen is used by industrial customers (in particular for



Pic: Creative Commons_Dave Snowden

Challenges and risks analysis in development of H2 value chain

While the production and use of hydrogen looks very compelling, to create an entire infrastructure, and even economy, gives rise to many challenges, for example:

- H₂ contains less energy per unit volume than all other fuels and has smaller molecules, and it has little understood corrosive properties in some situations, so storing, transporting and delivering it to end users can require new expensive equipment and technology.
- Building filling stations for fuel cells, a new pipeline network capable of handling hydrogen and new storage and transportation facilities will involve extremely high capital costs. However, because a wide variety of processes and resources can produce hydrogen, regional or even local hydrogen production can maximise use of local resources and minimise distribution challenges, although a cost analysis would need to be carried out to determine whether or not local or regional production makes better sense.
- Transitioning demonstration projects into commercial reality give rise to high technology risks, which need to be addressed. Government grants or multilateral support plays a role but the risks often need to be carried by the developers themselves.
- At each stage of the value chain – from production, to transport, to distribution to end user – there must be a source of future revenue to

oil refining and production of ammonia, methanol and steel), in fuel cells for transport applications, and there are various demonstration projects and plans for use in commercial buildings and multi-family units and for power generation.

One particularly interesting proposal is to inject hydrogen into existing natural gas networks. Studies show hydrogen can comprise up to 20 per cent of the mixture without the need to upgrade networks (eg the HyDeploy project in the UK and pilot projects in the Netherlands and France).

For power generation, work is being carried out on how development of gas turbines for use with hydrogen as the fuel. H₂ derived from renewables is being considered as part of the concept of ‘power to gas’, where excess renewable power production is used to drive electrolysis for hydrogen production, which can be stored as a fuel for use in all sorts of other applications, including further power production when the renewable energy sources can no longer produce (eg overnight or in windless conditions).

0.1%

Percentage of global hydrogen production from electrolysis

justify making the relevant capital expense. This is ‘project on project’ risk, where the first project only works if the second project is actually built and up and running.

To succeed in developing the entire value chain, developers will need to align the renewable energy production, the alkalyser H₂ production plant, the distribution network, storage facilities, transportation infrastructure, industrial customers, power customers and transport customers (all fundamentally different industries). The developer will then need to address technical and operational interface issues between the various components of the value chain.

Risks associated with each part of the entire chain will need to be fully understood by each relevant party and then those risk should be allocated appropriately between the various stakeholders: the host government, the developers, the suppliers, contractors, any lenders, customers and suppliers. This will also need tremendous political support, especially where governments are being asked to share some of the risks.

Mitigating these risks would include synchronising completion, testing, commissioning and acceptance of the alkalyser plant with the renewable power generation facilities as well as the gas transportation and storage infrastructure, industry utilisation and/or fuelling station infrastructure and any H₂ power facility. This is in order to minimise any potential delay or

even penalties that might arise through contracting to supply hydrogen by a particular date and failing, or not be able, to take power from the renewable source.

Current proposals for selling produced H₂ through electrolysers using renewable energy to existing industrial customers (eg for the production of mineral fertiliser, steel, methanol or ammonia), where this creates demand for hydrogen production, seem like a sensible way of keeping it simple and avoiding for now the need to align the different components. In this way the technology for the production of H₂ can be finessed incrementally, with the development or upgrade of distribution networks, transportation and more widespread utilisation coming later.

Regulatory development

At the same time as considering the technical, legal, financial and political challenges, stakeholders will also need to develop the underlying regulatory frameworks in each particular country or region.

Governments and stakeholders will need to work together to develop regulations that are permissive to the production, storage, transport and distribution of H₂, the use of hydrogen as a fuel and in vehicles, use of hydrogen in the electricity grid and gas grid as well as in homes, offices and industrial facilities. This includes permitting the use of H₂ as a hazardous material, regulating standards for components along the value chain especially in the consumer context, potentially providing certificates of origin for ‘green’ hydrogen, creating a framework for power to gas systems and standards for home and office use systems.

The development of the H₂ economy will be complex but also tremendously rewarding as the benefits are very clear. **te**



Pic: Creative Commons_DSH Trains

THE UK'S 'NET ZERO' TARGET

Ten years after the Climate Change Act (2008) became a law, The UK's Climate Change targets have recently been tightened, from 80% reduction in total carbon emissions by 2050, to 'net zero'

The Climate Change Act (2008) allowed the formation of the Committee on Climate Change (CCC) to advise government on tackling and preparing for climate change. In October 2018, Claire Perry MP, energy and climate change minister, along with her Scottish and Welsh counterparts, wrote to the CCC asking for their recommendations on how to achieve net zero greenhouse gas emissions by 2050 in line with the Paris Agreement.

In May 2019, they released their findings, a 277-page report on the steps the UK needs to take to achieve net zero emissions by 2050.

This report could so easily have been brushed under the carpet where all great ideas go to die, but with the Extinction Rebellion protests around the world and Greta Thunberg's dressing down of MPs in April 2019, this meant that climate action was at the top of everyone's minds.

As a country, we are already leading the world in tackling climate change and if the new target is hit, the UK is to be the first G7 country to reach net zero.

What does net zero mean?

Net zero means just that, there are no emissions entering into the atmosphere from anything we do.

Ultimately, with current technology we are not able to do this. So, we need

to reduce emissions from activities we can – electricity production, transport etc. And then we need to get better at capturing and removing emissions that would otherwise escape into the environment from everything else.

What needs to be done?

Ultimately, we need to redefine how we live our lives. To fully reach net zero everything we do needs to be rethought and redesigned.

We need to use our resources better and put the environmental impact of every decision in the home and the board room at the forefront of our minds.

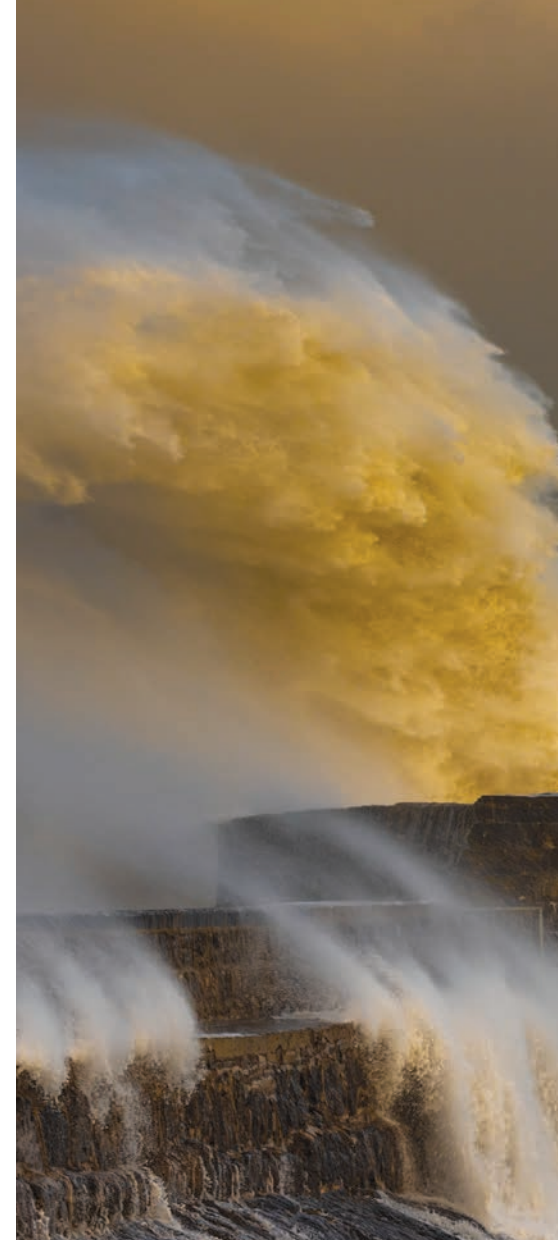
How much will it cost?

The Committee on Climate Change has estimated that reaching net zero will cost £50bn a year; BEIS thinks it is closer to £70bn.

Where the cost of the changes required fall is a topic of hot debate, would the UK government legislate the cost of replacing traditional gas boilers onto homeowners?

Increases in taxation on UK business could also stall the economy, something the current government is very wary of.

It has been feared that due to the cost of becoming net zero by 2050, less money would be available for schools, police, hospitals and other public areas.



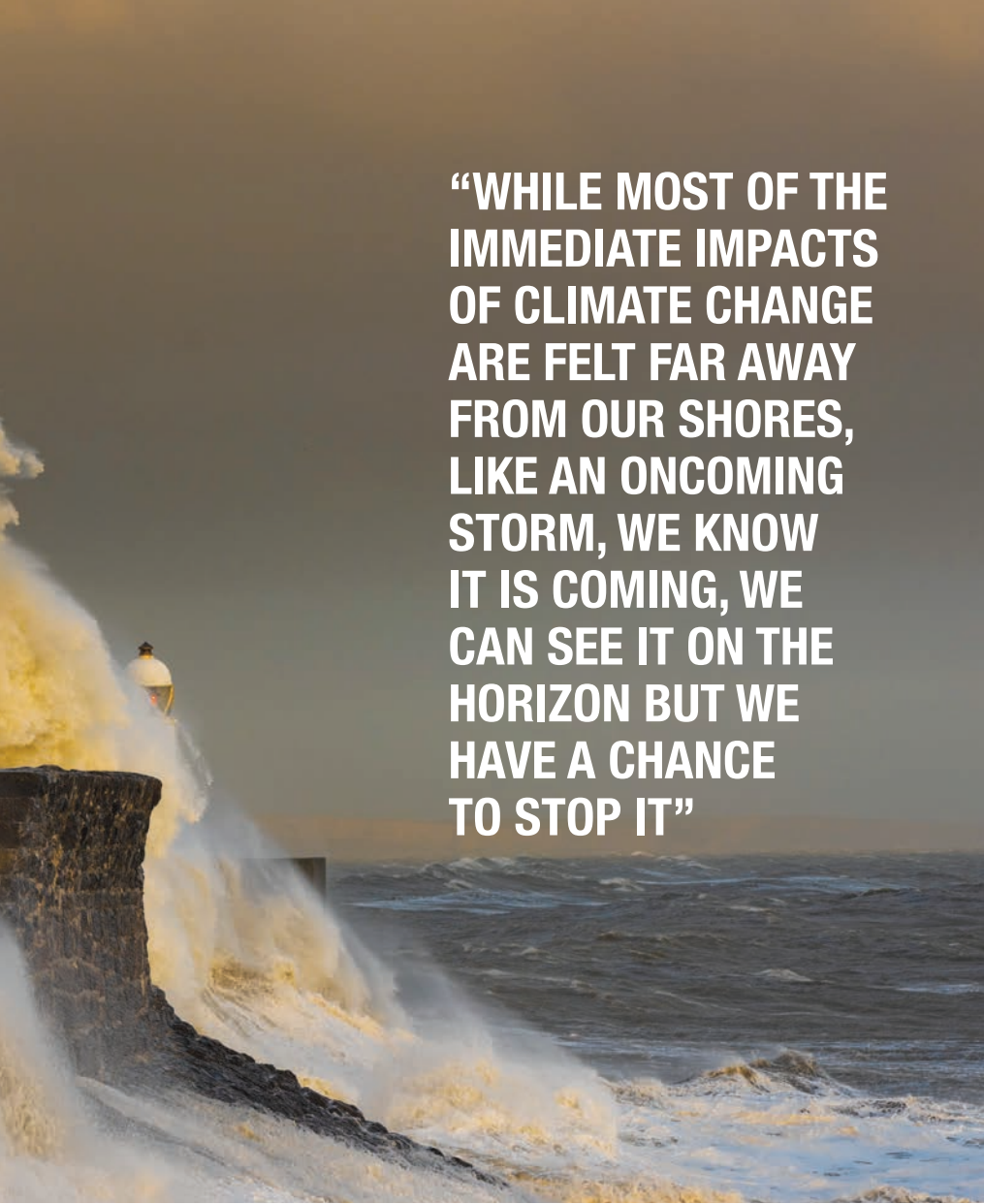
What can I do?

Your daily diet

A person's diet can contribute to more carbon emissions being used than we actually realise, something not many of us actually think about. "Meat free Mondays" is an international campaign that has been a running trend for a couple years, designed to improve both the health of people and the health of planet. Each Monday that you leave meat out of your diet, you can reduce your carbon footprint by nearly 200kg per year.

Travel

Air pollution is a major global issue and a lot of it is caused by traffic in prominent towns and cities due to congestion. To assist with reducing carbon emissions, electric vehicle (EV) sales must speed up, but with government grant levels dropping in late 2018, is this sending the right message to consumers? As technology progresses, EV batteries will last longer, and may even have a second life as domestic storage batteries – reducing overall environmental impact.



“WHILE MOST OF THE IMMEDIATE IMPACTS OF CLIMATE CHANGE ARE FELT FAR AWAY FROM OUR SHORES, LIKE AN ONCOMING STORM, WE KNOW IT IS COMING, WE CAN SEE IT ON THE HORIZON BUT WE HAVE A CHANCE TO STOP IT”

In the haulage space, companies will need to replace their diesel fleet with a compressed natural gas (CNG) fleet, with the CNG coming from biomethane (green gas).

Those flights away may also need to become a lot more expensive, with increased carbon taxes incentivising people to look closer to home.

Energy

The future of domestic heating in the UK is looking like the full electrification – gas heating will be banned from new homes from 2025 – but what about the existing 23 million homes in the UK with a gas boiler? Are district heating schemes and heat pumps ready to pick up the strain?

Other home remedies to help control heat and power use are things like insulation and double glazing – cutting energy bills as well as carbon emissions being used. The UK government tried this in the past with the ‘Green Deal’ to not great success.

All of the UK’s electricity needs will have to be met by zero carbon production, renewables such as wind, solar and hydro with nuclear energy

and interconnectors helping meet demand.

Why does it matter?

While it is true that most of the immediate impacts of climate change are felt far away from our shores, like an oncoming storm, we know it is coming, we can see it on the horizon but we have a chance to stop it.

Climate change has a disproportionate impact on people in developing countries, even though the vast majority of carbon dioxide pumped into the atmosphere is from developed countries. Climate change is impacting on life in the UK with extreme weather fluctuations: 2018 was one of the hottest summers on record, and that caused a 6% and 10% fall in wheat and spring barley production respectively; 2019, however, has seen flooding in the middle of June.

Increases in carbon dioxide in the atmosphere is linked to rises in global temperature and sea levels. Simply put, the more carbon dioxide in the atmosphere, the warmer the global temperature, the higher the sea level. Carbon dioxide naturally fluctuates over

time but since the use of fossil fuels by humans, carbon dioxide has risen to levels never seen before. Global temperatures are rising, and what is expected to follow next? Sea level rises.

Too often, we only decide to do things after it has already happened. We only built the Thames Barrier to protect Greater London from flooding after the North Sea floods of 1953, when 307 people were killed on land in the UK. The London sewer system was built following the ‘Great Stink’ in 1858, after being dismissed as being too expensive, but three cholera epidemics and tens of thousands dead changed people’s mind.

Now is the time to drive forward and be bold in our aspirations. If we fail to take this opportunity, it will be future generations that pay.

Thankfully, however, the UK government is taking up the challenge. Outgoing prime minister Theresa May has tabled legislation to amend the Climate Change Act (2008) to bring the net zero target by 2050 into law. The UK looks likely to host the COP26, the UN’s 26th Climate Conference, due to be held in November 2020.

With the backdrop of the US pulling out of the Paris Climate Agreement, the COP26 event is due to be held just a few days after the 2020 presidential election. The UK needs to take this opportunity to bring the world’s largest economy and second largest carbon emitter back into the fray and lead the world on a Greener more sustainable future.

Read the full article at <https://green.energy>

Green is a new energy supplier based in the north-east of England with artificial intelligence and renewable energy at the heart of its ethos

green.

Energy firms: Guarantee revenues for small storage

Richard Palmer, senior consultant at Roadnight Taylor, says energy companies could de-risk smaller storage investments by providing minimum revenue guarantees for five years



There have been two exciting items of news in recent weeks which seem to pave the way for a bright future for battery storage. However, more must still be done by the clean energy industry to become less reliant on government support and allow investments in battery storage to flourish, particularly in smaller organisations.

Price guarantees

EDF Energy has struck a deal with Anesco to provide a guaranteed floor price for its co-located 16MW solar and battery storage site at Clayhill. This is a significant step forward for the UK renewables industry, whereby a Big Six supplier is providing a guaranteed minimum revenue for the battery storage output. EDF Energy will bid the output into wholesale markets through its 24/7 trading platform and secure contracts with grid operators.

Falling battery costs

The price of lithium-ion batteries continues to fall;



Reduction in the levelised cost of electricity (LCOE) for battery storage since June last year



If the wider industry could offer guaranteed minimum revenues for smaller, behind-the-meter sites - say for five years - the reduced investment risk would make any battery storage project look more viable



and the rate of cost reductions has accelerated. According to *Bloomberg New Energy Finance*, the levelised cost of electricity (LCOE) for battery storage – that’s the average cost for building and operating a scheme – has fallen by 35 per cent to £141.5 per MWh since June last year. This has opened the door for more businesses to invest in batteries to increase their energy resilience and generate revenue by providing services to the grid.

But risk remains

Despite the falling costs, battery storage investment still carries a high element of risk. The multiple revenue streams, savings and returns you can make from the investment in a battery are highly complicated and offer little certainty. There have previously been no guarantees of income levels for any storage scheme operator.

Looking back three years,

for example, if a business planned to invest £100,000 in a solar PV scheme, it would have considered the cost of investing, the revenues it was going to get from their investment and how certain those revenues were going to be.

With government subsidies for renewable electricity generation it was guaranteed a double-digit return, indexed to RPI for 20 years. There would have been other risks to consider, but in principle these investments were something of a no-brainer. From the £100,000 investment, payback would be within 10 years, and there would be a safe and guaranteed “pension style” income for up to 20 years.

With battery storage, it is different. If you invest £100,000 in a battery today, while there are guarantees around a limited slice of the revenue stack, the certainty of



Anesco's Clayhill Farm subsidy-free solar and storage scheme



Flexitricity to trade 19.5MW battery's flex

Flexitricity will act as trading partner for Anesco's 19.5MW Larport Farm battery after the two firms struck a deal.

The aggregator and supplier will bid its power into wholesale markets, the Balancing Mechanism and attempt to secure FFR contracts.

"With the competition in reserve and response services increasing rapidly, trading in the Balancing Mechanism is key in helping customers optimise the revenue from their energy assets," said Flexitricity head of business development, Andy Lowe. Flexitricity claims it now has more than 450MW of flexible assets under management.

Anesco hopes to amass a 380MW battery portfolio by the end of next year. The company works with various aggregators and suppliers, including Shell-owned Limejump, EDF Energy and Upside Energy.

In 2017, it developed the UK's first subsidy-free solar scheme (Clayhill Farm) by combining it with batteries at a site with a good existing export connection. In June, the company completed work on a 20MW battery storage project at Lascar, near Manchester, taking its storage portfolio to 147MW.

Limited revenue visibility is a challenge for firms investing in storage. But Anesco executive chairman Steve Shine said the company has built a tool "capable of predicting whole-life cost, IRR and long-term revenue streams," based on actual data and revenues from its storage portfolio.

these revenues only extends to one, two or three years.

There are also fundamental technical considerations to consider which underpin the investment returns: the capacity and the duration of the battery. Indeed, cannibalisation of savings and revenues can occur, in particular where demand-side response, or other onsite assets could perform the same function as the battery.

Guarantees please

Nevertheless, by offering a guaranteed minimum income, EDF Energy is giving Anesco certainty in the investment of its large 6MW battery storage scheme; of course, the level of the floor price and the management fees EDF Energy charges are critical to the equation.

If the wider industry could offer guaranteed minimum revenues for smaller, behind-

the-meter sites – say for five years – the reduced investment risk would make any battery storage project look more viable. This would encourage more investment in the technology and be a huge boost to the battery storage market.

Industry responses:



James Hunt, Vattenfall: "It's fair to say that financing new

solar and battery projects has become more challenging without subsidy support or long term ancillary service arrangements. Floor price structures are not new to the market but now more than ever there is a need for these structures to enable investment. At the right level they can provide a good basis for managing risk and raising the finance needed for new

installations. We recommend developers engage early in the development cycle with off-takers to find the best offtake structure for their project."



David Taylor, Bryt Energy: "As well as providing customers with

greater site resilience and peak capacity, 'behind the meter' storage also has access to a number of potential cost savings and revenue streams; avoidance/reduction of peak charges, grid service revenues, and short term trading/arbitrage revenue. Each of these in their own right carry uncertainty and, without any government support schemes, make the returns from investment in storage far from certain; a situation which is impacting the uptake of energy storage at customers' sites.

"Bryt Energy is changing

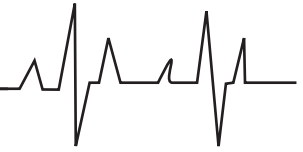
this by providing certainty on payback periods through guaranteed fixed, or minimum, revenue streams for a number of early 'behind the meter' storage assets at customer sites that it supplies."



Tim Wynn-Jones, Good Energy: "The value of battery storage

to small businesses goes beyond a traditional return on investment model. Simply looking to reduce investment risk by replicating the existing model for large-scale batteries misses the wider benefits of storage to smaller companies.

"Suppliers should be working with these businesses to better understand these practical benefits – whether it is to maximise onsite generation, supporting new EV infrastructure, or as a backup power source." **te**



Renewables can bid into Capacity Market

The government plans to run a capacity market (CM) auction for delivery in 2022/23 early next year. It intends to allow renewables to bid for contracts and make changes to methodologies that govern de-rating factors for interconnectors.

All of this is subject to successfully reinstating the CM following its suspension by the European Commission, which upheld a legal challenge by Tempus Energy over the treatment of demand-side response. Beis said the Commission is likely to have made a decision by early next year.

Agreements and credit cover

New build plants that pre-qualified for the postponed T-4 auction and hoped to get 15-year terms will only be able to bid for one-year agreements in the T-3 if they have already

commissioned. “Plant which has commissioned in the last year has demonstrated (by commissioning) that it does not need such an agreement in order to secure financing,” stated Beis.

The government will suspend credit cover requirements for the 2022/23 T-3 auction, the 2023/24 T-4 auction and the 2020/21 T-1 auction during the standstill period. But credit cover will be required with 15 days of the standstill ending, said Beis, though DSR and interconnectors will get 40 days to pay.

Renewable technologies will be allowed to bid for agreements on an ‘equivalent firm capacity’ basis – provided they do not receive subsidies such as the RO, Fit, CfD or other benefits, which Beis said could constitute state aid. As such,

Capacity market auction clears at 77p/kW

The T-1 capacity auction for delivery next winter has cleared at 77p/kW, a fraction of prices achieved in previous auctions. Some 129 units have been awarded an agreement, totalling 3.6GW of capacity.

By volume, reciprocating engines (gas recipcs) took the largest number of agreements (19 to existing engines, 26 to new build); CHP took the next largest number of agreements (29 existing plants and one new build).

The auction results do not make great reading for demand-side response, with swathes of units from Eon, EDF, Enel X, Flexitricity, Grid Beyond, Kiwi Power, Scottish Power, Smartest Energy and UK Power Reserve dropping out as the price plummeted.

Some 29 DSR agreements for approximately 200MW were awarded to DSR providers, with Limejump taking just over half of them.

The clearing price was also a turnoff for storage, with just six projects, totalling 22MW, taking agreements.

The Capacity Market is currently suspended following a legal challenge by Tempus Energy that was upheld by the European Court of Justice.

The government hopes to reinstate the market this year or next. Last year’s T-1 auction cleared at £6/kW.



those that use the Enterprise Investment Scheme or Venture Capital Trust set-ups would

have to declare it and see payments deducted from any CM agreements awarded. **te**

UK Power Networks buys £450k of DSR



UK Power Networks has offered contracts worth £450,000 for 18MW of flexibility. Six companies made successful bids and will now need to install generation or recruit demand-side response providers at eight locations.

The distribution network operator is attempting to manage network constraints by paying businesses with generation assets or that can adjust power consumption within buildings and processes to respond at certain times of the day.

The alternative is to invest more in network infrastructure, such as new substations and transformers.

UKPN director of asset management Barry Hatton said all the bids accepted represented cheaper solutions than building new infrastructure.

As such, the company has offered contracts to six businesses via an auction run on the Piclo platform. To fulfil those contracts, winners will now need to install – or in the case of aggregators, recruit – new capacity at Brandon, Leighton Buzzard, Lewes, Newhaven, Lithos, Merton, Mill Hill, Romney Warren and St Helier.

UK Power Networks said in February that it has set aside £12m to buy flex, or demand-side response services. It is also attempting to widen the pool by reducing the minimum threshold to 50kW, enabling smaller assets to provide services.

Last summer UKPN indicated it could require more than 200MW of demand-side response to defer load-related reinforcement over the next four years. **te**

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The UK government should consider targeted support for small-scale battery storage if it wants households to participate in a smarter, lower carbon energy system, according to Brian Davis, vice-president, Energy Solutions at Shell International.

Shell New Energies acquired German battery storage firm Sonnen in February. The company has deployed hundreds of megawatts of storage into households and small businesses in its home market, where domestic storage penetration – roughly 600MW – is greater than industrial storage (about 380MW, according to Bloomberg).

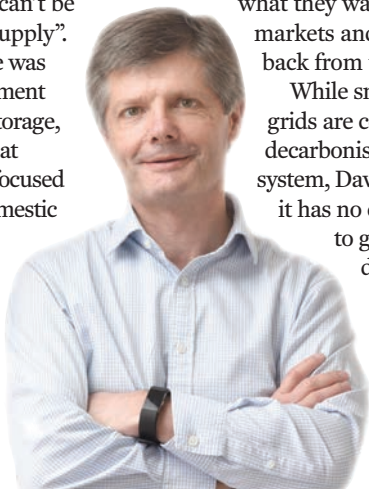
Sonnen and others use domestic battery to help balance the German grid. While there are companies in the UK providing grid balancing services via domestic batteries, the market is small in comparison.

Speaking at Aurora’s Summer Renewables Summit, Davis said storage, both short term and seasonal, “is critical to get the system to balance” in a decarbonised power system.

Yet while renewable generation creates an “increasingly intermittent supply picture, the demand picture is becoming increasingly controllable”, said Davis. Technologies such as electric vehicles, heat pumps and batteries “all internet connected” can help “balance what can’t be controlled on supply”.

Asked if there was a policy impediment to unleashing storage, Davis replied that “some form of focused subsidy” for domestic batteries would help

Brian Davis:
“It’s not the end of gas”



Shell: Subsidy would unlock flex faster

Shell’s vice-president of Energy Solutions on storage, shifting markets and why gas will still exist in a net zero world.

Brendan Coyne reports

provide that flexibility faster and deliver lasting benefits.

“Our batteries last 10,000 cycles, they are a long-term asset,” said Davis. “They can be aggregated to provide grid resource and services over what a household needs.”

Power play

Davis helped conceive Shell’s New Energies business and the company is busily buying up energy companies and investing in cleantech. Davis said the unit’s “overarching perspective is starting with the customer, understanding what they want across markets and working back from that”.

While smarter power grids are central to decarbonised power system, Davis indicated it has no current plans to get into UK distribution.

“It’s good to have a degree of value chain integration, playing

in the parts that are right for specific markets. I don’t see network assets as a pre-requisite as the UK is unbundled.”

He said Shell’s focus is “value chain integration versus vertical integration”.

Davis said that approach gives the firm optimism it can profitably continue its own pivot as the energy sector undergoes systemic change: Shell aims to become the world’s largest power company by 2030.

“The energy system of the future is different to the past. The value chains in 2040 will be different... margins will shift over time.” As such, said Davis, any energy company that thinks revenues can be mapped out “is probably wrong”.

“Portfolio diversification creates resilience... we think that is the way to create a business that in aggregate is more stable.”

Role for gas

Gas remains part of the future. Even in a world of net zero emissions, Davis suggested there is “an ongoing role for gas, there will still

be molecules out there... in an affordable economy”.

That may ultimately be biomethane or hydrogen said Davis, with UK natural gas infrastructure potentially acting as seasonal storage for those fuels. “So no, it’s not the end of gas.”

Davis said hydrogen created from renewables (using excess wind to power electrolysis, for example) could become a significant business.

“Globally, some areas don’t have the landmass for renewables, so they will require some other form of clean energy solution. We believe hydrogen [can work] particularly through electrolysis. You can liquefy the hydrogen and ship it around the world. That is no more incredible than in the 1950s when shell was creating the LNG business.”

Asked if that might be too expensive, Davis suggested markets tend to provide answers.

“What do people value and what will they pay for? It will always work if cost is below value.” **te**



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Define 'smart' charging, urge DNOs

UK Power Networks and Northern Powergrid on the need to define what smart charging actually means, greater low voltage network visibility, and how businesses and local authorities can ensure a smoother EV charging infrastructure rollout. Brendan Coyne reports

UK Power Networks has one key message for organisations planning electric vehicle charging infrastructure rollouts, says Adriana Laguna, senior innovation strategy manager at the distribution network operator.

“Talk to us. Consider your long-term needs, then we can work together towards the best long-term solution.”

As EV chargers increasingly connect to the low voltage network, lack of visibility is a key challenge for DNOs.

“We traditionally have not monitored secondary substations – and that is a shift the industry is going through. What was a top down network is changing, all the action is taking pace on the LV

network,” says Laguna. “And we need visibility both ways, so understanding where EVs are connecting is a good start; the better data we have today, the better we can plan.”

How smart is smart?

Deploying a smart approach to charging is necessary in areas that are likely to become constrained. “That can be anything from a simple timed connected to active network management,” says Laguna.

But one of the challenges facing industry is defining ‘smart’. “What does smart charging mean, what does it require from an IT architecture perspective and how do you make it standardised,” Laguna explains.

“We [the DNOs] all agree

that smart charging should happen, so how do we as networks enable anyone that wants to do smart charging to do so and what do we need to have in place?”

UKPN’s Smart Car innovation trial examined different smart charging models, from DNO controlled to free market approaches.

“The conclusion was the market approach was generally favoured by customers,” says Laguna. “So the next phase at the project aims to test what a market signal looks like, working with suppliers, operators and owners to see how efficient that is.”

Capacity unchained

For business deploying EVs, particularly those with larger

fleets, a smart approach is necessary to mitigate cost. Laguna cites UPS as an exemplary case study (published in *The Energyst’s* April/May edition).

“UPS is embracing change. They approached us, we worked with them to define their minimum power requirement and how to optimise behind the meter, how to maximise the connection [capacity] that they have on site.”

The benefit goes both ways, says Laguna. “Partnering on that project and taking a different approach to connections has been very eye opening.”

Meanwhile, deploying storage and active network management at the UPS site shows what is possible.



on the need to define smart charging.

“Getting government policy right, that in itself is a smart option,” he suggests.

Miller says intelligence is also required around price signals for smart charging, given the changing generation mix.

While there is a view that charging might best occur overnight when demand is lower from businesses and households, there is also less generation output overnight. “So it makes sense to charge vehicles during the day as well,” he says.

Should solar generation continue to grow, charging during the day might become more attractive in future, says Miller. But if EV owners react en masse, it could create challenges for DNOs, whose networks are built around a diversified maximum demand.

“If a signal comes through that says, ‘it’s sunny, power’s cheap, start charging’ and everyone reacts, that would be more than the system is designed for and may cause significant issues,” says Miller.

“Equally, we should not be telling people they cannot do that when wind and solar are available.”

“These are the kind of solutions customers definitely need to look at to optimise their connection,” says Laguna. “Storage is a fantastic example of technology evolving to get the most out of the network – and to put back in. Again, there is a lot of education required, and that is where we can definitely help.”

The broader challenge for businesses is that “they are not energy specialists”, says Laguna. The transition to electrification demands wider investment and “will not be easy for a lot of companies ... so partnering to develop the optimum solution is key”.

Smarter thinking required

Iain Miller, head of innovation at Northern Powergrid, agrees

Local balancing

He says one solution is to consider where solar is located

Free electric vehicles report

This article was published in *The Energyst's* 2019 EV Report.

The report includes a survey of more than 100 businesses and details their EV and charging plans as well as attitudes to smart charging and vehicle-to-grid services.

It also contains interviews with other businesses switching fleets to EVs, charging point companies, distribution network operators, consultants, carmakers, technology firms and energy suppliers. Download the report, free of charge, at theenergyst.com/EV

“

We [the DNOs] all agree that smart charging should happen, so how do we as networks enable anyone that wants to do smart charging to do so and what do we need to have in place? Adriana Laguna, UKPN



in the first place. From a domestic perspective, using rooftop solar is ideal, he says, because it then never needs to be exported onto the network.

Bundling EVs, solar and storage would enable a “useful, joined up” approach, from that perspective, says Miller. It would also help enable new network models.

“We like the idea of fractal balancing or nested microgrids, essentially the same thing,” says Miller. That is, balance the house and transfer as little through the meter as possible, then incentivise balancing of the local distribution substation, to minimise usage of the

“

We like the idea of fractal balancing or nested microgrids, essentially the same thing Iain Miller, Northern Powergrid



high voltage system, which in turn is balanced to minimise use of the extra high voltage network.

Theoretically, that approach could lead to “a point where you almost never call on National Grid, which total changes the way the energy system runs”, focusing on the user upwards rather than top down, says Miller.

However, Miller also sees merit in laying fatter LV cables, given it adds little cost if networks are digging up the road anyway.

Better visibility

Meanwhile, he says it is incumbent to direct local authorities, communities and business to the best places to install charging points.

Northern Powergrid will launch a mapping tool later this year that allows developers to input what they wish to install, and the system will show “feeder segment by feeder segment” where they can install, with or without reinforcement. Miller says in some case that can differ from one side of the road to another.

It will also give a budget quote in real time – or minutes at least – depending on location.

“That should make life easier,” suggests Miller. **te**

V2G: The journey to commercialisation

Alexander Lewis-Jones, head of electric vehicles research at Delta-ee, gives a snapshot of vehicle-to-grid developments

Vehicle-to-Grid is the technology that enables bidirectional charging – where an electric vehicle can both charge from and discharge onto the grid. With V2G, EVs can play the same role as static batteries in managing local loads and participating in energy market value streams.

The technology could become a powerful disruptor to European electricity markets, but is not yet commercially available. Apart from one instance in Denmark, all V2G has been deployed in the form of trials and pilots over the past five years.

So, what can be observed from current developments? What is happening, where and involving whom?

Where is V2G happening?

There is interest in V2G technology across Europe but certain countries are emerging as frontrunners in terms of the number and maturity of projects.

In 2013, Denmark hosted one of the first demonstration projects for V2G. The success of this research project opened up interest in developing V2G further. Subsequently Denmark hosted what we recognise as the first commercialised V2G project in Europe. Nuvve's V2G project is delivered for a business fleet for electricity retailer Frederiksberg Forsyning. The predictability of fleet vehicle use can make the opportunities for V2G services more reliable for the market.

Several pilots have been carried out in the Netherlands. Many Dutch cities have smart and innovation-focused programmes typically influenced by research institutions, such as TU Delft and Hogeschool van Amsterdam, with Horizon 2020 or similar European innovation backing. Local DSOs have considerable interest in the control of EV charging because it pairs with the growth of intermittent renewables.

The UK government has been a major driver for the development and deployment of V2G on a global scale. Not only is V2G seen as a technology that provides grid benefits but it is seen as a part of the industrial strategy that will enhance the country's automotive and electrical manufacturing sector. For this reason, Innovate UK (the UK government's innovation body) launched a £30m competition for V2G projects. Twenty-one projects shared the funding, with eight 'real world' demonstration projects taking most of the money. While these are now live, 2019 will only see the recruitment phase. It will be in 2020 and 2021 before results are announced.

Who are the leading players?

Nissan's LEAF and eNV200 vehicles are already commercially available and V2G-enabled. So, they are being supplied to many of the ongoing V2G demonstration projects, even without having

Nissan in the project team.

In 2017, the Italian utility Enel acquired US-based eMotorWerks, a charging and platform developer and has gone on to explore V2G under the new brand.

Nuvve is a California-based technology developer with a decade of V2G experience. It provides software and can act as the aggregator. The firm, in which EDF Energy has invested, already has a commercial client via the Denmark project outlined above. Its proposition is designed to lower the cost of the infrastructure, overcoming a potential barrier to V2G technology.

Will Nissan stay dominant?

Nissan has been the car maker of choice for use in V2G projects but other vehicle manufacturers are gearing up. Renault is trialling V2G; Volkswagen's newly launched energy business, Elli, is talking about it; Honda is investing in it (see p40). However, there is still some work to be done before these manufacturers have established a V2G charging standard that can seriously challenge CHAdeMO (the charging standard preferred by Nissan which can accommodate V2G).

Though VW remains behind the pack on V2G deployment, its high level of investment in EV solutions and publicly stated ambition to lead the sector could see it leapfrog competitors such as Nissan and establish a leading position in the years to come.

Four factors need to be considered for V2G to become fully commercial across Europe:

1. The duty cycle of the EV – when is the EV available for V2G and how predictable is this? Fleet applications may be fruitful early markets
2. The volumes available – what is the potential when the EV batteries are stacked up? How many will be available simultaneously?
3. The customer – how many customers are there and how willing are they to contribute?
4. The value streams of V2G – will V2G find its feet best providing grid level flexibility services, or at a more localised level such as for cities or homes? This will vary country by country.

On this basis, buses and large vehicle fleets operated by individual clients are likely to offer the earliest market opportunities. Pools of privately owned cars and vans plugged into distributed networks of domestic chargers could ultimately offer greater stacked value but the stack will take longer to develop. By this point, static solutions may be too powerful to compete against.

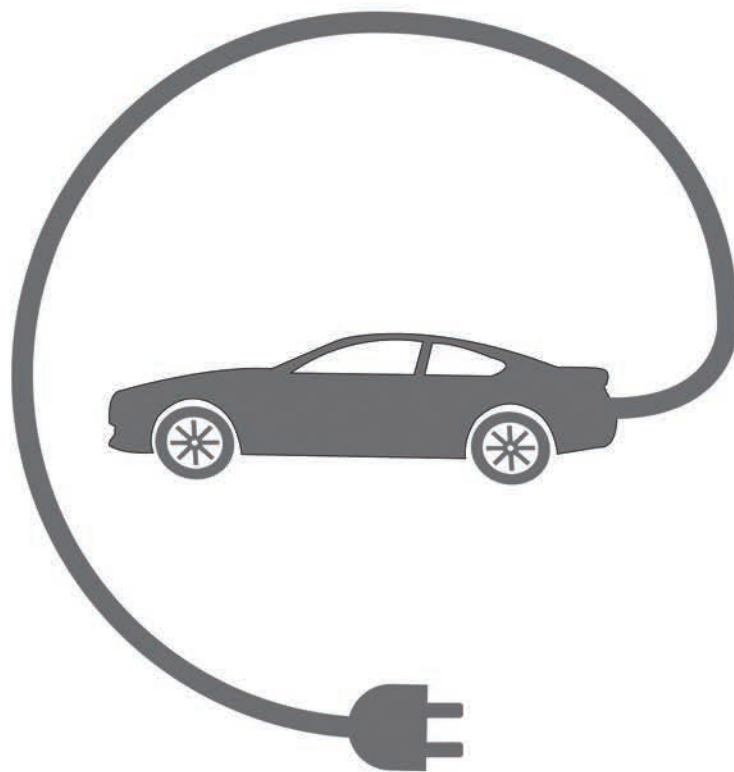
With Innovate UK's 2018 demonstrators due to complete in 2021/22, the next few years are critical for the future of V2G technology in Europe. **te**

For more information on EVs research, visit delta-ee.com

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Honda makes energy management shift

Honda has led an £8.6m funding round in Moixa. The carmaker struck a deal with the UK smart grid firm earlier this year as it bids to join the dots between the batteries in its cars and the global energy system. Brendan Coyne reports

Moixa controls batteries in homes and cars to provide energy and grid services. CEO Simon Daniel says it has about 70MWh of home batteries under management in the UK and Japan.

It will use Honda's investment to work out how to best apply its platform to "moving batteries, to improve the economics of electric vehicle ownership", said Daniel, "which helps the overall economics of car ownership, charging infrastructure and enables deferral of grid investment".

Virtual interconnector

Moixa aims to "scale to gigawatt hours" with the ultimate goal to become not just a virtual power plant but a "virtual interconnector", Daniel suggested.

He said the company "already sub-aggregates large fleets of domestic energy storage and will do the same with EV storage," packaging up flexibility for utilities to manage imbalances, network companies to manage constraints, "or to another aggregator or direct to National Grid".

"The role Moixa plays as an aggregator is core to our model, but our definition

is at all stages: house, street, local, national and international," he explained.

Much of the flexibility it currently provides to National Grid, distribution network operators and aggregators is currently under project or trial frameworks, though Daniel said Moixa does have commercial contracts with DNOS via recent flexibility tenders.

Vehicle-to-grid

Moixa had some input into a UK vehicle-to-grid study that found V2G services might earn £400/year at best. Asked if that is sufficient

incentive for businesses given the additional cost of bi-directional chargers, Daniel suggested broader benefits should be taken into account.

"If you can help address local issues [through smart charging/V2G], that is a benefit to everyone, and all the assets seeking to connect. So a lot of the value lies in network deferrals," said Daniel.

He said that V2G income cannot be valued in isolation, pointing to lower maintenance costs and reduced fuel costs for electric fleets versus petrol and diesel. "So the economics of electrification already work for fleets – and

Vehicle-to-grid study suggests £400 max per EV

A UK study into the income potential of using electric vehicles to balance the grid suggests approximately £400 per annum may be the upper limit for cars plugged in 75 per cent of the time

The findings contrast with headline figures touted by vehicle-to-grid (V2G) proponents such as Nissan and Nuvve, which have suggested earnings of €1,300-€1,800 (£1,150-£1,600) have been achieved, albeit in an application-specific trial in Denmark.

The report by Cenex took data from three electric vehicle trials and demonstrators and overlaid it with simulated new data to determine a mean plug-in rate. That data suggested a 28 per cent mean plug-in rate across the sample over a year. The lowest rate was 6 per cent, the highest plug-in rate was 80 per cent.

Researchers then created use cases and modelled different types of charging approaches – from dumb, to unidirectional controlled or ‘smart’ charging, to bi-directional vehicle-to-grid charging – all using a 7kW charger.

The study assessed all potentially available revenue streams for both smart and V2G services, ran the numbers and come up with some figures based on currently available tariffs, grid services and prices.

For V2G, it found the most suitable revenue streams over the next five years include National Grid ESO balancing services FFR, Stor and Demand Turn Up, plus imbalance management, arbitrage and local grid peak tariff avoidance.

However, the most important component of that stack is FFR, where prices are declining due to an influx of batteries. Adding electric vehicles to that pool would exacerbate price cannibalisation.

Of a total of £414 annual revenue for grid services available to vehicles plugged in for 75 per cent of the time, the study found FFR would deliver £358, or 86 per cent.

The study acknowledged that its figures do not take into account any costs associated with battery degradation as a result of increased cycling.

See the report at <https://bit.ly/30mwcSO>

any kind of income from grid services is going to tip the scales in favour of accelerated adoption of EVs.”

Honda energy management

Honda is moving closer to the energy market, as are other carmakers. Daniel wouldn't speculate on whether Honda would become an energy supplier in future but said the sector is undergoing a pivotal shift.

“Electrification of the global automotive sector will require a rethink of electricity supply – so the supply moves away from the pure [energy] retailers and towards the

automotive companies. Their customers will need a large amount of power.”

Some carmakers are shifting to include electricity with the car. On the flip side, making money as a standalone energy retailer is increasingly challenging in some markets, “so the value is shifting,” said Daniel.

Whether or not carmakers become energy suppliers, “they will increasingly play a role in overall energy demand,” said Daniel. “The better they can manage that, the better it is for everyone. If you integrate and deliver well, everyone benefits.” **te**

Centrica bundles EV charging, solar and storage

Centrica Business Solutions hopes to take a slice of the burgeoning EV market by bundling charging infrastructure with solar, storage and energy supply.

The company says businesses aiming to install large numbers of chargers are often falling at the first hurdle: sufficient grid capacity. It believes onsite generation can help address the issue and potentially bring firms into its virtual power plant, enabling them to cut energy bills through load shifting or earn revenue from balancing local and national grids, wholesale markets or enabling Centrica to reduce imbalance penalties.

A spokesperson told *The Energyst* that Centrica will fund solutions so that they are capex-based.

“We have a range of funding options including a PPA solar product, which allows businesses to immediately benefit from savings from having their own on-site generation capability with zero capital outlay,” she said. “We also have a combined solar-storage solution that provides flexibility and reduces energy spend when it is at its most expensive during peak hours.”

While Centrica ultimately aims to enable vehicle-to-grid (V2G) services, that remains “a way off”, according to the spokesperson.

“We are very much looking at [V2G], but the optimisation

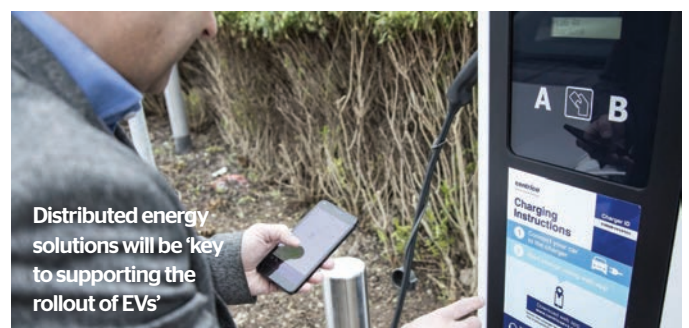
angle today is focused on [customers’] wider estates in terms of on-site generation and storage, and managing that alongside the chargers so they’re all working in harmony.”

She added that while larger businesses, particularly those with fleets, are keen to understand smart charging solutions in order to cut running costs and avoid grid upgrades, “a lot of businesses are literally just looking for chargers and finding the whole thing massively confusing, hence the single supplier offer”.

Jorge Pikunic, global managing director for Centrica Business Solutions, said distributed energy solutions will be “key to supporting the cost-effective rollout of EVs, reducing the need for costly grid upgrades and new centralised generation capacity”.

If companies buy-in to that approach, it will also boost Centrica’s distributed energy business and help deliver the global scale it seeks to achieve with flexible power. The company bought flexibility aggregator Restore in late 2017 for £62m in a bid to build a multi-gigawatt virtual power plant.

Centrica is planning a major EV rollout of its own. It aims to electrify 10% of its 12,000 vans by the end of next year – though may face challenges sourcing that many vehicles, as others have found (see April/May issue). **te**



Conway's travels

Newcastle, Belfast, Coleraine – Joe Conway travelled around Ireland's green countryside and lively cities for several months, visiting the country's supermarkets

Joe Conway, commercial manager at Cross Group, examined Northern Ireland's supermarkets; counting all the fans and every single light fitting within each refrigerated display cabinet (RDC).

The cooling technology expert had to replace 2,000 fans and just as many light fittings in the freezer cabinets and RDCs in 70 of the Henderson Group's stores. The company is one of the largest retail brands in Northern Ireland. In addition to the company's own 85 stores, it has the SPAR and EUROSPAR brand franchise for the country, comprising more than 450 stores. One of the biggest challenges this project faced was keeping the stores open while replacing the parts.

Dr Glen Crumley, energy manager for Henderson Group, approached Tony Wright from ebm-papst UK at a conference in London, after hearing Tony's presentation on the potential energy savings from replacing AC fans in cooling systems with EC fans. Knowing that cooling systems consume between 30 and 60% of the energy in supermarkets, Dr Crumley considered it a key point for improvement.

"I was impressed by the numbers, but also appreciate the quality of the products and ebm-papst's guarantees and company history. So I gave the order for the retrofit to Cross Group and required them to procure the EC fans from ebm-papst," he explained.

Alongside the fans, they were asked to replace all the light bulbs in the freezer cabinets with LEDs.



Nothing left to chance

Management at Henderson gave its approval, and the Cross Group started the planning phase.

Conway received information from the store managers. "But I couldn't use it for detailed planning. So I went to each of the 70 stores myself. This was the only way to pinpoint the project's scope," Conway said.

The Cross Group trained six subcontractors to do the replacement work. Conway supplied them with detailed plans that told them everything from where they could park to avoid any inconvenience to store customers, to how many fans had to be put in which refrigerated display cases, which ones needed adapters and what precautionary safety measures they would need to take.

Since the Cross Group needed the assistance of the store employees, who had to empty the refrigerated display cases before their arrival and fill them immediately after the work was completed, the work could only be done during the day



"The project was definitely one of our largest and most complicated, but it was well worth the effort"

JOE CONWAY

“I went to each of the 70 stores myself. This was the only way to pinpoint the project’s scope”
JOE CONWAY

– although some of the Group’s stores are open around the clock.

After a six-month planning phase, the subcontractors started retrofitting. They replaced between 20 and 60 fans and light fittings per store, which took anywhere from a few hours to a maximum of two days.

“The retrofit went smoothly,” said Dr Crumley. “They did not have to do any mechanical work on the unit bases and the fans could be replaced one-to-one. Only 15% of cases required an adapter. And for the most part, the stores could operate normally.”

After three months, the retrofit was completed.

Savings for the bottom line and the environment

The Henderson Group is really saving now. The retrofit reduced the energy usage of the fans and lights by 70%. As Conway explained: “The EC fans are not only more efficient, they give off less heat – which translates into less cooling. The savings are tremendous.”

In total, the old AC fans consumed almost 800,000 kWh per year, but the new axial EC fans use just under 150,000 kWh. By replacing the fans and lighting, the Group saves over 200,000 euros per year. The investment will be paid off after 20 months and the new fans are more reliable, quieter and have longer service lives. The environment also benefits, as after the retrofit, the Henderson Group emitted 550 tonnes of carbon less, per annum.

“The project was definitely one of our largest and most complicated,” said the commercial manager. “But it was well worth the effort.” ●



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Generation game changer

As the market for embedded generation evolves, organisations with onsite generation may need to re-evaluate their approach. Engie's Russel Reading explains



The market for embedded generation is changing. Electricity prices are increasingly volatile and revenue streams are under pressure. Many of the benefits and incentives for onsite generators are being removed or adapted. Further changes to balancing services, distribution and transmission network charges and the benefits associated with Triad avoidance are imminent, as Ofgem conducts its significant code review.

A changing environment
The government's aim in incentivising small-scale generation was to help secure future energy supplies in an increasingly fragmented market. These incentives have grown onsite generation in the UK from 25GW in 2015 to more than 40GW in 2018.

Now many of the cost-avoidance and charge-reduction benefits are potentially being removed, so organisations with onsite generation need to rethink how they use their assets. For most businesses these assets are required first and foremost to fulfil specific operational tasks and any financial benefits from exporting electricity or avoiding peak charges are incidental. In the new world, businesses will still need their CHP for heating, and manufacturers will still need onsite generators for back-up power.

Fresh thinking required
In the absence of cost-



“



Organisations with onsite generation need to rethink how they use their assets
Russel Reading, Engie

reduction and other incentives, businesses will need new strategies to get the most from their generation assets, above and beyond operational requirements. That means working out when assets need to run to fulfil their roles, when they can be used to capitalise on higher market prices for exported energy, or on lower prices on gas to fuel controllable assets.

Embedded generation plant can still be valuable in earning extra revenue for a business, or helping operations run more efficiently, but businesses may need the help of a specialist energy partner to maximise those benefits.

Optimising onsite generation assets requires an understanding of a business's energy or heat requirements, of its onsite generation capabilities, and of its attitude to risk. This knowledge and understanding, combined with energy market insights and expertise, can enable informed decisions to be made about when to run generation assets, when to export and when to self-supply.

Balancing controllable and renewable energy assets

Managing the output of generation assets, such as CHP and gas-fired plants, is relatively straightforward since these are controllable, fuelled assets. Adding wind turbines, solar panels and other renewable generation plant to the mix creates further complications, since businesses have no control over when the sun shines or when the wind blows.

One solution is to combine renewable generation assets with battery storage, so businesses can better control when to use the energy they have generated, accounting for operational needs

Optimising onsite generation assets requires an understanding of the energy or heat requirements of businesses

and prevailing market rates.

For any businesses that don't yet have onsite generation, but are considering it, now is the time to engage with an energy export specialist for advice.

Another option, if green power is the main driver, could be to set up a form of corporate power purchase agreement, which establishes a direct supply arrangement between a renewable energy generator and a business. Such agreements enable the business to benefit from renewable energy sourced from a named generator at a fixed fee, while giving the generator a guaranteed buyer for its output. Businesses can even agree such contracts for a proportion of their energy requirements, allowing them to purchase the remainder at market-reflective rates.

Consider the bigger picture

What becomes clear when you start to investigate the opportunities for optimising onsite generation is that any decisions must account for operational requirements, energy purchasing contracts, energy management systems, carbon emissions and a host of integrated factors. It means embedded generation and associated power purchase agreements cannot be considered in isolation. A more holistic approach is required, which factors in when and where energy is consumed, how that energy is supplied, from where it is sourced, and the costs associated with generating and consuming energy.

Looking at the bigger picture means finding ways to manage energy inputs and outputs in the most efficient way, to help save money and reduce carbon emissions. Low-carbon or renewable onsite generation certainly has a key role to play, but it must be considered as part of an integrated approach to business energy management, cost reduction and resource optimisation. **te**

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Rail firms switch diesel for solar



A major rail renewal project in south Wales saw Network Rail and Colas Rail massively reduce diesel consumption and emissions by using solar PV instead of traditional gensets

A project led by Network Rail and Colas Rail has used solar lighting and power generation to prove the viability of a sustainable ‘Site of the Future’, achieving 97 per cent diesel-free operation in support of a major rail renewal project at Llanwern in south Wales.

The initiative used solar and battery technologies from Prolectric instead of diesel generators to save 6,000 litres of fuel and more than 15 tonnes of CO₂ during a 14-day project centred around a 72-hour possession over the early May bank holiday weekend.

The results are seen as a significant achievement that marks an environmental milestone towards clean, carbon-free, off-grid working in support of Network Rail’s target to reduce non-traction energy consumption by almost 20 per cent and carbon emissions by 25 per cent by 2024.

Nick Matthews, Network Rail programme engineering manager, says: “In business improvement, generally a one or

two per cent gain is considered significant, so to achieve 97 per cent at the first attempt is simply staggering. Saving close to 6,000 litres of diesel is the same as driving a family car at 40mpg twice around the circumference of the world.

“It’s also very clear where we have learnt the lessons from Llanwern so we can close that small gap. We really want to get to that 100 per cent fuel free-figure by the time of our next challenge, planned for a rail renewal project later in the summer.”

The kit

Solar lighting and power generation technologies were used across the site covering more than 8.5ha. This included access roads, the welfare cabin area, car parking and the track working area itself,



Solar technologies are seen as a vital to non-traction carbon targets

where the London to Cardiff main line meets the Llanwern steelworks spur, near Newport.

Three 25kW solar generators replaced conventional diesel generators providing light and heat for seven welfare cabins, including site offices, a canteen, toilets and a drying room.

A total of 21 solar tower lights illuminated the site compound, car parking and work preparation areas, as

well as being deployed on the trackside, where 200m of battery-powered link lighting was also used and column street lights were positioned along the access road to the site.

Matthews continues: “It was just as important to explore and extend the range of renewable applications, including a new solar-powered camera security system. We were also able to demonstrate the versatility of using portable lithium battery packs, recharged as necessary from the solar generators to power dust suppression systems, water cooler stations and point motors.”

Cutting pollution

Using diesel generators to support rail renewal work has been the only option for reliable off-grid power. Now viable solar technologies are being seen as a vital contribution to non-traction carbon targets, as well as to reduce the noise, smell and air pollution from diesel exhausts, especially next to residential areas.

“The environmental impact of running diesel generators all day on a major worksite like Llanwern is absolutely huge,” explains Matthews. “It’s not just about carbon emissions; our lineside neighbours are very important to us. By using solar harvesting, we’re not polluting their environment with unwelcome fumes and noise.”

Ryan Ballinger, production manager for Colas Rail, explains: “We have worked closely to drive the development of suitable onsite solar tower lights and walking lights. Now, at Llanwern, we have been able to add solar generators for the first time and moving forward we want to add smaller plant and tools such as disk saws and band saws.

“There’s no doubt these technologies are going to be a complete game changer. Now we need to push on and get to the point where they are just business as usual.” **te**

“It’s not just about carbon emissions... By using solar harvesting, we’re not polluting the local environment with unwelcome fumes and noise

FACILITIES MANAGERS: TAKE CONTROL OF IT LOADS

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Traditional static UPS systems often come with the misconception that they are inefficient. This may be true for units over 10 years old but today's static UPS systems deliver efficiencies of up to 98% when

deployed in the correct application and environment.

Ever-tightening energy regulation puts facility managers under increasing pressure to source leaner systems and adopt more efficient processes. The greatest way to achieve this is to view IT infrastructure in its entirety and not in isolation. Power Control Ltd has worked with facility managers for over 25 years to deliver best practice with the latest power protection technologies. Power Control looks at the complete power protection landscape, environmental factors and physical infrastructure and provides solutions that meet exact business needs - not just now but in the future.

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Systemising food for thought

The Hospitality Carbon Reduction Forum is putting best practice around energy and sustainability on the menu, with rival pub, restaurant and coffee chains all willing to collaborate. Brendan Coyne reports



Mark Chapman runs Carbon Statement, an energy analytics and sustainability consultancy that specialises in the hospitality sector. His mission is to “systemise sustainability” so that even small pubs and restaurants can reduce their carbon footprint and energy overheads using the same best practice honed by large operators.

Chapman also founded the Hospitality Carbon Reduction Forum, where pubs, quick-service restaurants and coffee chains share best practice around energy and sustainability.

The Energyst attended the last forum in May, hosted by pubco Young’s. Perhaps most striking was members’ willingness to collaborate, given many compete directly for share of wallet.

“They don’t see this as a competitive area, they’re keen to share and learn,” says Chapman. “Life’s too short to make your own mistakes – and too expensive.”

All 40 forum members collaborate on an energy

efficiency benchmarking project each year, and are currently collectively resourcing a plastics initiative. The aim is to create a best practice action plan on minimising single use plastics in the sector – with the specifics of how to do it. That’s key to the forum, says Chapman, “it is actions-based; implementable actions that can be taken to the board, rather than a talking shop.”

Momentum

Chapman says the forum has been running for the best part of a decade but that momentum around sustainability has increased markedly over the past 12-18 months.

“We’re seeing increasing adoption [of energy and sustainability measures] in

the hospitality sector driven by reputational risk, financial and internal stakeholder pressure,” says Chapman.

He says CSR and environmental reporting requirements are also boosting board-level interest. “Companies have to have a story around this – if nothing else, they have to implement actions or risk having nothing to put in the director’s annual report.”

That is partially why Chapman thinks Esos will be different second time around, but there are some other fundamental reasons.

“Firstly, you have to tell people more than once to do something, that’s human nature,” he says.

Secondly, there is Brexit and its associated economic torpor.

“It’s difficult for all businesses

to grow their topline, so everyone is focusing on taking out cost.”

Specifics, not boilerplate

Esos phase one was regarded by many as a missed opportunity, a tick box exercise that delivered little outcome.

Chapman thinks it was too generic, with “boilerplate findings insufficiently actionable for most companies”.

Tailoring Esos to specific sectors increases the likelihood of businesses implementing recommendations, says Chapman, which is the approach Carbon Statement takes.

“Before Esos, we were doing energy audits anyway – benchmarking [clients’] energy efficiency in the sector and its implications for profitability”



We show them how much more carbon they are emitting than their competitors. Combine those two messages – finance and sustainability – and it hits all of the stakeholders in the business
Mark Chapman, Carbon Statement





Pic: Creative Commons Marco Verch

says Chapman. "That meant we could show people energy cost per pound of turnover comparisons against their competitors and highlight, for example, that they are losing 2 per cent on margin."

Putting energy into financial metrics tends to sharpen board engagement, says Chapman, and placing margin-boosting solutions in front of them improves the chances of action. The carbon aspect is also increasingly important, Chapman reiterates.

"We show them how much more carbon they are emitting than their competitors. Combine those two messages – finance and sustainability – and it hits all of the stakeholders in the business, because if the public becomes aware they are emitting twice as much carbon as their competitor, and they have not done anything about it, that becomes brand damaging."

Take ownership

Carbon Statement uses its custom energy and analytics platform combined with

Bringing the c-suite into sustainability

Tim Doubleday is group CFO at Burger King. He is also chair of the environment leadership team at Business in the Community – and gave a snapshot of how to engage the c-suite in sustainability at the May Hospitality Carbon Reduction Forum.

Doubleday outlined the simultaneous snowballing of environmental regulation and taxes and growing public concern around climate issues.

That has created a climate of fear and risk for businesses, said Doubleday, which feeds through to the CFO as "if you do not respond, your regulatory and tax burden will increase and your customers will go elsewhere".



Tim Doubleday

Present opportunity

It is time to change the message, said Doubleday. "Don't talk about risk, talk about opportunity. If you present opportunity to your CEO or chief marketing officer, they will be onboard straightaway. So change the agenda."

He pointed to the \$12tn opportunity identified by United Nation's Sustainable Development Goals; hundreds of thousands of UK jobs – and the trillions of pounds in green funds looking for good, sustainable receptacles.

Doubleday suggested talking to CFOs about the UN Principles for Responsible Investment (UN PRI), which require investors to ensure that the companies in which they invest make continuous, demonstrable sustainability improvements.

engagement programmes to reduce energy use, says Chapman. Using that approach, he says hospitality companies have saved 30 per cent of energy consumption via non-capex projects. "That equates to £4,000-£5,000 in additional profit per outlet," says Chapman.

Engaging all stakeholders is critical, he says. "If it is uncoordinated, it leads to uncontrolled energy use. So we try to create structures that engage all internal stakeholders – property, maintenance, operations, finance and marketing."

Equally, he says systems, not one-off exercises, breed success. "It has to be an ongoing process in the same way that health and safety, sales or customer services are

This forces both public and private equity investors to push the sustainability agenda, said Doubleday.

Meanwhile the environmental agenda is working its way into the home, and into the mindset of the next generation of employees and customers.

"So if you have the investors pushing from behind and your customers and employees pulling from the front, then from a business perspective, the c-suite has to take notice," said Doubleday.

His takeouts were:

- Present opportunity, not threat
- Benchmark where your business stands among peers
- Map a journey of changes you can make that are materially relevant to your business
- Collaborate with other businesses to drive step change

Doubleday also advised appealing to leaders from a personal perspective.

"As you get older in business, you don't remember the numbers. What you remember is the experiences you had, the good things that you did, and the legacy you created. That is a powerful message to take to the c-suite."

Business in the Community represents about 750 members, including more than half the FTSE100, SMEs and academia. See bitc.org.uk

ongoing business processes."

The first step is to establish an owner, says Chapman. "That doesn't mean they have to do everything, but they are the project lead. It could be the FD, the ops director; it could be health and safety. It doesn't matter, as long as somebody takes ownership."

Smarter approach

Using energy data from smart meters is another cornerstone to driving down consumption. Because smart meters are widely deployed across industry, Chapman says there is no need for additional kit.

"That's the key starting point. If you are not doing anything with your smart meter data, it's a massive waste."

Chapman says the analytics

system uses smart meter data to highlight areas requiring attention and send weekly reports with "actionable insights on how to improve, and what it will cost if they don't," says Chapman.

That approach means "everybody has a template, an action plan, so they are not floundering around," says Chapman. "So if you are a pub operator, here's the plan and here's how you execute," he says. "Then you can quickly embed sustainability within your business – and improve margin to boot." **te**

If you would like further information about the Hospitality Carbon Reduction Forum, contact mark.chapman@carbonstatement.com

Why small loads matter...

...Or how to charge 87,705 electric vehicles a year without additional UK generation capacity. Colin Grenville, director at UKAEE, highlights two examples that show why it is important to keep perspective when pursuing energy efficiency in order to correctly prioritise investment and action

While these are domestic energy usage examples, the principle of having clear energy saving objectives and a well-crafted

plan of action is even more relevant in a business context. Firstly, despite knowing that my job entails helping people save energy, my children are oblivious to applying this fact

in their own world and frequently head out to school leaving their rooms lit up. Naturally, I have tried various approaches to tackle this but short of installing

occupancy sensors it has limited effect. After berating the kids repeatedly, I sat down and calculated how much energy they were wasting and, as the lights are all LEDs, the answer was not that much since I check regularly and switch them off myself. A 10W load left on for an extra hour a day is only 3.65kWh a year.

This led me to undertake a more systematic review of energy-consuming equipment in my home, which revealed the most addressable energy saving opportunity was an old freezer in the garage. Using a simple plug-in power monitor revealed the 20+-year-old appliance was using at least 3kWh every day.

After benchmarking against real measurements of a few operational A+ rated freezers, I swiftly realised it was using about five times as much electricity as a modern equivalent and wasting about £130 a year. A high-efficiency replacement was swiftly acquired and the offending appliance removed.

It is easy to spot where the new freezer savings start in Figure 1, followed by a further dip while we were on holiday, and then a massive spike due to temporary electric heating when the boiler died. You would think the moral here is “don’t sweat the small stuff”, which is good advice when there are bigger issues to deal with, but the small loads really do matter over longer time periods or when you look at the impact of many such loads at a national scale.

The second example is something found in 98 per

Figure 1: Daily electricity usage (kWh)

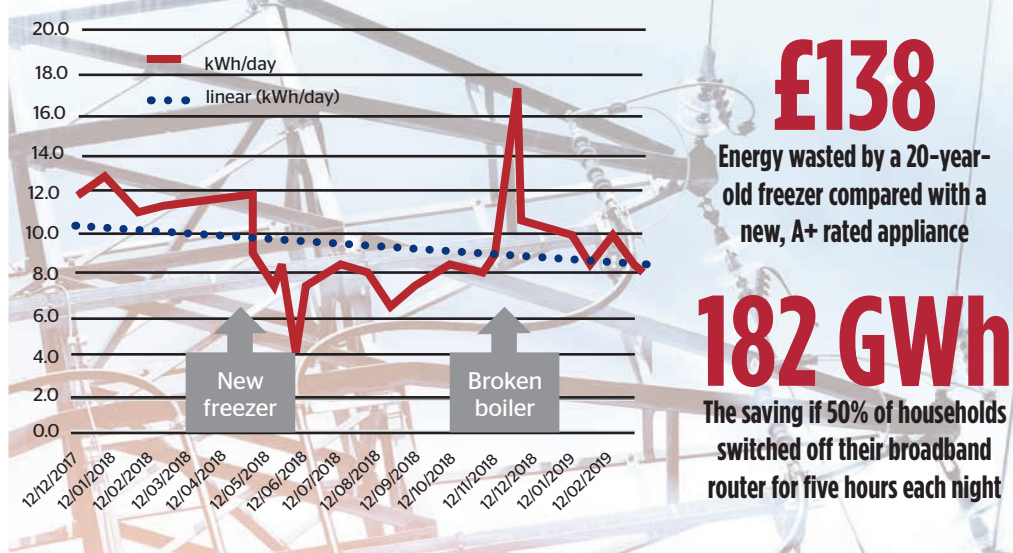


Figure 2: Estimated UK home broadband router electricity demand

No. of households	27,200,000
% with broadband	98%
Therefore # of routers	26,656,00
Average W/router	7.5
Average kW/router	0.0075
Total kW demand	199,920 national

BASELINE	Per day	Per year	Tariff/kWh	Annual saving
kWh/router	0.18	65.7	£0.15	£9.86
kWh/national	4,798,080	1,751,299,200	£0.15	£262,694,880

Figure 3: Estimate of potential annual electricity savings

Switch off start	1am
Switch off end	6am
Hours saved/night	5
% of routers switching off	7.5

SAVINGS	Per day	Per year	Tariff/kWh	Annual saving
kWh/router	0.0375	13.7	£0.15	£2.05
kWh/national	499,800	182,427,00	£0.15	£27,364,050

cent of UK homes – a broadband router. These typically demand between 6 and 20W. My own measurements found our router draws about 7.5W. Unless there is a need for scheduled overnight internet use, it is reasonable to consider that many of us could probably switch off our router from say 01:00 to 06:00 daily. Individually, this saves less than 14kWh or £2 a year but there are 27.2 million UK households and therefore some 26.6 million routers.

Figure 2 shows the impact of so many devices at a national level. If 50 per cent of these could be switched off for five hours each night this would avoid using more than 182GWh of electricity (see Figure 3) and a temporary demand reduction of nearly 100MW.

Estimated savings assume a software time control solution, ie no additional



The example illustrates that big numbers, whether routers or kids' bedroom lights, collectively have a massive impact on national energy performance

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

electricity demand required to control the routers, and that none of the routers are currently being switched off. Now 182GWh of saved electricity, it turns out, goes a surprisingly long way when it comes to charging electric vehicles.

Average annual car use in the UK is about 7,800 miles. Taking a typical EV with a modest efficiency of 3.75 miles per kWh range, 182 GWh provides over 684 million miles range – equivalent to juicing up 87,705 EVs for a whole year based on average mileage.

With increasing use of connected services in the home there are clearly reasons why it is desirable for many routers to be left operational 24/7 so the estimated savings above are not necessarily deliverable. However, the example illustrates that big numbers, whether routers or kids' bedroom lights,

collectively have a massive impact on national energy performance. Perhaps we should sweat the small stuff after all. **te**

Colin Grenville runs Erebus Environment (www.erebusenvironment.co.uk) and is secretary of the UK Association of Energy Engineers (UKAEE) supporting its drive for energy education and action for sustainable development. UKAEE covers a range of expertise in the energy management and energy efficiency sectors. It delivers a range of technically focused seminars and offers excellent networking opportunities for energy and sustainability professionals. It offers Continued Professional Development opportunities for AEE certifications such as Certified Energy Manager, Certified Measurement and Verification Professional and Certified Energy Auditor.

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Making sense of your energy

Dan Shields, CEO of Shields Energy, says IoT-enabled smart buildings and spaces allow businesses to retain and attract talent, investment and clients, as well as cut consumption

Smarter building, smarter business

The deployment of IoT technologies is aiding in the creation of smart spaces and smart buildings, enabling business benefits including energy and operational efficiencies and carbon and cost reduction.

According to the International Energy Agency, commercial buildings account for 36 per cent of global electricity consumption and 18 per cent of all energy. IoT technologies could cut consumption – and therefore energy costs – by up to 30 per cent.

However, there is an increasing focus on the importance of wellness within buildings, and with it the emergence of environmental, social and governance (ESG) strategies. Moving forward, this is what smart spaces and smart cities are focusing on. But intelligent system design and operation mean the two aspects are not mutually exclusive.

What's a 'smart space'?

Commercial buildings are a great and very real example of the growth of smart

spaces, defined as interactive environments where humans and technology can openly communicate with each other in a physical or digital setting. This enables “a more immersive, interactive and automated experience for a target set of people and industry scenarios”, according to research firm Gartner.

More than operational performance

Because of the development in smart spaces, businesses are starting to realise the non-energy benefits that IoT devices can bring to employees within a building such as improved productivity and employee retention. In that sense, building IoT is much more than operational performance

management; it can have a huge impact on the feel-good factor for those

working within a

building and boost wellness of staff. Businesses with clear ESG strategies can tap into untapped opportunities including:

- Staff retention and attraction (engaging with talent that selects employers based on their environmental credentials)
- Client retention and attraction
- Brand reputation (environmental stewardship is increasingly considered by stakeholders)
- Financial growth and investment (investors are under increasing pressure to favour companies with defined ESG strategies and goals)

Is IoT right for my business?

Firstly consider what you want to achieve, eg operational improvements, reduced energy consumption and/or wellness. Defining this from the outset helps to shape your IoT and data analytics strategy.

Next, gather the data, eg deploy temperature or CO₂ sensors throughout the building to understand internal environmental conditions.

Dan Shields: IoT can boost staff wellness and productivity

Then connect systems together, such as HVAC&R alongside the deployed sensors. Now you can see what your systems are doing and how they are impacting on internal conditions and energy consumption/costs.

Once systems and sensors are connected, two-way communications from the central IoT control device can happen. The IoT device transmits data to the cloud-based software platform where clever analytics and control strategy design is created and executed, tweaked and monitored.

Finally, configure your IoT control strategy to help deliver efficient and effective building and system controls with the purpose of achieving building operation and performance management, improved maintenance as well as energy cost and carbon reduction – all optimally balanced to maximise occupant well-being and productivity.

For buildings with an existing BMS, IoT technology can run in harmony, extracting and delivering information to improve the local BMS control and deliver remote communications to users through cloud-based software platforms. te



Pushing at sustainability barriers



Ashden UK Awards manager Mike Pepler outlines some of the innovative UK companies tackling world energy issues

Last October, the IPCC explained the consequences of global temperatures rising by more than 1.5°C. We are already getting a foretaste of this in the flooding in Midwest USA, where farmers and food production are being seriously impacted.

We were told that limiting global heating to 1.5°C “would require rapid, far-reaching and unprecedented changes in all aspects of society”, and that global greenhouse gas emissions would need to roughly halve by 2030. Incremental changes and gradual improvements will not suffice – we need radical ideas scaling up quickly, with no segment of society, business or government left untouched.

The Ashden Awards are pivoting to focus on work that is meeting the challenges the world faces. We are not completely there yet but this year’s finalists are taking significant steps along the road. Here are three that are working on retrofitting existing buildings, decarbonising heat and long-term energy storage.

Energiesprong UK

Before looking to renewable heating systems to reduce CO₂ emissions from buildings it is important to improve efficiency. However, insulating and draughtproofing millions of older properties in the UK to the required standard is difficult and tackling each one individually can be costly and disruptive. Energiesprong UK’s approach treats the entire home in one go, fitting new walls and a roof around it to give the required insulation and airtightness and adding heat-recovery ventilation, solar PV and a heat pump. This enables wall and roof sections



to be manufactured off-site, reducing waste, cutting costs and minimising disruption.

The retrofitted homes appear new from the outside and can reduce net energy use to almost zero while remaining warm, dry and healthy. Energiesprong UK is working to build the market with new ‘solution providers’ offering retrofits and large social landlords getting involved.

Funding is a combination of landlord maintenance budgets and pay-as-you-save from tenants, with a 30-year energy performance guarantee from the solution provider. Grant-funded top-ups are also required at present but costs will reduce as the market scales up.

Guru Systems

District heating is often put forward as a solution to decarbonise heating but many projects fail to deliver the promised efficiency. A range of issues during design, implementation, commissioning and maintenance can cause

this, and the lack of access to operational data makes them hard to track down.

Guru Systems is addressing this by installing a small device in each home on a district heating network to gather data on temperatures and flow rates that is currently only used for billing. The device has a screen to enable households to manage their energy use and bills and passes data back to Guru’s Pinpoint software for automated analysis. The heat network manager is then presented with diagnostics and options to improve efficiency. The system has been installed in more than 100 district heating and cooling networks and can reduce heat losses by over 60 per cent.

Highview Power

Significant progress has been made in decarbonising the UK electricity supply but there is a growing need for energy storage to ensure the grid’s stability and to store renewable energy. Lithium batteries are still too

Clockwise from top: Energiesprong UK; Highview Power; Guru Systems

expensive for more than a few hours’ worth of energy storage, lose capacity over time and cause environmental damage through mining to access minerals. Highview Power has addressed this by developing a system to liquefy air when electricity demand is low, hold it in insulated tanks until demand is high, and then allow it to return to its normal state – driving a turbine in the process.

By capturing and reusing waste heat and cold, a round-trip efficiency of 60 per cent has been achieved and can reach 70 per cent if a local source of waste heat is available. Although this level of efficiency is lower than a lithium battery, the plant is built from readily available components, maintains its performance over many years and is easily scaled up by adding more insulated steel tanks.

Highview has already completed a demonstration plant and has plans to build several larger capacity plants for customers imminently. The plants will provide flexibility services to the grid, and as renewable energy capacity grows, they can be expanded to store surplus renewable generation for use at a later time.

Although none of these finalists will turn the world upside down overnight, they are pushing at the technology boundaries and we at Ashden will be helping them to reach their goals. If you know of organisations engaged in similarly inspiring work to cut CO₂ emissions, point them to the Ashden website to register their interest for future awards. [te](#)

National Trust to upgrade off-grid energy tech at t'mill

Work under way to ensure heritage building remains entirely self-sufficient

The National Trust's Gibson Mill is installing battery storage, solar PV and upgrading its hydro to ensure it remains fully powered while totally off-grid.

The mill, located at Hardcastle Craggs in Hebden Bridge, West Yorkshire, was the first heritage building with a visitor centre and associated facilities to operate 100 per cent off-grid and through the sole use of renewable energy technologies.

Increase in visitors

Renewable energy firm Dulas is undertaking the upgrade work, which is required as the mill's visitor numbers have swelled, increasing energy use by 200 per cent since 2005.

Built in about 1800 as one of the first mills of the industrial revolution, Gibson Mill has had an extraordinarily varied life. After a century as a cotton mill, it was converted to provide entertainment for local people, offering a dance hall, a roller-skating rink, refreshments and boating on the mill pond. The National Trust acquired the mill following a period of disuse in 1950. In 2005, with support from Dulas, it launched a project to make the site entirely energy self-sufficient.

The initial work carried out by Dulas included the restoration and reinstatement of the cotton mill's original 1926 Francis hydro turbine, the installation of a smaller Crossflow hydro turbine, a

solar photovoltaic system, and a battery storage system.

The combination of these technologies was chosen to ensure that the site's electricity needs were met through sustainable means at all times.

Evolving needs

Jonathon Brewer, general manager for the National Trust at Hardcastle Craggs, says: "While this combination of sustainable technologies previously produced an excess of electricity for the site, Gibson Mill's needs have evolved dramatically in the last 14 years. Upgrading and refurbishing the 2005 system will make sure this extraordinary site can manage the power challenges raised by public and private events, as well as increasing visitor numbers."

Following a consultancy period where Dulas reviewed the existing system together with more than a decade of data on the site's energy consumption and renewable energy performance, the

work to upgrade Gibson Mill's sustainable energy system commenced in June.

The modernisation work will include the replacement of the original battery storage system with a new battery bank that offers 30 per cent more storage capacity. The site's three inverters will also be replaced and reconfigured to satisfy greater peak power demand and provide greater system flexibility.

Chris White, technical consultant for Dulas, says: "It's fantastic to see Gibson Mill remaining independent from national power supplies over the last 14 years. Regardless of this achievement, the Mill's sustainable energy system needs to evolve to meet the changing requirements of the site.

"These improvements will provide more instantaneous power from storage when needed, delivering greater confidence for the National Trust that the site is able to meet the needs of large events and the busiest open days." **te**

“ *While a combination of sustainable technologies previously produced an excess of electricity for the site, Gibson Mill's needs have evolved dramatically in the last 14 years*



Bridging the gap to decentralised energy

Energy security and cost concerns are highlighted as key barriers for UK industry to realise the benefits of decentralised energy, according to a report launched by Aggreko.

Bridging the Energy Gap is the result of 200 energy decision-makers across industry offering their views on decentralised energy in the UK. It finds that energy security remains a major or significant

concern for most respondents (82 per cent), while reducing energy consumption is viewed as a medium or high priority for the vast majority (94 per cent) of correspondents.

According to Aggreko's report, decentralised energy solutions such as solar power, CHP systems or wind power, may offer the answer. However, a potential barrier to its adoption has been the high

investment costs associated with purchasing a system. Aggreko believes hire can be a bridging solution between current reliance on the grid and a future where the majority of electricity is generated on-site.

Chris Rason, Aggreko's managing director – Northern Europe, comments: "Decentralised energy solutions offer a tantalising glimpse of a future where companies can

generate their own energy, adhere to their sustainability targets and sell their surplus back to the grid. Though this technology already exists, cost is a significant barrier to its implementation. We hope that by providing a long-term hire solution, we can provide a bridging gap between current overreliance on the national grid, and a future of secure power generated onsite."

Zinc hybrid battery first

Birmingham-based renewable energy company Bryt Energy has collaborated with Eos Energy Storage and Connected Energy to develop what is claimed to be the EU's first zinc hybrid battery system.

The Eos system has a high energy to power ratio, enabling greater flexibility during peak load periods. Its low hazard risk makes it suitable for COMAH sites (Control of Major Accident Hazards). It is also environmentally friendly – at the end of its life, parts can either be reused, recycled or safely disposed of.

The battery's economic potential includes grid service income, peak shaving and

capacity charge avoidance, optimised by Bryt Energy's software. Enabling energy resilience, businesses can gain security, avoid grid capacity restrictions and make the most of their onsite generation, said the firm.

Statkraft-owned Bryt said it will provide the Eos battery system to the UK market as part of a package, supplying zero carbon, 100 per cent renewable electricity with options for onsite generation and optimisation solutions. Together they can be combined to maximise value for customers, said Bryt. The battery system is also being developed to integrate with electric vehicle charging and demand-side management solutions.

It will be tested under UK conditions before being targeted at universities for research purposes. It is expected that the first EU-certified system will be provided to the UK I&C market next year.



Hotel in sustainability switch

Stonehouse Court Hotel in Stroud has switched to SSE Business Energy's flagship green energy contract. This is part of a committed sustainability drive for the award-winning Gloucestershire hotel, which has, with support from Green Tourism, already implemented sustainable practices across all areas of its business.

These include waste minimisation schemes, energy saving measures such as using 95 per cent LED lighting throughout

the site, ethical purchasing as well as a dedicated onsite bottling system to meet the hotel's water needs.

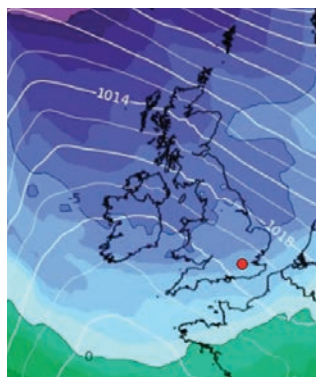
SSE Green, the electricity contract the hotel has opted for, is sourced solely from wind and hydro assets and fully backed by Renewable Electricity Guarantee of Origins (REGOs), which proves the electricity comes from a renewable source. This will help the hotel towards its goal of reducing its carbon footprint and allow it to report zero emissions.

Algorithmic power price predictions

Kinect Energy Group is touting new advanced machine learning capabilities that predict electric spot prices for regional power markets using real-time weather tracking.

The technology uses the Amazon SageMaker DeepAR time-series forecasting model and incorporates historical pricing and weather data to drive the machine learning models.

The technology has been designed to improve price



Kinect's technology incorporates historical pricing and weather data

predictions and assist with increased trading volumes for forward pricing contracts.

Richard Delisser, vice-president of Global Infrastructure at World Fuel Services, Kinect Energy Group's parent company, said: "The volatility of the energy market is at some of the highest levels it's ever been. Affected by factors such as the increased adoption of renewable energy, geopolitical tension, macro-economics

and more unpredictable weather – forward pricing can be difficult to predict.

"Working with Amazon Web Services, we have created something that will transform the way energy spot prices are predicted. By tracking the weather more closely, and better understanding that relationship to market pricing, we will be able to support our customers in making more informed choices about their energy purchasing."

IRIS eyeballs higher returns from wind assets

Kaiserwetter Energy Asset Management has launched new technology to provide data on operational wind farms. The so-called 'IRIS – analytics machine' is a spin-off from its Aristoteles platform, the company said.

Kaiserwetter says IRIS's algorithms are the basis

for detailed analysis of operational data of renewable energy facilities for a given point in time. The data intelligence provides quick insight into the status of assets, said the firm. Smart data analytics and the subsequent implementation of machine learning allow for practice-oriented predictive analysis and are the key elements for a swift analysis of renewable energy facilities, added Kaiserwetter.

The tool includes is an assessment of possible

performance increase (potential gain). This number is one of the key analysis results and is regarded as a 'magic number' for stakeholders along the entire investment cycle, according to the company: It shows wind farm operators the potential that exists from a technical perspective for improving their investment return.

Kaiserwetter said the tool is suitable for wind energy facilities and entire wind parks. In addition to due diligence reports, Kaiserwetter also provides status reports and potential analyses, the latter, it said, being the smallest and most inexpensive analysis report option available from IRIS.

Status reports have been created for asset holders, financiers and ratings agencies of wind farms that seek comprehensive status information regarding performance and technical conditions for a wind park at any given point in time. If these reports are created on a regular basis, said Kaiserwetter, they can help clients get a neutral and data-based perspective on the wind farm in question.

Arm flexes muscle with analytics tool

Arm has launched a workspace analytics tool, Space Analytics, to give property managers of coworking spaces, commercial offices and hotels a view of the utilisation and availability of offices and hospitality spaces.

Dogpatch Labs, an Irish startup hub and home to 80 startups, has deployed this solution to optimise coworking space and better understand movements of its members

Property managers can 'leverage the physical data insights of IoT to design energy efficient and monetisable spaces, as well as increase employee safety, productivity and engagement', states the firm's literature.

Space Analytics gathers and analyses data from off-the-shelf IoT devices (such as smart lighting, sensors, locks, IP cameras, badge readers) to predict availability of space.

Arm claims the tool's machine learning capabilities hone insights on space and resource usage, all of which work toward driving greater efficiencies and maximising revenue, according to the company.





'Forty-year flaw' in solar technology solved

A team of scientists at The University of Manchester has solved a key flaw in solar panels after 40 years of research around the world.

The majority of solar cells only achieve 20 per cent efficiency – for every kW of equivalent sunlight, about 200W of electrical power can be generated.

Now an international team of researchers have resolved a key fundamental issue of material defect which limits and

degrades solar cell efficiency. The problem has been known about and studied for over 40 years, with more than 270 research papers attributed to the issue with no solution.

The new research shows the first observation of a previously unknown material defect which limits silicon solar cell efficiency.

Professor Tony Peaker, who coordinated the research now published in the *Journal of Applied Physics*, said: "During

the first hours of operation, after installation, a solar panel's efficiency drops from 20 per cent to about 18 per cent. An absolute drop of 2 per cent in efficiency may not seem like a big deal, but when you consider that these solar panels are now responsible for delivering a large and exponentially growing fraction of the world's total energy needs, it's a significant loss of electricity generating capacity."

The energy cost of this

shortfall across the world's installed solar capacity measures in the tens of gigawatts, this is equivalent to more energy than is produced by the UK's nuclear power plants. The solar shortfall has to be therefore met by other less sustainable energy sources such as burning fossil fuels.

Combining a specialised electrical and optical technique, known as 'deep-level transient spectroscopy' (DLTS), the team have uncovered the existence of a material defect which initially lies dormant within the silicon use to manufacture the cells.

Dr Iain Crowe, associate professor at the University of Manchester, said: "This flow of electrons is what determines the size of the electrical current that a solar cell can deliver to a circuit, anything that impedes it effectively reduces the solar cell efficiency and amount of electrical power that can be generated for a given level of sunlight. We've proved the defect exists, it's now an engineering fix that is needed."

Lighting control system delivers savings of 60 per cent

Abtec Building Technologies has provided the control system for the main and emergency lighting systems at a new Siemens facility in Lincoln, rated by BREEAM as 'Very Good'.

The Hydra integrated building energy management system (BEMS) from Abtec provides the foundation for the solution, ensuring comfortable lighting levels for staff and the testing of emergency lighting in line with the safety standards. Moreover, Siemens is achieving energy savings of up to 60 per cent when compared with a traditional installation.

"We installed Hydra, which could not only control the lighting, but also report on the lighting levels being used and any associated



cost savings," explains Russell Downing, building controls engineer at Abtec.

Lights can be programmed to come on at target lux levels that are defined by the user. Having this system in place means Siemens can capitalise on daylight saving hours whereby lighting comes on at a lower level during the summer months.

Factory shows its 'metal' to make large heating gains

Cashmores is a specialist coil processor in stainless steel and aluminium, providing a bespoke service to customers nationwide. To ensure workers are comfortable all year round, the company has installed Tansun infrared heaters into its factory work stations.

Following discussions and a site survey, Tansun's Apollo infrared heaters in black were chosen as the most suitable solution for the factory. Eighteen A1A and eight A1J Apollo infrared heaters were selected for the factory's very high ceilings and were specified to replace the existing inefficient and costly heating system and keep the area warm

during the winter months.

The infrared heaters are controlled via localised switches for individual zones, which provide instant heat and allows workers to control the heating in areas only when and where required, reducing unnecessary energy consumption.





Robin Hale

The chief executive of the Major Energy Users' Council on the Egyptian pharaohs, keeping sane on a desert island and failing to heed the best piece of advice he's ever been given

Who would you least like to share a lift with? Anyone transporting durian fruit. Takes Marmite to a whole new level.

You're god for the day, what's the first thing you do? Sack my publicist. Religion has a lot to answer for but it's not God's doing. While miracles are great – and as God for the day poverty, war and the global effects of climate change could be resolved in an instant – we unfortunately live in a disposable, short-vision and short-term world. We have the answers but we all need to become better than we are for future generations to inherit a more sustainable and peaceful place to live.

If you could travel back to any historical period when would it be and why? A day-trip to see the Seven Wonders of the Ancient World. To look in awe at the Hanging Gardens of Babylon

and the short-lived Colossus of Rhodes.

Who or what are you enjoying listening to? Various albums streamed on (my now ageing) Sonos system from George Ezra to Tom Walker, easy listening music on the weekends playing in the background.



What unsolved mystery would you like the answers to? To see what happened during Akhenaten's reign, the pharaoh who changed Egypt's religious beliefs and commanded a vast empire. What happened after to him, his wife Nefertiti and their son, Tutankhamun.

What would you take to a desert island and why? Wilson, the volleyball. Seemed to keep Tom Hanks sane(ish).

What's your favourite film (or book) and why? *Frozen*, but I'm

guessing that will soon become *Toy Story 4* or even *Frozen 2*. If my four-year-old likes it, I get little choice.

If you could perpetuate a myth about yourself, what would it be? That as a physicist I should understand all things energy.

What would your super power be and why? Contagious Omnilingualism, because a lot is lost in translation.

What irritates you the most in life? Not heeding the advice I've been given.

What should businesses be doing to help themselves energy-wise? In the main energy users know what needs to be done and can be done, but require the right support – both externally from industry stakeholders and internally from the board. As an industry we need to provide

“ **Best piece of advice? Never to answer personal questions in the back of an industry magazine!** ”

What would you do with a million pounds? Sponsor a Nobel Prize for Energy Efficiency to acknowledge game-changing technologies and solutions in the continual pursuit of energy reduction.

What's your greatest extravagance? Holidays in Brazil to see the in-laws and explore such a diverse and wonderful country and culture.

If you were blessed with any talent, what would your dream job be and why? To be a great innovator and inventor like Steve Jobs, Elon Musk or James Dyson. To make a positive contribution affecting our everyday environment.

What is the best piece of advice you've ever been given? Never to answer personal questions in the back of an industry magazine!

greater support to end users especially around education and best practice. We have the experience and contacts to provide the right energy management and cost reduction advice, together with case studies and practical experience – it's a tough economic climate and we should all help one another. Let's make it happen!

What's the best thing - work wise - that you did recently? Having recently moved to a new role, the best thing is re-engaging with end users. Visiting them onsite and seeing the challenges and time constraints they are under helps to focus on our task of making things easier; and providing the right support as we enter into perhaps the most challenging decade, certainly in the past 30 years. **te**



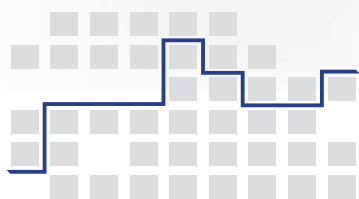
Pic: 20th Century Fox

Wilson the volleyball kept Tom Hanks relatively sane

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